The Politics of Scientific Practice in Taiwan: 
The Hepatitis B Control Program

by

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(ABSTRACT)

This dissertation discusses the political dimensions of scientific practice in Taiwan from two perspectives: the social contingencies of scientific knowledge and the role of government in medical science. The history of Taiwanese hepatitis B control program from 1980 to 1993 provides a valuable case study to investigate these issues.

The controversies over the safety of the hepatitis B plasma vaccine display the social contingency of scientific knowledge. On the basis of different concerns or political interests, numerous participants joined the scientists in interactively shaping and reshaping the vaccine safety. When participants used various strategies and contradictory scientific knowledge to argue against each other, the credibility of experts and their scientific knowledge was downgraded, which in turn prevented scientific knowledge from serving as the sole arbitrator of resolving the controversies. The socially contingent characteristics of scientific knowledge provided a space for government agencies participating in shaping scientific knowledge
formation.

This historical case displays how the Taiwanese government significantly influenced the scientific knowledge formation regarding hepatitis B control in Taiwan. The government designed science policy to promote hepatitis B control, and government officials were involved in resolving the controversies over the safety of the hepatitis B plasma vaccine. Government scientists not only gave government agencies a certain degree of interpretative authority in the controversies, but also produced alternative scientific knowledge to support the government’s science policy. When the government policy changed in response to social problems, the scientific knowledge regarding hepatitis B control also changed.

This dissertation concludes by calling for more attention toward studying the role of government in scientific practice. Without considering how the Taiwanese government participated in the hepatitis B control program, our understanding about the formation and change of scientific knowledge regarding hepatitis B control would be incomplete.
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### Abbreviation

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>AIDS</td>
<td>acquired immune deficiency syndrome</td>
</tr>
<tr>
<td>DCB</td>
<td>Development Center for Biotechnology</td>
</tr>
<tr>
<td>DOH</td>
<td>the Department of Health</td>
</tr>
<tr>
<td>DPP</td>
<td>Democratic Progressive Party</td>
</tr>
<tr>
<td>FDA</td>
<td>Food and Drug Administration</td>
</tr>
<tr>
<td>FY</td>
<td>fiscal year</td>
</tr>
<tr>
<td>GMT</td>
<td>geometric mean titer</td>
</tr>
<tr>
<td>HAV</td>
<td>hepatitis A virus</td>
</tr>
<tr>
<td>HBeAg</td>
<td>hepatitis B e antigen</td>
</tr>
<tr>
<td>HBig</td>
<td>hepatitis B Immune Globulin</td>
</tr>
<tr>
<td>HBsAg</td>
<td>hepatitis B surface antigen</td>
</tr>
<tr>
<td>HBV</td>
<td>hepatitis B virus</td>
</tr>
<tr>
<td>HCC</td>
<td>hepatocellular carcinoma</td>
</tr>
<tr>
<td>KMT</td>
<td>Kuomintang party</td>
</tr>
<tr>
<td>NIH</td>
<td>National Institute of Health</td>
</tr>
<tr>
<td>NSC</td>
<td>National Science Council</td>
</tr>
<tr>
<td>NT$</td>
<td>New Taiwan dollar</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>research and development</td>
</tr>
<tr>
<td>STAG</td>
<td>Science and Technology Advisory Group</td>
</tr>
<tr>
<td>STS</td>
<td>Science and Technology Studies</td>
</tr>
<tr>
<td>TPDHO</td>
<td>Taiwan Provincial Department of Health</td>
</tr>
<tr>
<td>US</td>
<td>the United States of America</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
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Chapter One

Introduction

The principal objective of this dissertation is to examine the political dimensions\(^1\) of scientific practice in Taiwan. The history of Taiwanese hepatitis B control program from 1980 to 1993 provides a valuable case study to investigate this topic.

This research examines the political dimensions of scientific practice from two perspectives. First, I argue that government can be seen as a significant participant in scientific practice rather than an outsider intervening in science. This perspective raises four subsidiary issues. First, government agencies design science policies to direct the development of science. In Taiwan, this issue is especially important because most of the research and development (R&D) budgets come from government. Second, government agencies may influence scientific development by

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\(^1\)The basic idea of "politics" here is the management of human beings, their institutions, and the relations among social actors. Daniel S. Greenberg(1967:xii) defines the politics of science that "is in the participants, institutions, and processes that determine what is to be researched, by whom, where, under what circumstances, and, finally, what is to be done with the results."
means of funding. The more scientists rely upon government agencies for funding resources, the more influence government agencies may have in scientific practice. Third, government supervises or regulates scientific research. Scientists may not like government's supervision, but sometimes government's regulations help scientific development. Fourth, government participates in scientific practice through governmental scientists. This point is important because governmental scientists give government a certain degree of interpretative power and authority on scientific affairs. In other words, government not only influences scientific practice by funding and regulating, but also does science. Therefore, we cannot confine the study of scientific practice to traditional scientific communities only.

The history of the hepatitis B control program in Taiwan shows that the design of Taiwanese government's science policy\(^2\) and the government's funding

\(^2\)Although science and medical science are different in terms of support, locations, training, commercial connections, etc. in the United States, I lumped them together in this thesis for several reasons. First, although hepatitis B research belonged to medical fields, the hepatitis B control program was included in the general title "science policy" in Taiwanese government's policy design. For example, in the early 1980s, when the government designed its "Science and Technology Development Program," hepatitis B control was juxtaposed with energy, information, automation, biotechnology, electro-optics, and food technology as the major strategic areas of science and technology(The Executive Yuan, 1982). The terms "medical policy" and "public health policy" were rarely used by government agencies in the history of the hepatitis B control program in Taiwan. In other words, the government agencies in this case study did not differentiate "medical science" from "science." Second, in this case study, Taiwanese hepatitis B researchers included physicians, epidemiologists, biochemists, pharmacologists, immunologists, molecular biologists, pathologists, and statisticians. Some researchers' works blurred the distinction between "science" and "medical science." Third, in this case study, research budgets
regarding hepatitis B control significantly influenced the direction of hepatitis B research. In addition, government agencies and government scientists produced certain "scientific knowledge" in order to promote government’s policy. Besides, in controversies over the safety of the hepatitis B plasma vaccine, they actively argued for government’s policy. In other words, the government was a significant participant in scientific practice regarding hepatitis B control.

The second perspective concerns the social contingency of scientific knowledge in public controversies. Analyzing this topic raises three subsidiary issues. First, various participants besides scientists may enter scientific practice. They may bring in a range of ethical, cultural, economic, and technical issues and create a controversy. Second, in a controversy, the credibility of scientists and scientific knowledge become negotiable. Since various participants can simultaneously enlist contradictory scientific knowledge to argue against each other, the privilege of scientific knowledge decreases. Third, scientific knowledge is not the sole arbitrator to resolve a controversy. Rather, the "scientific status" of certain "scientific knowledge" need not become stabilized until a controversy is resolved.

came from the National Science Council(NSC) and the Department of Health. The NSC sponsored most of basic research in Taiwan. The NSC’s funding category juxtaposed medical research and biology. In other words, the NSC did not differ "medical science" from "science." Therefore, on the one hand, I do not make distinction between "medical science" and "science;" on the other hand, I use the term "science policy" to refer to how the Taiwanese government designed its programs and allocated funding in developing science and technology, which included hepatitis B control.
The history of the hepatitis B control program showed that scientific knowledge might not be universal. Although it was "scientific knowledge" in the United States, it might be doubted or even rejected and lose its scientific status in Taiwan. When scientists accepted it as a "fact," various publics might question it. Although it was accepted as "fact" at one time, it might be downgraded by other participants at other times without any crisis. Its meaning might be decided by the local context and by the users' particular agenda. In addition, from the study of the social contingency of scientific knowledge in a public controversy, we can see that the scientific status of a "fact" was not necessarily decided by a 'core set' of scientists only. Besides scientists, government agencies, industries, doctors, patients, and a range of public groups, all might participate in creating and shaping scientific knowledge.

From these two perspectives, this research is going to contribute to Science and Technology Studies (STS) by characterizing the political dimensions of scientific practice. The detailed theoretical arguments are shown in the next chapter. The following sections introduce the case study and outline the thesis.

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3H. M. Collins (1985) believes that some elite scientists--allies and enemies alike--form a 'core set' that plays the principal role in determining the outcome of a scientific controversy.
The Hepatitis B Control Program

Hepatitis B is an inflammation of the liver caused by the hepatitis B virus. Compared with the viruses of hepatitis A, C, and D, the hepatitis B virus is special because it can stay in healthy persons, who are called carriers, and infect other people. Many researchers believe that the hepatitis B virus is an important cause of hepatocellular carcinoma and cirrhosis. On February 17, 1981, the Kuomintang (KMT) government approved a hepatitis B vaccine trial program, and its scientists and officials (Sung JL, 1981; Lin CC, 1981; Liu CY, 1981; Lee TY, 1981) presented the following data as evidence that the hepatitis B virus infection was extremely severe in Taiwan:

- 80% - 90% of Taiwanese adults had been infected before they were 39 years old.
- The hepatitis B surface antigen (HBsAg) carrier rate of the general population was 15%-20%.
- About three million people out of eighteen million population were HBsAg carriers.
- Hepatitis B virus was the main cause of hepatocellular carcinoma (HCC) and cirrhosis. HCC was the leading cause of cancer mortality for men in
Taiwan. Cirrhosis ranked sixth in the causes of death in Taiwan.

- 86%-96% of infants born to hepatitis B e antigen (HBeAg) carrier mothers became chronic carriers early in the postnatal period.
- There was no satisfactory means of eliminating persistent hepatitis B virus infection.
- Prevention of infection was the only way to solve this problem.

Then, in 1982, hepatitis B control became one of the eight major strategic areas of science and technology for top priority development. On July 1, 1984, the KMT government began a mass hepatitis B immunization program.

The hepatitis B control program was one of the national projects of which many government officials were proud because Taiwan was the first country in the world to promote this program, and they felt that this program was successful (Chen DS et al., 1987; Hsu HM et al., 1988; STAG, 1988b). But, why did the government choose hepatitis B as the top priority of the health policy? Was it the most serious public health problem in Taiwan to deserve most of the research budget of the

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4The eight major strategic areas of science and technology were energy, materials, information, automation, biotechnology, hepatitis control, electro-optics, and food technology.
Department of Health for disease control? The government said yes. But when we look back at the history to see the process of the governmental policy making, the "yes" answer becomes questionable.

We still need to ask: why did the government choose hepatitis B as the target of the health policy? During the 1970s, many hepatitis B researchers had pointed out that Taiwan had severe prevalence of hepatitis B. But before 1980, the government never recognized it as a problem. Why did the government suddenly emphasize it in 1980? Did the government pay attention to it just for the sake of public health? In 1980, when there were other more serious diseases--such as malignant neoplasms, cerebrovascular diseases, and heart diseases--why did the hepatitis B control become the government's top priority? The hepatitis B control program was expensive; this was why many countries could not afford it. Taiwan was much wealthier in the early 1990s than in the early 1980s. But Dr. Chen Ding-Shinn, a key person in the

5 For example, the Department of Health spent 42% of its research budget for disease control on hepatitis B control (NSC, 1987a:268).

6 In 1980, the mortality per 100,000 population was 75.35 for cerebrovascular diseases, 75.09 for malignant neoplasms, and 43.37 for heart diseases. Meanwhile, it was about 32 for all liver disease, including hepatocellular carcinoma, cirrhosis, and chronic liver diseases.

7 Interview with Dr. Chen Ding-shinn at National Taiwan University, Taipei, on June 14, 1993. He was a member of the Hepatitis Control Committee of the Department of Health and a member of the Hepatitis Advisory Committee of the Executive Yuan. He was also the medical adviser of Minister Without Portfolio Lee Kuo-ting in the Science and Technology Advisor Group of the Executive Yuan in the 1980s. The importance of these organizations are described in chapter three and chapter four.
hepatitis B control program, said that "this program would not happen if it were promoted in the early 1990s." Why?

When controversies over the safety of the hepatitis B plasma vaccine arose, how did the government resolve them? What were the roles of governmental scientists in the controversies? Did they act differently from academic scientists? When the U.S. FDA had approved the safety of the hepatitis B plasma vaccine, why was this "fact" not universally accepted in Taiwan? What kinds of "scientific knowledge" did the government and governmental scientists produce to support the hepatitis B control program? How did they make efforts to convince Taiwanese people of the validity of their "scientific knowledge?" This dissertation pursues answers to these questions in order to display some of the political dimensions of scientific practice in Taiwan.

Before going to the detailed history, we need to understand the social context in Taiwan in the late 1970s. This context significantly influenced how the KMT government designed the science policy and promoted the hepatitis B control program, and how the controversies over the safety of the hepatitis B plasma vaccine were resolved.

Taiwan's Political Context and Economic Structure
Taiwan's Political Context

After losing mainland China and moving to Taiwan in 1949, the Kuomintang (KMT), the most powerful party in Taiwan, had dominated Taiwan without challenge until the mid-1980s (Lin CL, 1989; Wang JH, 1989; Sorensen, 1990). Since 1948, the constitution was amended by the so-called Temporary Provisions (effective during the period of Communist rebellion). Until 1991, the Temporary Provisions suspended general elections of the National Assembly, the Legislative Yuan, and the Control Yuan (Figure 1-1). Therefore, the KMT could dominate these three organizations by freezing their memberships, since the mainlander delegates (also called senior delegates), most of them being KMT members, dominated these three organizations (Gold, 1986:56-73; Copper, 1990:53-

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According to the Constitution of Republic of China, there were five Yuans (branches) under the President: Chienchayuan (the Judicial Yuan), Hsingchengyuan (the Executive Yuan), Kaoshihyuan (the Examination Yuan), Chienchayuan (the Control Yuan), and Lifayuan (the Legislative Yuan). The Executive Yuan managed public affairs. The Control Yuan supervised governmental affairs. Its members were elected by provincial and municipal councils. The Legislative Yuan was responsible for legislation, approving the budget, etc. The Examination Yuan held examinations for the civil service and professional licenses. Besides the President and five Yuans, the Central Government included Kuomintahui (the National Assembly) which elected the present and decided the constitution. The Legislative Yuan, the Control Yuan and the National Assembly consisted of the congress of the Republic of China.

9
Martial law was in force in Taiwan for 38 years, from 1949 to 1987. During this period, no new political parties, newspapers, TV stations, or radio stations were allowed; furthermore, public meetings, strikes, and demonstrations were forbidden (Sorensen, 1990:123). The KMT government dominated most of the organizational resources of various social sectors, such as mass media and financial sectors. It also inhibited the formation of opposition movements. For example, Taiwanese labor unions could not go on strikes because of martial law; therefore, they played only token roles (Lin CL, 1989:153).

To keep its regime, in fact, the KMT government made efforts to develop the economy, especially industries. The government held the first National Science and Technology Conference in 1978. President Chiang Ching-kuo directed that:

[The aim of this conference] is to involve science and technology in the regulation of national policies. ... The first priority is applied science and technology in order to help national economic development (NSC, 1978: 39).

Then in 1979, the government announced a "Science and Technology

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9The mainlander delegates were those elected in mainland China in 1947. They came with the KMT government to Taiwan in 1949. Although there was a supplementary election was held to add more delegates to represent Taiwan from 1969, Taiwanese delegates held small part of seats in the National Assembly (Cooper, 1990:53-66).
Development Program" in order "to promote national economic development and to enforce national defense" (The Executive Yuan, 1979:1). Due to this program, the Executive Yuan established a Science and Technology Advisory Group (STAG) directly under the Premier to design science policy. The director of the STAG was Minister Without Portfolio Lee Kuo-ting. From the mid-1970s to the late 1980s, he became the "godfather" of science and technology affairs in Taiwan. During this period, the decision-making of the science policy mainly came from his group (Lin CH, 1989:103-108). Chapter three and chapter four show how he actively promoted the hepatitis B control program and participated in two controversies over the plasma vaccine safety.

Meanwhile, the Legislative Yuan and the Control Yuan did not have any committee to provide oversight regarding science and technology affairs. In addition, compared with the strong administrative sectors of the government, scientific

10 In the government, there was a Committee for Science Development in the office of the President. This committee was set up under the National Security Council in 1967. This council was a reaction of the KMT government to the Cultural Revolution in the mainland China. But this committee was only a token (Lin CH, 1989:108-110). Regarding the minimized power of the committee, the chairman of the committee Wu Ta-yu said that: Because of the political context, the organization of the Committee was simplified and its power was reduced [in 1973]. Then the Executive Yuan took the responsibility of science policy. In fact, from that time, the committee has not participated the decision-making of science policy (Wu TY, 1987).
communities were minority groups in the decision-making of the science policy. Although every scientific discipline had its own association, each association at the most held meetings or conferences and published its journal. Under martial law, the KMT government did not allow the appearance of any strong oppositional scientific group (Lin CH, 1989). Therefore, the administrative sectors of the government dominated science policy.

Structure of Taiwan’s Economy

From the late 1950s, Taiwan’s economic structure has been dualistic, the huge state-owned enterprises and large private enterprises dominated the domestic market while many small and medium enterprises\(^\text{11}\) aimed at exporting (Wu CY, 1992; Liu CC, 1992a). This economic structure was a historical product of the KMT regime. This economic structure would influence the development of the hepatitis B control program circa 1980.

When Japan occupied Taiwan between 1895 and 1945, Japanese enterprises dominated almost all the non-agriculture sectors in Taiwan. After Japan’s

\[^{11}\text{A small enterprise had employees fewer than 30 persons. The employees in a medium enterprise were from 30 to 299 persons. A big enterprise had more than 300 employees.}\]
unconditional surrender and the return of Taiwan to China, the KMT government took over most of the Japanese enterprises in Taiwan and let them become the state-owned enterprises. These enterprises controlled all the communication and financial sectors and most of the manufacturing sectors. Liu Chin-ching (1992a:24-28) calculates that they produced 70% of the manufactured products in 1947. Through the policy "Taking Over Enemy's Properties," the KMT government established the huge state-owned enterprises.

The state-owned enterprises had 42.6% of Taiwan's total capital formation in 1952. Though this percentage gradually decreased to 20%-30% in the 1980s, it still presented the direct manipulation of economy by the government. Wu Jo-yu (1992:2-9, 99-101) shows how the state-owned enterprises functioned in Taiwan. For example, they occupied most of the up-stream sectors of industries\textsuperscript{12}, the financial system, and infrastructure to dominate the supply of resources. This domination not only allowed the state to control huge economic power, but also enforced the political power of the state. Chapter four examines how the state-owned enterprises played an important role in promoting the hepatitis B control program in the 1980s.

The large private enterprises and conglomerates rose in Taiwan after some large textile companies moved in from mainland China circa 1949. Chu Yun-han

\textsuperscript{12}In industries, the up-stream level meant affording basic materials, such as cotton; the mid-stream level meant producing semi-products, such as textiles; the down-stream level meant manufacturing final products, such as clothes.
(1989:146-149) and Wu Chyuan-yuan (1992:181-197) characterize how the KMT government and the large private enterprises exchanged interests. The KMT government protected the state-owned enterprises and the large private enterprises enjoyed monopolistic or oligarchic controls over the domestic markets through various procedures of industrial licensing, multiple exchange, import controls, high tariffs, and allocating credit. In return for this protection, these firms would support the KMT government. However, those procedures for protecting domestic markets were obstacles to Taiwan's exports.

There was a special kind of enterprise in the category of the large private enterprises: the KMT-owned enterprise. According to the research of Chen Shih-meng and his colleagues (1991:69-73), the assets of this group were estimated to be more than NT$ 500 billion (US$ 19 billion), bigger than Chinese Petroleum Corporation, the top manufacture in Taiwan. There were some noteworthy characteristics of the KMT-owned enterprises. First, they tended to be the partners of the state-owned enterprises, such as Bank of Taiwan, China Steel, Taiwan Electric Power, Taiwan Stock Exchange, and China Petroleum. Second, they favored monopolistic or oligarchic businesses, such as the fields of finance, insurance, and investment banking industries. Third, they favored mass media, such as China Broadcasting Company, China Television, and Central Daily News.13 The KMT-

13There were only three TV stations in Taiwan allowed before 1994. Taiwan Television Company belonged to Taiwan Provincial Government. The KMT owned
owned enterprises also played a role in promoting the hepatitis B control program from 1984. But in 1991, they became a target in a controversy over the safety of the hepatitis B plasma vaccine.

In 1958, the KMT government began reform programs to "improve the investing climate." These included tax rebates, tax breaks, exchange unification, and the establishment of export zones in order to attract foreign capital and technology and thus create more foreign exchange and a self-sustained growth. These programs opened a door for export-led growth.

But many researchers (Cho TC, 1989:103-105; Wu CY, 1992:158-188; Liu CC, 1992a:256-7) argue that these reform programs were not an economic liberalization; instead, the KMT government chose only to offset obstacles to exports, while keeping the rest of the protection policies.\textsuperscript{14} Therefore many small and medium enterprises rose for exports because exports were the only place where the administrative controls were few. Those reform programs and the protection policies created a dualistic economic structure in Taiwan: the state-owned enterprises and

\textsuperscript{14}The best evidence of the protection policies is that consumer goods were only counted 5.5\% of the total imports in the 1960s and 6.4\% in the 1970s(TSDB, 1991:214). In other words, foreign consumer goods were often excluded from the Taiwan’s domestic market. Even foreign consumer goods could enter Taiwan’s market, they became very expensive and less competitive because of tariffs(Wu CY, 1993:27).
large private enterprises monopolistically or oligarchically dominated the highly protected domestic markets; the small and medium firms could only compete in the international markets. The protection policies and the dualistic economic structure would influence the direction of the hepatitis B control program in the 1980s. Also, in 1991, the protection policies would become a target in the vaccine controversy.

The small and medium firms usually were labor-intensive and export-oriented. In manufacturing sectors, Liu Chin-ching (1992b:139-143) calculates that the small and medium firms numbered 99.7% of the total firms in Taiwan in 1961 and 98.8% in 1981. Cho Tien-chen (1989:108-112) and Wu Chyuan-yuan (1992:212-213) indicate that the small and medium firms had few abilities and intentions of doing research and development (R&D). They kept their competitive advantages by factors such as low wage levels, foreign exchange rates, environmental negligence, the mobilization of family resources, including financial resources and self-exploitation of family labor, rather than by doing R&D. Huang Weng-foung\(^{15}\) (1986) describes the characteristics of the pharmaceutical industry in Taiwan:

Small scale manufacturers proliferating during 1960s have remained static and unimproved over the past two decades regardless of rapid industrial development in this country over the same period. Insufficient incentives and funding resources for research and

\(^{15}\)In 1986, Huang Weng-foung was the Director of the Bureau of Pharmaceutical Affairs, the Department of Health.
technology development [were] mainly due to regulatory restrictions
and price-oriented market competition.

Because of the small-firm characteristic of the pharmaceutical industry, when the
KMT government began developing the hepatitis B control program, it sought help
from the state-owned enterprises rather than the existing pharmaceutical industry.
Chapter four examines the details.

The statistics of the National Science Council(1988:30) shows that Taiwan
spent little on R&D--less than 1% of the gross national product(GNP) until 1985.
Denis Fred Simon(1980:426) points out that, generally, Taiwan’s industries depended
highly on foreign technology to support their economic activities. The export-led
enterprises fully used Taiwan’s cheap and high quality laborers and "good"
investment environment to occupy an advantageous niche in the international division
of labors. They imported and processed capital & technology-intensive intermediate
products and then exported the finished products. Few of them created their own
products independently. At the beginning of the hepatitis B control program, the
KMT government still followed the strategy of technology transfer to produce the
hepatitis B vaccine.  

The economic structure, the political power network, and the international

\[16\]In 1984, the National Science Council and Development Center for
Biotechnology bought the technology of producing the hepatitis B plasma vaccine
from Pasteur Institute at France.
circumstances were not just "social factors" irrelevant to Taiwan's scientific development. Rather, they participated in the development of the hepatitis B control program. Practitioners and officials from these realms were active participants. The political and economic situations in the early 1980s played an important role in shaping the first controversy. But a different political context and economic structure in the early 1990s shaped another controversy in a totally different way. Chapter three and chapter five examine the details.

Outline of the Thesis

After this chapter's introduction, chapter two examines some conceptual issues of the political dimensions of scientific practice from two perspectives. First, I discuss the social contingency of scientific knowledge in order to understand political operations in scientific practice. I analyze this topic from three points, including various participants entering scientific practice, the credibility of scientific knowledge becoming negotiable in controversies, and the resolution of controversies producing new scientific knowledge. Second, I argue that government agencies can be seen as significant participants in scientific practice rather than outsiders intervening in
science. I discuss this topic by following the four subsidiary issues of scientific research relying more upon government funding, government directing scientific development by science policy, government supervising scientific research, and government doing scientific research by government scientists.

Chapter three investigates the early history of the hepatitis B control program. I examine how hepatitis B was constructed as a severe problem in the early 1980s; how some "scientific knowledge," such as the 15%-20% carrier rate in Taiwan, the mode of transmission, and the safety of the hepatitis B vaccine, were shaped; how some "scientific knowledge" was used to serve political interests; how government officials participated in a controversy over the safety of the hepatitis B vaccine; and how the controversy was resolved.

Chapter four examines how the Department of Health's policy shaped its "correct knowledge" regarding hepatitis B control. Under some policy considerations, government scientists and government agencies produced certain "correct knowledge" to support the hepatitis B control program. Then the government agencies and governmental scientists made efforts to convince Taiwanese people of certain "scientific knowledge" in order to promote the hepatitis B control program. If the Taiwanese people did not accept the "scientific knowledge," the

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17 In this dissertation, I use the term "correct knowledge" ironically. This usage implies that government scientists claimed a certain statement "correct knowledge," although they knew that it was incorrect or uncertain at that time.

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government would have a difficult time convincing them to accept the hepatitis B plasma vaccine. If the vaccine was rejected in popular domains, then the initial basis of the biotechnology, which the government wanted to promote, would be destroyed.

Behind the "success" of the hepatitis B control program, there were many social costs, social changes, and social problems. For example, as Chapter four outlines, the Department of Health promoted the use of polystyrene utensils in order to prevent hepatitis B infection. But millions of polystyrene utensils every month created a environmental problem. In addition, many HBsAg/HBeAg carriers were discriminated against in families, hospitals, military, and companies. Responding to these social problems, the Department of Health changed its policy, which in turn changed the content of its "correct knowledge."

Chapter five deals with two other controversies over the safety of the hepatitis B plasma vaccine; one occurred in 1987, the other in 1991. After millions of doses of the vaccine had been used in Taiwan and other countries for many years, there were no serious accidents reported due to the vaccine; in other words, there was no crisis with the vaccine. But the safety of the vaccine was questioned again and again. Political context and economic change played an important role in the controversies. Finally, the credibility of the vaccine was downgraded by politicians, although most of the scientists endorsed the safety of the vaccine.

This dissertation concludes by calling for more attention toward studying the role of government in scientific practice. Without considering how the Taiwanese
government participated in the hepatitis B control program, the understanding about the formation and change of scientific knowledge regarding hepatitis B control would be incomplete. It was not that the government intervened in scientific practice. Rather, the government participated in the hepatitis B control program by designing science policy, funding research, and doing research through government scientists. The government scientists gave the government a certain degree of interpretative authority in resolving controversies and forming science policy. The power relation and interaction among government agencies and politicians shaped and reshaped the safety of the hepatitis B plasma vaccine. Studying the role of government in scientific practice promises a valuable way of understanding scientific knowledge formation.
Chapter Two

The Political Dimensions of Scientific Practice

This dissertation contributes to the Sociology of Scientific Knowledge by outlining the participation of government in scientific practice. Chapter one introduced a general background of the hepatitis B control program and Taiwan’s political context and economic structure, which significantly influenced the development of the hepatitis B control program. This chapter provides a conceptual context for exploring the political dimensions of scientific practice. Through displaying that various people may participate in scientific practice, especially in shaping and resolving a public controversy, this chapter discusses social contingencies of scientific knowledge. Through denoting that government can be a funder, a designer, a regulator, or a researcher in scientific practice, this chapter examines how government can be seen as a significant participant in scientific practice.

From the late 1970s on, the sociology of scientific knowledge emerged, insisting that scientific knowledge is a social product. Sociologists of scientific
knowledge critically created some new STS approaches.¹ Their research mostly focuses on scientific laboratories or scientific communities, but almost ignores the roles of government in scientific practice. Since government may influence scientific practice through science policy, government funding, government regulations, and government scientists, ignoring the roles of government in scientific practice may cloud understanding about the process of scientific knowledge formation.

The sociology of scientific knowledge has contributed a lot in elaborating social contingencies of scientific knowledge. They challenge the previously accepted objectivity of scientific knowledge by investigating social process as involved in scientific knowledge formation. They emphasize the theory-laden, decision making-laden, social context-laden, and cultural-laden aspects of scientific knowledge. Their research breaks the dichotomies between "rational" and "social" or "internal" and "external" in STS, thereby also challenging the traditional epistemology of the philosophy of science, which almost ignores the social dimensions of science.² One

¹Influenced by the Strong Programme, the Edinburgh School came first in the sociology of scientific knowledge. In the Strong Programme, David Bloor(1976) asserted that the sociology of knowledge should be causal, impartial, symmetrical, and reflexive. The Edinburg School asserted that the "interests" of participant groups shaped the content of scientific knowledge (Barnes, 1977; Bloor, 1976). Later on, different approaches emerged in the sociology of scientific knowledge, such as the constructivist and ethnographic study of science(Latour & Woolgar, 1979; Latour, 1987; Knorr-Cetina, 1981), the relativist programme(Collins, 1983), the ethnemethodological study of science(Lynch, Livingston, & Garfinkel, 1983; Lynch, 1985a), the discourse analysis programme(Gilbert & Mulkay, 1984).

²Kuhn (1962) and Feyerabend (1975) are two of the few exceptions.
of the benefits from their studies over social characteristics of scientific knowledge is an understanding that various participants, besides scientists, may interactively shape the formation of scientific knowledge, thereby providing a possibility of seeing government as a significant participant rather than an outsider intervening in scientific practice.

The first section of this chapter introduces the basic viewpoint of this dissertation that treats science as practice. Scientific activities are rich. How scientists learn knowledge, plan proposals, apply for funds, run projects, explain phenomena, revise assertions, and argue in controversies, all shape the formation of scientific knowledge. Starting from the study of scientific practice may provide a more comprehensive understanding about scientists’ activities or scientific knowledge production.

The second section outlines some political dimensions of scientific practice through investigating the social contingency of scientific knowledge. In general, scientific knowledge may be shaped and reshaped by numerous participants, such as government officials, industries, local residents, mass media, and scientists. Specifically, in a public controversy, scientific knowledge may not be the arbiter of the controversy since the participants simultaneously hold contradictory scientific knowledge to argue against each other. In other words, scientific knowledge becomes a tool of the participants. Various participants bring ethical, cultural, legal, economic, and technical issues into a controversy, and use different strategies and
rhetorical arguments to enlist more allies and paralyse their opponents. Therefore, compared to scientific rationality studies, political operations studies provide an alternative approach to understanding how scientific knowledge is stabilized in a controversy.

The third section reviews literature regarding how government agencies and governmental scientists have functioned in the process of scientific knowledge production. From World War II on, government has taken a more active role in scientific development, not only in funding but also in doing science itself. The more scientists rely upon government funding, the more influence government may have in scientific practice. Moreover, government scientists give government agencies more legitimate authority in scientific affairs. If we overlook the role of government in the cognitive and institutional development of science, we may have a limited understanding about the whole picture of twentieth-century science.

Science as Practice

In this dissertation, I operate with the basic premise that science is practice. I interpret "practice" as the acts of making and unmaking that all participants, such as
government officials, businessmen, mass media, interests groups, and scientists, perform in the field of science.³ In this picture of science, neither social nor cognitive factors have priority in explaining the formation of scientific knowledge. Rather, in order to understand the process of scientific knowledge formation, we have to investigate the interaction among activities of participants, institutional factors, social context, conceptual development, and material elements.

After reviewing the contributions of the social studies of science in the 1980s, Golinski(1990) calls for attentions toward regarding science as practice:

Various attempts have been made to develop more plausible accounts of scientific practice that recognize both the flexibility and the constraints operating in any specific situation. In general terms, the problem is that of developing a "theory of practice," which would enable scientific work to be related to the aims and resources of its practicipants and to the structure of constraints within which they find themselves(Golinski, 1990:500).

Golinski shows that many studies on how scientists operate experiments(Collins, 1985; Pickering, 1984; Pinch, 1986) and on how scientists rhetorically persuade or

³Andrew Pickering(1992:3) interprets "practice" as the acts of making (and unmaking) that scientists perform in that field and refers "culture" to the field of resources that scientists use in their work. But in this dissertation, I extend Pickering’s interpretation of "practice" since the history of the hepatitis B control program shows that participants of scientific practice also include government officials, businessmen, and mass media rather than scientists only.
argue with others (Latour & Woolgar, 1979; Latour, 1987) have offered valuable conceptual resources to STS. But Golinski continues that we have to create a "science as practice" account to incorporate both "active" and "passive" elements in the production of scientific knowledge.⁴

Besides, Pickering (1992) argues that scientific knowledge is only part of science rather than science itself. He also suggests that science be regarded as practice in order to "catch up the richness of the doing of science, the dense work of building instruments, planning, running, and interpreting experiments, elaborating theory, negotiating with laboratory managements, journals, grant-giving agencies, and so on."

Pickering criticize the sociology of scientific knowledge for only regarding science as knowledge and also for insisting that scientific knowledge is only constitutively social.⁵ Pickering continues that no special social element of science, such as "interests," can be the axis of scientific practice. Instead, he argues:

The image of science that emerges is one in which all of the different elements of scientific culture that one might care to distinguish--social,

⁴Golinski (1990:501) interprets "active elements" that "comprise those under the control of scientists: their will, desires, and imagination and the skills and techniques that select to probe the natural world." He refers "passive elements" to "those beyond [scientists'] control that they encounter when they feel resistance in the course of investigation."

⁵In the 1986 postscript of Laboratory of Life, Bruno Latour and Steve Woolgar even called for a ten-year moratorium on cognitive research in STS.
in institutional, conceptual, material--evolve in a dialectical relation with
one another. The different elements are interactively stabilized against
one another, as I put it, are "coproduced" as Latour and Callon put
it..., with no particular element or set of elements having any
necessary priority (Pickering, 1992: 14).

In this picture of science, no single social factor decides the development of
science. Without necessary institutional supports, material offering, and cognitive
creation, science would have a difficult time developing. Furthermore, the concept of
"science as practice" questions perspectives that usually regard scientific knowledge
in cognitive terms alone. If we accept that scientific practice has heterogeneous
facets, such as social, cognitive, institutional, and material, then such perspectives
must be incomplete.6 In other words, no matter whether we are interested in the
activities of scientists or the formation of scientific knowledge, we have to start from
the study of scientific practice.

I argue below that the history of the hepatitis B control program shows that
the interaction of various participants, such as government officials, businessmen,
mass media, newborns’ parents, and scientists shaped the scientific knowledge
regarding hepatitis B control. Besides, changing political contexts and economic
considerations during the 1980s also influenced the development of the hepatitis B

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6 Thomas Kuhn (1962), Paul Feyerabend (1975), and Joseph Rouse (1987) are some of the few exceptions.
control program. On the one hand, a purely cognitive approach cannot explain how a scientific controversy over the safety of the hepatitis B vaccine was resolved when no participants could persuade each other with arguments, evidence, data, explanations, or predictions. That is, no "rational criteria" could judge the controversy. On the other hand, a purely social account of knowledge cannot explain the resolution of the controversy since existing scientific knowledge regarding hepatitis B control arguably played an important role in the controversy. In other words, neither cognitive approaches nor social factors alone can explain the development and resolution of the controversy. Rather, to regard science as practice provides a better approach to study this historical case.

In sum, if we want to understand science, we not only have to investigate how scientists’ reasoning works but also have to examine how they choose problems, how they argue for their assertions, how they develop their strategies, how they plead for funding, how they negotiate with others, and so on. In addition, we have to investigate the activities of various participants besides scientists in scientific practice since all of them not only may influence directions of scientific development but also participate in the process of scientific knowledge production.
Social Contingency of Scientific Knowledge

This section investigates political dimensions of scientific practice through examining social contingency of scientific knowledge. When does an assertion become "scientific knowledge"? Does it become "scientific knowledge" when a certain experiment is finished? Does it become "scientific knowledge" only if many experiments are successfully repeated? (How many experiments are necessary?) Does it become "scientific knowledge" only if it is published on a journal? (If no one cites it ever, is it still "knowledge"?) When a paper is accepted by a journal but its assertion is questioned in a controversy, what is the "scientific status" of the paper in the controversy? When people accept certain "correct knowledge" from scientists, though it lacks "scientific support," is it "scientific knowledge"?

This section discusses social contingencies of scientific knowledge by exploring three subsidiary issues. First, various types of people rather than scientists alone, may participate in scientific practice. Participants may bring different moral, legal, cultural, or commercial issues to bear in debate and controversy. Second, the authority and credibility of scientific experts and scientific knowledge may be

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In this thesis, I use the term "scientific knowledge" with quotation marks referring to the traditional sense of objective facts. In contrast, when I use this term without quotation marks as a STS jargon, it denotes that scientific knowledge is a social, cultural, and political construct.
downgraded in a public controversy by various participants for any possible reasons or interests. Third, the "scientific status" of certain "scientific knowledge" might not become stabilized until a public controversy is resolved.

Various Participants in Scientific Practice

Collins (1985) believes that some elite scientists--allies and enemies alike--form a 'core set' that plays the principal role in determining the outcome of a scientific controversy. But more and more studies point out that besides scientists, government, mass media, interests groups, industries, and local residents all are possible participants in scientific practice (Clemens, 1986; Jasenoff, 1987; Hornig, 1990; Lievrouw, 1990; Rabino, 1991; Indyk & Dier, 1993). When these groups bring different issues for their concerns into scientific practice, the dynamics of scientific knowledge production may change.

Zallen (1989) points out the importance of guidelines or rules along with an administrative apparatus for research on topics which raise ethical concerns. She also points out that many participants might interact with each other to shape the guidelines. For example, the participants who shaped the 1976 guideline for recombinant DNA research in the United States included scientists, ethicists, public interests groups, and citizens close to research sites (Zallen, 1989:381). In other
words, different concerns of the participants helped form the guidelines which further shaped the development of recombinant DNA research in the United States.

When various participants enter scientific practice and use their arguments and strategies to argue for their concerns, they become possible scientific knowledge producers and consumers. Contrary to the traditional picture of scientists producing "scientific knowledge" and then diffusing it outward, Indyk and Rier(1993) argue that scientific knowledge production may be bottom-up; that is, local groups may produce scientific knowledge rather than esoteric scientists only. Indyk and Rier(1993:7) examine how grassroots AIDS groups produced knowledge regarding HIV/AIDS and point out that local groups successfully created, diffused, and assessed AIDS knowledge so that the FDA relied on the data of a local group Community Research Initiative(CRI) during a drug’s approval process. Indyk and Rier(1993:15) conclude that "knowledge creation can be a multisite process, involving not hierarchies of diffusion but webs of exchange.[emphasis in original]" In such a web of exchange, researchers, decisionmakers, people with AIDS,8 and private primary-care physicians can each function as both knowledge producers and knowledge consumers.

8Some people with AIDS refused to be treated in the traditional view of the patient role. Thus AIDS activists’ 1983 manifesto of self-empowerment, the Denver Principles, opens as follows: We condemn attempts to label us as "victims," a term which implies defeat, and we are only occasionally "patients," a term which implies passively, helplessness, and dependence upon the care of others. We are "People With AIDS."(Advisory Committee of People with AIDS, quoted in Indyk & Rier, 1993:6)
The necessity of funding for research makes possible the participation of funders in scientific practice. After surveying 430 recombinant DNA scientists, Rabino (1991) assesses the impact of public attention, political advocacy, and litigation on the scientists' work. He observes that continuous litigation against scientific research is costly to scientific practice. He tells a story:

In one court case, a major university responded to litigation by using the following resources of the institution: the board of regents, the university president’s office, the divisions of natural and agricultural sciences, statewide agricultural experiment stations, various campus officials and department chairs, the office of vice president for budget and university relations, the university government and public relations office, the office of the general counsel and a Washington, D.C., firm that was fired to represent the university. The cost to the university reached close to one million dollars (Rabino, 1991:71-72).

Rabino reports that 43% of researchers feel that they have benefited from public attention to the field, while 24% feel that the impact has been harmful, and 27% believe the impact to be equally beneficial and harmful. Only 6% perceive no impact. That is, other participants instead of researchers may influence scientific practice.

Rabino (1991:76-77) points out that about 70% of the academic researchers respond that the most favorable effect of the impact they experienced is "greater interests from funding agencies." In contrast, the two worst negative effects experienced by
the academic respondents are "less interest and support from colleagues" and "funding difficulties." In other words, how to attract public attention and funding agencies in order to get enough funding are the most important concerns of the academic researchers. The thirst for funding opens a door for funders in scientific practice.

Rabino(1991:75) also reports that in the 1980s, many industrial scientists in the United States experienced the negative impact of public attention and litigation:

[The] private industry scientists report not only a higher incidence of total negative experiences but also a higher incidence of those that seem to be the more difficult ones, that is, having to delay or cancel an experiment (46% in industry versus 18% for government and 34% for academe) and having to change the nature of their programs to de-emphasize or omit recombinant DNA research (50% in industry versus 27% for government and 23% for academe).

That is, the research projects of scientists in industries, government, and universities may be discontinued because of the impact of litigation or the interest change of funders. No matter whether funders continue or cease their support for research because of litigation, their decisions shape the development of the field.

Since public attention and advocacy significantly influence scientific practice, Lievrouw(1990:1) argues that "the scientific community employs various communication processes and structures in a strategic manner that help the
community preserve the privileged status of scientific knowledge in American culture." Lievrouw(1990:1) added that more and more scientists are going directly to the mass media with their findings and assertions, "especially in fields where the intellectual and economic stakes are the greatest." The aim of the communication and popularization of a scientific issue is to "facilitate the gathering of resources for pursuing certain lines of research." (Lievrouw, 1990:9) Therefore, how the mass media reports scientists' assertions and scientific development may influence scientific research's funding. For example, Clemens(1986) shows that the press, either professional or popular, both influences and is influenced by theoretical, political, and cultural interests, and shapes a scientific debate regarding whether asteroids caused the extinction of dinosaurs.

From the studies presented above, we can see that besides scientists, various other participants act in scientific practice, including mass media, government officials, and the concerned publics. Therefore, any possible moral, commercial, cultural, legal, and technical issues may come into scientific practice and entail possible political operations in the process of scientific knowledge formation. Many cases of scientific controversies illustrate this political dimension of scientific practice.
Negotiable Scientific Credibility in Controversies

If "scientific knowledge" is objective and value-neutral, and if scientific research is the only way of producing "scientific knowledge," then there should be no public disputes over scientific issues. However, many cases of scientific controversy show that scientific statements are not objective and value-neutral. Moreover, "scientific knowledge" is not the only judge to resolve the controversies. Furthermore, the credibility of scientists may be downgraded when they are involved in the controversies. Investigating the development of scientific controversy provides a good way to understand political dimensions of scientific practice.

Limoges (1993) sketches a case of controversy in Québec from 1981 to 1985. The Ministry of Energy and Resources wanted to spray chemical pesticides over forests in order to fight an epidemic infestation of the forests by an insect, the spruce-budworm. This plan triggered a complex controversy. For the government agency, the problem was simple: the solution to the epidemic of spruce-budworm was the aerial spraying of chemical pesticides. But many other voices disagreed. Some agreed that the epidemic was a problem, but they rejected the idea of using chemical pesticides; instead, they proposed to use a biological pesticide, the bacterium Bacillus thuringiensis. Others rejected the use of either chemical or biological pesticides. Rather, they advocated the use of new technologies, such as pheromone trap. Other groups rejected that the epidemic was a problem at all. They believed that natural
ecological cycles would balance the environment. In this controversy, defining the problem domain, defining the appropriate solution, and deciding how to execute the solution all were open for dispute.

Limoges continues his argument that a public controversy does not consist of homogeneous participants. Instead, government officials, industries, farmers, local residents, environmentists, and scientists all may be participants in the controversy. Moreover, scientists are not necessarily all on the same "side" to confront "opponents" or "audiences." Other participants are not necessarily "audiences" waiting to be "educated." Instead, Limoges (1993:421) emphasizes that "participating groups are fully-fledged [sic] actors in the controversist space," and "all the actors involved in controversies contribute to the dynamic unfolding of their content." Limoges (1993:424) concludes that scientists have no higher authority than other participants in controversies.

Controversy means uncertainty. In areas of high uncertainty, authority is not a given; instead, it is negotiable. Ziman (1991:101) observes that:

Public conflicts on social issues between scientific experts inevitably downgrade the privileged position of scientific knowledge. But public and private discussion helps people combine their scientific knowledge, ethical views, and tacit understanding of life into personal positions on controversial matters.

That is, when various participants simultaneously hold contradictory scientific
knowledge to argue against each other, the credibility of scientific experts and scientific knowledge become negotiable. Nelkin (1992:xix) also observes that "for, ironically, as scientists debate the various sides of political issues, their involvement undermines assumptions about the objectivity of science, and these are precisely the assumptions that have given experts their power as the neutral arbiters of truth."

But it is not the condition that scientific knowledge totally loses a certain degree of authority in a controversy. Rather, scientific knowledge becomes a tool for any participant in a controversy to argue for their concerns. As Jasanoff (1987:195) says: "In areas of high uncertainty, political interest frequently shapes the presentation of scientific facts and hypotheses to fit different models of 'reality'."

Nelkin (1975) also suggests that in a controversy, technical decisions are basically based upon political and economic considerations. Experts are enlisted by participants to support their positions and assertions; the selection of data and arguments are thus related to the participants' concerns. In other words, as Nelkin (1992:xix) adds, "as technical expertise becomes a resource, exploited by all parties to justify their moral and political claims, it become difficult to distinguish scientific facts from political values." Therefore, scientists are not necessarily decisive actors in a controversy and scientific knowledge can become a tool of argument for any participant.

Jasanoff (1987:195) adds that "the process of deconstructing and reconstructing knowledge claims give rise to competition among scientists, public officials and political interest groups, all of them have a stake in determining how policy-relevant
science should be interpreted and by whom." In this condition, no one has higher privilege in a controversy. All the participants of a controversy, based upon their moral, commercial, legal, or technical considerations, can argue against each other to shape the dynamic of scientific practice.

Resolving a Controversy

How is a scientific controversy resolved by participants? There is no simple answer. No matter how a controversy is resolved, neither scientific arguments nor social factors have higher priority to settle the dispute (Nelkin, 1992; Martin, 1991). Many STS researchers have different assertions on this topic.

Some philosophers of science, such as Imre Lakatos and Larry Laudan, believe that scientific rationality is the criterion to resolve a scientific controversy. Lakatos (1970) asserts that when two research programs compete with each other, which one will win depends upon whether it is progressive: it must predict some novel facts and increase its empirical content. Laudan (1977) believes that scientists will choose a research tradition which can maximize the scope of solved empirical problems and minimize the scope of anomalous and conceptual problems.⁹ In

⁹Laudan (1977: 17) defines anomalous problems as "those empirical problems which a particular theory has not solved, but which its competitors have."
contrast, Kuhn(1962) thinks that when some paradigm candidates compete to be the
new paradigm in the period of crisis, many factors, such as the sense of aesthetics,
the faith of individuals, or the problem-solving ability of the paradigm candidates
may influence scientists' decisions to select a new paradigm.

Kuhn’s paradigm revolution, Lakatos’s research program, and Laudan’s
research tradition are all confined within the traditional domain of scientific
communities. They exclude other possible participants, such as government agencies,
industries, local residents, interests groups, or ethicists, from the domain of scientific
practice. Although Kuhn(1962) and Rouse(1987) try to bring social aspects of
scientific development into the philosophy of science, their studies remain within the
boundaries of the scientific communities.

Recent trends in STS tend to reject the dichotomies between "rational" and
"social" or "internal" and "external" (Knorr-Cetina & Mulkay, 1983; Shapin &
Schaffer, 1985; Latour, 1987). Scientific rationality and social context by themselves
do not explain how a scientific controversy is resolved. Bloo(1981:209) argues that
scientific rationality does not exist universally but is rather a social-context related
phenomenon. It is a dynamic product of the negotiations and consensus of a scientific
community. As soon as we abandon the distinction between "internal" and "external"
or "rational" and "social," and consider various participants besides scientists in
scientific practice, the dynamic of resolving a controversy will be beyond the
rationality picture of science. Since ethical, cultural, economic, political, or technical
considerations held by participants shape the development of a controversy, as mentioned above, we need to consider how possible participants develop their strategies and negotiate or struggle with each other in order to resolve a controversy.

Analyzing a controversy over water fluoridation, Martin (1991) observes that various participants used different strategies in the controversy to argue against each other and to argue for their desires or interests. The participants included dentists, politicians, government officials, scientists, corporations, and "members of the public." These groups used many possible resources, such as slogans, claims of scientific knowledge, publications, professional prestige, authoritative endorsements, community organizations, government, and the mass media, in the struggle over fluoridation. Martin(1991:9) continues that they tried to obtain authoritative backing and attack the credibility of those on the other side. The attack was "on the credibility of individuals as scientists and as honest, sensible, and upstanding citizens," rather than just on the credibility of scientific statements.

How is a controversy resolved? In contrast to Lakatos's or Laudan's rationality model, Nelkin(1992:xxiii) indicates that "the vagueness of the boundaries between the technical and political dimensions of policy decisions, and the problems of technical feasibility and political acceptability enhance the difficulty of finding appropriate means to expand public choice." In other words, scientific knowledge has a difficult time serving as the sole arbitrator in a controversy. Besides, Martin(1991: 139-147) points out some possible ways to settle a debate. One way in which a
debate fades away is "through gradual withdrawal or death of leading advocates on one side." Another way is through new issues which may shift problem domains and new supports which may change power balance. Martin(1991:147) concludes that "the actual closure of the debates is more likely to come through accumulating small successes on one side or the other, or a shifting of the debate to other issues." Since the dynamic of a controversy significantly depends upon the strategies of various participants and the power relations among them, how to resolve the controversy may vary case by case.

Therefore, scientists may not have higher privilege than other participants in resolving a controversy because their scientific credibility is negotiable. Scientific knowledge is not necessarily the only judge of a controversy because participants can simultaneously draw favorable scientific knowledge to argue for their positions and against others. The credibility of scientific knowledge held by any side of a debate may become problematic. Neither do social factors decide the resolution of a controversy since various sides of the debate enlist scientists and draw scientific evidence to debate. In addition, sometimes the emergence of new scientific evidence may influence the development of a controversy. In sum, we need to symmetrically investigate how scientific arguments, power relations, ethical considerations, or economic interests shape the resolution of a controversy.
Stabilizing "Scientific Knowledge"

Scientific knowledge will appear as soon as a controversy is resolved. As discussed above, scientific knowledge is not the sole arbitrator in a controversy since scientists and other participants can simultaneously hold contradictory assertions, creating an uncertainty which weakens the credibility of scientific knowledge. Only when the dispute is resolved, that is, when there is no doubt on the credibility of scientists’ assertions, will the assertions of the scientists who win in the controversy become "scientific knowledge." Latour and Woolgar(1979:236) suggest that "reality was the consequence of the settlement of a dispute rather than its cause." Latour (1987:98) further elaborates the social contingency of scientific knowledge:

As long as the controversy lasted, no appeal to Nature could bring any extra strength to one side in the debate. As soon as the debate is stopped, the supplement of force offered by Nature is made the explanation as to why the debate did stop. ... When you wish to attack a colleagues’s claim, criticize a world-view, modalise a statement you cannot just say that Nature is with you; 'just’ will never be enough. You are bound to use other allies besides Nature. If you succeed, then Nature will be enough and all the other allies and resources will be made redundant.[emphasis in original]

In Latour’s view regrading the social contingency of scientific knowledge formation,
"Nature" is not the cause to resolve a controversy. Rather, the winners are those who can enroll more and more allies and resources to strengthen themselves and paralyse others. How to enlist allies depends on different strategies, rhetoric techniques, arguments, and power relations. When most of the participants are enlisted by one side, the controversy usually is gradually resolved, and then the so-called "consensus" emerges. When the controversy is resolved, the losers' assertions will fade away and the winners' assertions become the "scientific knowledge."

In the case study of this dissertation regarding the history of the hepatitis B control program in Taiwan, various participants besides scientists acted in controversies over the safety of the hepatitis B plasma vaccine. In controversies, government agencies and government scientists used various rhetorical arguments, political authority, institutional resources, and foreign experts' endorsements to argue for the government's policy in promoting hepatitis B control. In contrast, critics created their own strategies to argue against supporters' assertions. They brought in ethical, legal, and technical issues to challenge the safety of the vaccine. Both sides looked for scientific evidence to support their positions. But no scientific knowledge could resolve the controversy. No one could prove or disprove the safety of the vaccine. But as soon as the controversy faded away, the safety of the vaccine became acceptable in public discourse since no one questioned it in public anymore at that time. Neither scientific knowledge nor social factors solely resolved the controversies. Chapter three and chapter five examine the details of the controversies.
in order to display the political dimensions of scientific practice in Taiwan.

When government agencies and government scientists wanted to promote the hepatitis B control program, they produced some "correct knowledge" regarding hepatitis B control, such as the severity of hepatitis B in Taiwan, the mechanism of hepatitis B virus transmission, and methods of controlling hepatitis B. However, this "correct knowledge" was still open to question at that time. Chapter four investigates why and how government scientists created "correct knowledge" and made efforts to convince Taiwanese people of the "knowledge" in order to promote the hepatitis B control program and government's biotechnology program. Through examining political operations of government agencies and government scientists in making science policy, resolving controversies, and producing certain knowledge, the history of the hepatitis B control program provides an understanding regarding political dimensions of scientific practice in Taiwan.

The Role of Government in Scientific Practice

This section examines political dimensions of science by investigating the role of government in scientific practice. Without considering this issue, we will miss some important facets of scientific development after World War II. As discussed
above, various people may participate in scientific practice and shape scientific knowledge formation. This section elaborates some conceptual issues regarding how government participates in scientific practice through funding research, designing science policy, regulating scientific activities, and the doing of science by government scientists. On the one hand, scientists may rely upon government not only for research funding but also for research regulations. On the other hand, government agencies may actively influence the directions of scientific development through their science policies and government scientists. Therefore, government can be seen as a significant participant in scientific practice rather than an outsider intervening in scientific communities.

**Government as Funder**

Since World War II, government has taken a more active role in scientific practice by funding science. Scientists have gradually depended more upon government funding because of the increasing scale and cost of scientific research. For instance, Mowery & Rosenberg(1989:126) and Thibodeau(1986:81) calculate the rapid growing funding of the U.S. federal government in science. In 1940, only 19 percent of the total national expenditure in the United States for R&D came from the federal government. By 1953, federal money accounted for 53.7 percent of the total
national support for R&D. This number grew to a peak of 66.5 percent in 1964. What was the influence of the government funding on science?

Price (1963) argues that the growth of Big Science changes the dynamics of scientific communities because science requires more government support. In addition, Mukerji (1989:105) points out that advanced technology not only empowers scientists in research but also ties them to the government funding system, "both because labs with advanced instrumentation are too expensive to run without funds, and because advanced instruments are generally too complicated for scientists to make inexpensively for themselves."

On the one hand, some have argued that the direction of the government funding may influence the direction of scientific research. For example, Zuckerman (1978:86) points out that competition and expectation of reward, and funding from government or industries based on economic and military considerations all variously influence scientists' selection of general problem areas as well as particular problems. On the other hand, the direction of government funding may hinder the development of a field which is poorly funded. Cole (1983:7) indicates that:

As government agencies sponsor research and development, they may promote one avenue of inquiry at the expense of another. Some scientific projects may be deprived when funds are diverted for military research or for development of new sources of energy.
Government-sponsored prizes and appointments induce some scientists to avoid activities that do not draw funds and recognition.

Regarding the significant influence of government funding on the scientific research, Mukerji (1989:1) says what it is:

In the summer and fall of 1986, a group of marine biologists and geologists were notified by the Department of Energy that their funding for studies related to deep ocean disposal of nuclear wastes had been cut out of the next year’s budget. The DOE had decided on a policy of land-based disposal of wastes and no longer need their services. This was a moment of victory for the citizen groups that had been fighting against using the ocean as a dump site; it was also a moment that revealed quite dramatically the political character of research funded by the government and the vulnerability of scientists to the political process.

In this case, the policy change of the Department of Energy directly hindered the studies related to deep ocean disposal of nuclear wastes in favor of studies regarding land-based disposal. Regarding the phenomenon of how government funding influences scientific practice, Stapleton (1993) follows the lead of earlier commentators and uses the metaphor "Faustian bargain" to describe it. He studies the postwar history of Case Western Reserve University and finds that "industrial, government, and foundation funders of science and technology altered the
development of entire institutions." In other words, the government’s desire may influence scientific development through funding. What characterizes government’s desire to fund science?

Researchers have outlined several reasons why government funds science. First, government seeks scientific information to solve its problems or to get support of scientists for its policies. For example, during the Cold War, U.S. military sponsored many research programs to develop miscellaneous weapon systems for "national security." (Dickson, 1984) Second, government agencies may sponsor one field of research in order to promote a specific industry. For example, after World War II, when the Atomic Energy Commission wanted to promote the civilian nuclear energy industry, it sponsored most of the research funds for industrial firms (Del Sesto, 1979:39-49). Third, government agencies may support some research for preserving and training potential experts for future consultation in policy issues. Mukerji (1989:7) asserts that some government funding, which seems to have no specific goals, seeks to train and keep "a skilled labor force of scientists." Fourth, government may want to control a significant technology for national and internal security. For example, Needell (1984) points out that when the U.S. government set up Brookhaven National Laboratory, it did not aim to promote high-energy physics for the sake of science. Rather, the government wanted to "keep careful control over the technology of nuclear reactors."

Following World War II, scientists have commonly relied upon government
funding. The more scientists rely upon government funding, the more influence
government agencies may have in scientific practice. Furthermore, government
agencies fund scientific research for various reasons. Sometimes government agencies
find help from scientific information in response to social problems. Sometimes they
actively pursue their desires, such as promoting an industry, by investing in certain
fields of research. In other words, in order to achieve certain goals, government
agencies may actively design a science policy which guides the directions of scientific
research. The next section reviews this issue.

Government as Designer

Since government funding influences scientific practice, as mentioned above,
we need to examine why and how government designs a science policy to guide the
directions of scientific research. Government's science policy, which intends to
achieve certain goals, is reflected in its strategies regarding scientific development, as
well as in its allocation and mobilization of resources (Clark, 1985:6). Since
government funding is limited, there emerges a problem of allocating the R&D
budget, which becomes a major issue in science policy studies.

Among social scientists who study R&D policy, economists and political
scientists are the most active groups (Crane, 1984). Economists have been concerned
with the relationship between economic growth and technological innovation since Joseph A. Schumpeter (1934) introduced his innovation model of economic development. They mainly focus upon how technological innovation can promote economic development. For example, economists discuss the theory of market structure and innovation (Scherer, 1984), the determinants of investment in R&D and the role of public policies (Meyer-Krahmer, 1990), and technological innovation and international trade competition (Dosi & Soete, 1988; Graham, 1982).

Political scientists mainly treat science policy as a subdivision of general public policy (Crane, 1984). For example, some political scientists are concerned with how to design a science policy, which includes decision criteria (Jantsch, 1968), the function of formal organizations (Dupree, 1964; Brooks, 1968), the administration of policy (Jantsch, 1967), and the evaluation of outcomes (Chayes & Wiesen, 1969). Basically, they confine their studies to the normative domain of governmental decision-making. Other studies focus on the administrative histories of the funding agencies, such as the National Institute of Health, the Office of Naval Research, the Atomic Energy Commission, and the National Science Foundation (Swain, 1962; Cassidy, 1964; Strickland, 1972; England, 1983; Seidel, 1983; Needell, 1984). But Rossiter (1986:276) points out that there is little research focusing upon the impact or effect of science policy on scientists or the content of scientific knowledge.

Recent trends emphasize that research on science policy making cannot be
restricted to governmental bodies, such as the National Science Foundation, National Institute of Health, Congress, or the courts. Rather, Hiskes and Hiskes (1986) assert that the policy making participants should also include industrial entrepreneurs, lobbyists, public interest groups, and private citizens with no affiliation. Moreover, Dickson (1984) suggests that science policy decision-makers need to consider political, economic, technical, and ethical sides of policy issues rather than only economics. The following are some studies focusing upon social processes of science policy formation, such as various participants or different contexts shaping science policies. They also offer an understanding of the science policy decision making process from strategy analysis.

Regarding the participants in science policy formation, Barke (1986) analyzes how Congress, the President, executive offices, courts, the publics, and scientists all participate in science policy decision-making process. He uses a case study regarding hazardous waste policy to show that the interaction among various participants, rather than a single government agency, shaped the policy.

Some researchers observe that different considerations in setting priorities of science policy in different contexts decide the allocation of limited R&D budget and influence the direction of scientific development. In general, Freeman (1991:407) observes that:

[The] emphasis in science and technology policies has shifted from an essentially science-push framework in the 1950s, through a phase of
preoccupation with economic growth and management of innovation in
the 1960s, and on to a wider concern with the environment and quality
of life since the 1970s.

Specifically, Lederman and his colleagues (1986) indicate that most of the
industry research funded by the U.S. federal government is for mission-oriented
purposes rather than for developing the economy. Nelson (1988:323) also finds that
"during the post-war period, military R&D has absorbed a large share of total
industrial R&D in the United States, and likely has squeezed out a certain amount of
civilian R&D by bidding away scarce scientific and technological resources."

Strategy analysis provides another way to understand the process of science
policy decision-making. For example, Averch (1985) displays that different U.S.
administrations had different science policies due to different social contexts and
political considerations; meanwhile, scientists developed different rhetoric strategies
to argue for research funding. Averch denies that there is a "internal logic of science
and technology policy." Rather, he suggests that high-order value judgements,
beliefs, assertions, predictions, preferences, and prescriptions, all influence
participants' strategies which in turn shape science policy decision-making.

This dissertation will contribute to science policy studies through the historical
analysis of Taiwan's hepatitis B control program in the following ways. First,
informal power relations among participants may be more important than the
functions of the formal organizations in science policy decision-making. Second,
when we study how the participants function in the process of policy decision-making, we need to examine their ideologies, interests, and cultural identities in order to understand why and how they think. Third, the social context for a science policy is not a given; instead, we need to investigate how participants create a new social context in order to promote a specific science policy. Fourth, science policy may not only influence the direction of scientific research, but may also shape the content of scientific knowledge through the work of government scientists.

If government science policy can significantly influence the directions of scientific development, what might be the attitude of government agencies toward scientists? How do scientists perceive the regulations of government funding? The next section examines the tension between scientists and state.

**Government as Regulator**

Scientists often argue that they are politically neutral. But government often does not want to fund science with little accountability. This assertion and this conflict have their own history. In the 1880s, Henry A. Rowland and some scientists in academia insisted that science must be valued for its own sake rather than for any other goals. In addition, John Wesley Powell argued that government ought to support science with only nominal control since scientists were a select group who
deserved free research (Kevles, 1979:47, 53). Meanwhile, however, Congress and
government agencies believed that research funded by the federal government had to
serve for practical purposes and be subject to democratic political control (Kevles,
1979:59). Therefore, worrying about Congress, scientists in government, such as
those who served in Coast Survey and Geological Survey, said that "we are doing
practical work for practical purposes." (Kevles, 1979:47)

From the 1920s on, some philosophers of science, such as the "Vienna
Circle," and sociologists of science, such as Robert K. Merton, followed the
scientists' assertions that science was politically neutral. The logical positivism of the
"Vienna Circle" and its followers wanted to construct a criterion of meaningfulness
to distinguish science from non-science. Politics had no place in their concerns about
science. The Mertonian sociology of science proposed an account of a reward system
and four norms; universalism, communism, disinterestedness, and organized
skepticism, to guarantee the autonomy of science (Merton, 1973). Michael
Polanyi (1951:89) gave a clear ideal picture of scientific autonomy:

The pursuit of science can be organized... in no other manner than by
granting complete independence to all mature scientists. They will then
distribute themselves over the whole field of possible discoveries, each
applying his own special ability to the task that appears most profitable
to him. The function of public authorities is not to plan research, but
only to provide opportunities for its pursuit. All they have to do is to
provide facilities for every good scientists to follow his own interest in science.

J. L. Penick, Jr. and his colleagues (1965) reported that many civilian scientists in military R&D centers were dissatisfied with military administration and wanted to leave. After examining the relation between some oceanographers and their federal patrons, David Palmer and his colleagues (1988) found that "academic marine scientists rate science-oriented agencies more favorably than those whose support is influenced by their missions." But how does government cope with this concept of scientific autonomy?

Palmer's and his colleagues' study (1988:84) illustrates the conflicts between scientists' value system and government agencies' beliefs. They point out that "administrators in the society-oriented agencies must respond to expectations set largely outside areas of their control--agency hierarchy, Congress, political communities etc." Furthermore, they indicate an important character of government funding:

Where the basic science ideal calls for the divorce of science from politics, democratic politics demands that no expenditure of public funds be separated from political control, or, to state it another way, that no power be granted without responsibility, which always included accountability (Palmer et al., 1988:87).

On the one hand, government welcomes scientists' relatively autonomous
position which is the basis of why they are valuable to government.

Mukerji (1989:190) argues that:

Science gains value to the state because of its claims to "independence" and "detachment." The voice of science is authoritative to the extent that it seems objective and above politics even when applied to policy. Scientists use their degrees of institutionalized autonomy as evidence of their elite status and intellectual independence, but ironically, the government profits from the relative autonomy of scientists because scientists' belief in their own detachment help give the voice of science legitimating power that makes science a resource for the state.

That is, if scientific research looks like subjective, interest-oriented, politics-decided, or money-influenced, government would have a difficult time using scientific research results to support its policy.

On the other hand, even though government agencies appreciate the appearance of "autonomy" in science, sometimes they directly supervise and even control scientific research. For example, in 1946, as the chief of research and inventions in the U.S. Navy, Admiral H. G. Bowen wrote a letter to Western Reserve University president W. G. Leutner:

If the fundamental research undertaken under this contract indicates lines of development which the Navy desires to pursue, and which from their nature should be classified, the Navy will either offer the
University a separate contract for such development under appropriate security safeguards, or will relieve the University by removing the work to an industrial organization or a Government laboratory. ... You will be permitted to publish the results of your work provided that no reference is made to possible or proposed military applications arising out of it. We will, of course, advise you whenever you are in doubt as to the wisdom of publishing such material that might affect the National Security (Stapleton, 1993:305-6).

That is, the Navy's desire to confine development directions and publication of research results indicates a potential outside control over the scientists of Western Reserve University. Another similar example occurred on April 30, 1962, when U.S. Bureau of Budget reported to the President on government contracting for research and development:

The basic purposes to be served by Federal research and development programs are public purposes, considered by the President and the Congress to be [of] sufficient national importance to warrant the expenditure of public funds. The management and control of such controls must be firmly in the hands of full-time Government officials clearly responsible to the President and the Congress (Penick et al., 1965:234).

Besides supervising scientific research, sometimes government agencies even impose
loyalty oaths or security checks on scientists (Rossiter, 1986:293).

Although government agencies supervise scientists’ research and seem to limit the autonomy of scientists, Mukerji (1989:13) argues that "scientists want to get on 'somebody’s list’ rather than avoid government oversight," because "they want the attention from funders that will provide them with money they need for achieving greater public visibility." No wonder Dickson (1984:111) and Stapleton (1993:311) call this relation between scientists and government agencies a "Faustian bargain."

But the supervision of government agencies over scientific activities is not always negative to scientific development. Zallen (1989) challenges the view that any form of government regulation may damage scientific research. She argues that "research on topics which raise ethical concerns requires guidelines or rules along with an administrative apparatus in order for significant levels of research activities to be undertaken." (Zallen, 1989:377) For example, in the 1970s, the in vitro fertilization (IVF) research in the United States could not get federal funding because of no official apparatus to approve it. On the contrary, in the 1970s, recombinant DNA research in the United States could get government support because there were necessary regulatory apparatuses, such as Recombinant DNA Advisory Committee within NIH and local Institutional Biosafety Committees, to set up necessary research guidelines (Zallen, 1989:381-382). Without the research guidelines, federal funding would have a difficult time going to research because of fears of legal responsibility and possible adverse community reaction. Although a guideline may limit the
research boundary, it gives the research a living space.

From the discussion illustrated above, we see that scientists and government agencies need not share the same value systems regarding scientific research. Although scientists may not welcome government's supervision, the government research guidelines and funding can help their research. In such a case, government agencies become participants in scientific practice. Besides participating in scientific practice through funding and regulations, government agencies obtain a certain degree of authority in scientific affairs by the help of government scientists. The next section examines this topic.

**Government as Researcher**

The activities of governmental scientists are little discussed by STS researchers. This topic is important since more and more public policy issues involve complex scientific and technological information, and government scientists can offer the necessary information for the government in the process of public policy decision-making. Besides, as Burger(1980:2) points out, scientific experts may enhance government's capacity in the context of political bargaining. In other words, government scientists may give government interpretative authority in scientific affairs. Therefore, studying the activities of government scientists provides a valuable
perspective for understanding the political dimensions of scientific practice.

Thibodeau (1986) and Rossiter (1986) observe that although some researchers have studied science in the U.S. federal government, they mostly focus on the institutional history of government agencies. Some classical studies on the science done by government agencies include Swain's (1962), Cassedy's (1964) and Strickland's (1972) studies on the National Institute of Health; Seidel's (1983) and Needell's (1984) studies on government laboratories; England's (1982) study on the National Science Foundation; Cochrane's (1966) and Pursell's (1968) studies on the National Bureau of Standards; and Thompson's (1982) study on the U.S. Geological Survey.\(^{10}\) However, little research examines the activities of government scientists and the role of government scientists in the process of scientific knowledge production.\(^{11}\)

Although government scientists are members of scientific communities, they may practice science differently from the scientists in universities, since government scientists are also members of bureaucracy. In other words, government scientists face the problem of abiding by both the norms of scientific communities and also bureaucratic regulations and ethics. Given this condition, we can ask some questions

\(^{10}\)For more detail literature review about science in the United States federal government, see Thibodeau (1986) and Rossiter (1986).

\(^{11}\)Joan Lisa Bromberg's study (1982) of fusion research is one of few studies that examine the role of government scientists in the process of scientific knowledge formation.
regarding government scientists. For example, if two research schools compete with each other, and if the government scientists take part in making science policy, will they design the government science policy to benefit their own research school and disadvantage the competitors’ research school? If a research project conflicts with the government’s interests, will the government allow its scientists to do it? If the results of scientific research disadvantage the government’s interests, will the government allow its scientists to publish the research results or to communicate with other scientists? In addition, are government scientists required to argue for the government’s interests? Moreover, if government scientists argue for the government’s interests, will their scientific credibility be downgraded by other scientists or other people? These questions warrant detailed studies.

Some studies have pointed out some characteristics of government scientists. For example, Lakoff(1977:373) describes how institutional and vocational affiliations influence scientists’ practice:

A researcher employed by a company producing chemical pesticides is apt to share the perspective of his employer in controversies involving the safety of such pesticides. A researcher working for a government regulatory agency is likely to take the view that a new drug must first be approved safe before it is authorized for use, whereas a doctor anxious to be able to prescribe a drug which may help a patient will probably be more concerned with the efficacy of the drug against a
disease than with unknown and long-range dangerous side-effects.

In addition, Rossiter(1986:293) describes the vulnerability of government scientists’ research when government’s interests change:

This has been a highly cyclical process: vast sums of money lead to rapid expansion for the favored programs of the moment, such as atomic energy, space, science education, and biomedical research, and then, when the crisis passes or the luster wears off, either projects are tapered off and personnel let go, or a frantic search begins for new goals.

That is, the research directions of government scientists may be decided by the change of social contexts and government agencies’ interests. This confined condition is far from the image of "free research for the sake of science." Furthermore, Jerome(1986:24) reports how the government gagged government scientists:

You tell people you’re writing a column on our government’s refusal to talk to the press during the Chernobyl crisis and they give you a quizzical look like maybe they didn’t hear you right. "You mean the Russian government," they say. No. you explain, it wasn’t just the Russians who clammed up about Chernobyl. The U.S. government--specifically the Department of Energy(DOE) and the Nuclear Regulatory Commission(NRC)--issued gag orders instructing their employees, including scientists at the national labs, not to talk to
journalists.

Therefore, mass media had a difficult time getting information or comments from government scientists. Jerome(1986:26) continues describing that government agencies gagged government scientists:

After the space shuttle Challenger blew up, the government did it again. The previously affable NASA officials suddenly turned silent, and the news media were forced to turn to outside sources for information about what had gone wrong.

Jerome(1986:26) concludes that "wherever it originated, the Chernobyl gag order does seem to reflect a pattern; more and more, U.S. government officials are restricting information." But why did government scientists obey the gag orders of government agencies? No "scientific norms" can explain this phenomenon.

From the studies illustrated above, we see that since government scientists are members of bureaucracy, they may practice science differently compared to university-based or industry-based scientists. But the most important reason to study government scientists is that the interpretative power of government scientists gives government a degree of authority in scientific affairs and lets government be a significant participant rather than an outsider intervening in scientific affairs. Therefore, there is a possibility that government may manage scientific information to serve its interests through the agency of government scientists. When more and more public policy issues involve scientific and technological controversies, we need
to examine the "knowledge" government scientists produce and what their strategies are to argue for government's policies.

Downey (1988a) asserts that scientists' credibility is a cultural-structured as well as a contextual-variable phenomenon. The more political content in scientists' statements, the less scientific credibility the scientists may receive. Additionally, Downey (1988b) shows that scientists in different groups may have different observations or interpret data differently because of their ideologies, interests, and cultural identities. Since government scientists may need to argue for the government's interests, it is worthwhile to study what their strategies are to keep their scientific credibility, and therefore achieve their goals.

From the history of the hepatitis B control program, this dissertation intends to examine the following questions regarding the role of government in scientific development in order to understand political dimensions of scientific practice. First, why did the government in Taiwan suddenly want to promote hepatitis B control in 1980 when the government ignored this issue in the 1970s? When there was a controversy over the safety of the hepatitis B plasma vaccine in 1981, how did government scientists argue for the government's policy? How did the government scientists construct the "severity" issue of hepatitis B in Taiwan? How did government scientists and government agencies make efforts to convince Taiwanese people of some "correct knowledge" regarding hepatitis B control? The following chapters examine the details.
Chapter Three

The Politics of the Vaccine Trial Project

This chapter begins investigating the early history of the hepatitis B control program. This historical case provides an understanding regarding political dimensions of scientific practice in Taiwan from two perspectives. First, this chapter examines social contingencies of scientific knowledge in a controversy over the safety\(^1\) of the hepatitis B plasma vaccine. Bringing various issues and strategies into the controversy, numerous participants contributed to defining the safety of the vaccine. We can see that scientists alone did not resolve the controversy. Both cognitive and social factors shaped the development and resolution of the

\(^1\)In this thesis, the term "the safety of the vaccine" does not necessarily refer to anything that should be technically accountable. There is no such concept "the vaccine is 100% safe" or "the vaccine is 97% safe." Rather, the concept "safety" is closely related to the concept of "risk." Regarding the concept of "risk," Mary Douglas and Aaron Wildavsky(1982:5) assert, "risk should be seen as a joint product of knowledge about the future and consent about the most desired prospects."[emphasis in original] Douglas and Wildavsky also point out that risks are usually hidden and selected. They continue that the assessments of risks are usually culturally and politically biased. They conclude by characterizing risk as a "collective construct." On the basis of this concept of "risk," I prefer to use the concept "safety" as a social construct in this thesis. That is, in the historical case, the concept of "the safety of the vaccine" was collectively defined by all the participants of the controversies over the safety of the vaccine rather than solely by certain "scientific standards."
controversy. Second, this chapter investigates how the Taiwanese government participated in resolving the controversy. Through science policy, research funding, and government scientists, the government became a significant participant rather than an outsider intervening in scientific practice.

The first section of this chapter introduces the social context in Taiwan in the late 1970s. The KMT government chose to upgrade Taiwanese industries when it faced a political and economic predicament circa 1980. This social context provided an important base for the appearance of the hepatitis B control program in Taiwan. The second section displays the hepatitis B research in Taiwan in the 1970s. This section shows that government funding would significantly influence the development of a research field. Besides, specific political contexts would favor certain researchers while disadvantaging others. The third section examines why the government began paying attention to hepatitis B control in 1980. Political and economic considerations helped shape the government’s public health policy. The fourth section discusses a controversy over the safety of the hepatitis B plasma vaccine in Taiwan. The development of the controversy indicated social contingencies of scientific knowledge. The final section shows how political operations of government agencies shaped the resolution of the controversy. Both sides could not reach a consensus in scientific arguments. It was the investigation and report of the Control Yuan that helped the supporters and the critics reach a compromise, and then the voices of the critics vanished from public discourse.
The Social Context in Taiwan in the Late 1970s

Taiwan faced a series of diplomatic set-backs in the 1970s. In October 1971, Mainland China took over Taiwan's seat at the United Nations. Forty-five countries severed their diplomatic relations with Taiwan from 1971 to 1978. Furthermore, the first oil crisis frustrated Taiwan's economy. There was severe inflation. While the average consumer price inflation rate was 3.4% from 1963-1973, it was 47.5% in 1974 (Wu CY, 1992:261). Foreign and domestic investments in Taiwan decreased and much capital left. Many people lost their confidence in the KMT government and emigrated to other countries (Hsiao CC, 1989:22). In addition, more and more people requested greater democracy in politics and reforms in economy and justice. The KMT government developed strategies for economic development not only to maintain its regime but also to use economic relations to replace traditional political

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2In January 1979, the total number of nations in the world were 166. Among them, 21 countries recognized Taiwan; 125 recognized mainland China; 20 had no relations with either (MOFA, 1979). Most of the countries that had diplomatic relations with Taiwan were rather small, carrying little weight in influencing international relations.

3For example, a number of opposition politicians began forming a loose political organization called Tang-Wai ("outside the KMT party") in the 1970s. It could not be a formal party since martial law was in force. It evolved into Minchindang (the Democratic Progressive Party), the first opposition party in Taiwan, in 1986.
relations with other countries (Gold, 1986:100; Hsiao CC, 1989:78).

The KMT government rebuilt its foreign policy along economic lines. Hsieh Chiao-chiao (1985:230-279) calls the new strategy "economics- and trade-first diplomacy." This strategy emphasized the "economic" and "unofficial" aspects of exchange rather than the traditional form of bilateral official government-to-government political relations. As Tsai Wei-ping⁴ said that "even though we cannot prevent the continued erosion of official relations we can replace them with substantive unofficial relations." (Hsieh CC, 1985:248) Also, Sun Yun-hsuan⁵ stated that:

Our international and diplomatic position in the past relied on military strength. This is gradually being replaced by economic power, trade, and technology (Kraar, 1971:129).

To promote this "economics- and trade-first diplomacy" strategy, Taiwan sought to expand economic growth.⁶ In the 1970s, Taiwan began developing industries in petrochemical, electric-mechanical, metallic, transportation, and

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⁴Tsai Wei-ping served as Taiwan's Vice-Minister of Foreign Affairs between 1968 and 1975.

⁵Sun Yun-hsuan was the Minister of Economic Affairs in 1971 and then Premier from 1978 to 1984.

⁶Besides developing industries, the government established the China External Trade Development Council (CETDC) in July 1970 to promote the new strategy. The CETDC had thirty-three overseas offices by the end of 1979. They not only promoted the international trade of Taiwan, but also served as "informal embassies" in the countries that had no diplomatic relations with Taiwan.
electronic sectors. The government also made many efforts to improve infrastructure, such as constructing the first highway, an international airport, three harbors, and an east coast railway. Most of these new developments were driven by public investment and state-owned enterprises.

Taiwan’s worst nightmare came true when the United States, on January 1, 1979, established formal diplomatic relations with mainland China and severed those with Taiwan. The Taiwanese economy also declined significantly due to the second oil crisis. Also, during the late 1970s, "Second-tier" Newly Industrializing Countries, such as China, Thailand, and Malaysia, were gradually emerging as Taiwan’s competitors in traditional areas of manufacturing. Thus, a range of factors forced the government to reconsider the direction of economic development, since economic growth and stabilization were important bases for the KMT regime.

The KMT government chose to upgrade Taiwanese traditional export sectors and to diversify into new product lines (Cheng & Haggard, 1987). In 1979, the government initiated a Science Park at Hsin-Tsu in order to promote high-tech industries. Later, in 1981, the government announced it had selected the information industry and the mechanical industry as "strategic industries." The criteria for "strategic industries" included high technology-intensive, low energy-consuming, high value-added, high other-product-related, and wide market, according to the

\[ \text{\footnotesize \text{7Thomas Gold(1986:101) points out that these infrastructural construction contained a significant defense component.}} \]
government officials' explanations (CEPD, 1982:13). Moreover, in 1982, in the Science and Technology Development Program, the government defined a "Eight Strategic Areas of Science and Technology," including energy, material, information, automation, biotechnology, hepatitis control, electro-optics and food technology (The Executive Yuan, 1982). These social and economic environments circa 1980 in Taiwan provided the conditions for the appearance of the hepatitis B control program.

The Hepatitis B Research in Taiwan in the 1970s

We can see the importance of the government research funding to scientific development by comparing the research circumstance of Taiwanese hepatitis B researchers and American hepatitis B researchers in Taiwan. In the 1970s, both Taiwanese and American hepatitis B researchers in Taiwan had pointed out the wide

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8 In the "National Economy Conference" (ch’uankuo chingchi huiyi) in 1981, the Executive Yuan announced that the information industry and mechanical industry were "strategic industries." Then in the conference, participants began discussing what the criteria of choosing "strategic industries" should be (CEPD, 1982:51). In other words, the criteria were constructed after the "strategic industries" were decided by the government.

9 They took 46% of the total national R&D expenditure in 1983 (NSC, 1985a).
prevalence of hepatitis B virus in Taiwan's population. In addition, the researchers hypothesized that hepatitis B virus might be an important cause of cirrhosis and hepatocellular carcinoma. Taiwan's liver disease researchers repeatedly appealed to the government for hepatitis B control. But before 1980, the government showed no concern to their request. Therefore, some hepatitis B studies of Taiwan's researchers were limited because of little funding.

A New Way of Understanding Liver Diseases

A high incidence of liver disease, especially viral hepatitis, cirrhosis, and hepatocellular carcinoma, among inhabitants of Taiwan had long challenged Taiwanese liver researchers (Sun SC et al., 1965). Identifying the markers of the hepatitis B virus offered new hope for the researchers to understand hepatocellular carcinoma or cirrhosis, especially when they found that the hepatitis B surface antigen (HBsAg) prevalence rate in hepatocellular carcinoma patients ranged from 65.4% to 91.2%. Many researchers suggested that the hepatitis B virus was the cause of cirrhosis and hepatocellular carcinoma (Smith JB and Blumberg, 1969; Tong et al., 1971; Sung JL et al. 1972b; Sung JL, 1975; Sung, JL et al, 1976a; Chen DS et al., 1977).

Before 1965, no one recognized the markers of the hepatitis B virus, except
that there might be some kind of virus that caused one kind of liver disease through blood. In 1965, Baruch S. Blumberg and his colleagues(1965) found a new antigen in both the serum of an Australia aborigine and in the leukemia serum of New York Blood Center, naming it the "Australia antigen." At this time, they had not formulated a relationship between this new antigen and hepatitis. Later, through the research of Alfred M. Prince(1968) and Kazuo Okochi & S. Murakami (1968), the Australia antigen was identified with the virus that caused serum hepatitis.

Researchers in the United States reported the appearance of Australia antigen in the sera of different populations. Blumberg and his colleagues(1965) checked the sera of 100 Chinese who had moved from mainland China to Taiwan or to the United States and 23 native Taiwanese. The antigen prevalence rate was 0 and 13.0% respectively. The 13% incidence rate was the highest among all populations in this study.\textsuperscript{10}

Taiwanese researchers had a difficult time finding the reasons why Chinese or Taiwanese had a high incidence of hepatocellular carcinoma compared with other populations.\textsuperscript{11} Liaw Yun-fan and his colleagues(1973a:348) summarized that hepatocellular carcinoma accounted for 21.75% of all malignant tumors reported in

\textsuperscript{10}Although the sample size of the Taiwanese subjects was small—three presented Australia antigen among twenty-three tested—this paper was cited again and again since it was the first paper that reported Australia antigen in the sera of different populations.

\textsuperscript{11}Another special case that had a high incidence of hepatocellular carcinoma was Uganda(Liaw YF et al, 1973:348).
Taiwan from 1899 to 1961. In addition, in 1971, cirrhosis had become the eighth leading cause of death (DOH, 1971). The studies regarding the Australia antigen mentioned above offered a possible direction to study liver diseases in Taiwan. As Shih Ping-ling and his colleagues (1971:697) said, "as viral hepatitis, postnecrotic cirrhosis of liver and primary carcinoma of liver are considered prevalent in [Taiwan], extensive study of Australia antigen in general population and liver diseases will probably give some promising result [sic] in the future."

Hepatitis researchers in Taiwan began studying the Australia antigen in various liver diseases in the late 1960s. They focused mainly on the prevalence rate of this antigen in different populations, its possible transmission mechanism, and the biomedical abnormalities of the patients with this antigen. In the early 1970s, some researchers had pointed out that the prevalence rate of the antigen ranged from 8% to 14.6% in different populations in Taiwan. In addition, they suggested that there was a coincidental relationship between the antigen and hepatocellular carcinoma in Taiwan since 65%-80% patients with hepatocellular carcinoma had the antigen in their serums (Tong MJ et al., 1971; Shih PL et al., 1971; Sung JL et al., 1972a & 1972b; Liaw YF et al, 1973a). Researchers initially called this antigen "hepatitis-associated antigen" (Tong et al., 1971; Shih PL et al., 1971; Sung JL, 1972a) and later, "hepatitis B surface antigen (HBsAg)" since they had identified different kinds
of hepatitis and found that hepatitis B had several kinds of antigen. Based upon the hepatitis studies illustrated above, Sung Juei-low and Liaw Yun-fang (1973b) argued that "the discovery of Australia antigen is the most important development in the research regarding the etiology of various liver diseases in the past several decades."

Funding, Political Context, and Research

The international political context favored American researchers studying hepatitis B in Taiwan. American researchers became interested in hepatitis B not only because of Taiwan's numerous cases of hepatitis B and other liver diseases, but also because the prevalence of the disease posed a potential threat for the U.S. military population on the island. Therefore, beyond medical issues, military considerations became an incentive for American scientists.

During the early 1970s, Taiwan's hepatitis B research had come mostly from National Taiwan University and Veterans General Hospital. Besides Taiwan's

\[12\text{In the early 1970s, researchers have recognized that there were hepatitis A, hepatitis B, and non-A, non-B hepatitis. Researchers also identified different kinds of antigen in hepatitis B virus, such as hepatitis B surface antigen (called Australia antigen earlier), hepatitis B core antigen (HBcAg), and hepatitis B e antigen (HBeAg).}\]

\[13\text{In the 1970s, the hepatitis B researchers at National Taiwan University mainly included Shih Ping-ling, Chang Chen-kang, Sung Juei-low, Liaw Yun-fan, Lin Tong-min, Liu Chen-hui, Chen Ding-shinn, Wang Cheng-yi, Yu Jui-yun, and Lai Ming-yang. The researchers at Veterans General Hospital mainly included Julja Tsui, Sun}\]
researchers, American researchers were interested in the prevalence of hepatitis B in Taiwan, including the U.S. Naval Medical Research Unit No.2 (NAMRU-2) in Taipei and the Medical Research Unit of the University of Washington, Seattle, Washington.\textsuperscript{14} The American researchers often cooperated with Taiwan’s military system, such as Veterans General Hospital or Chinese Naval General Hospital, in doing hepatitis research in Taiwan (Tong MJ et al., 1971; Beasley et al., 1974b; Stevens et al., 1974; Stevens et al., 1975; Anderson K.E. et al., 1975; Sun SC et al., 1976). On the contrary, the American researchers rarely cooperated with the researchers of Taiwan’s universities.

The NAMRU-2 was one of several research organizations that the U.S. Navy established throughout the world to support foreign military missions. Navy research units studied the local diseases where the U.S. military acted in order to prevent U.S. military personnel from illness. In 1955, the KMT government agreed with the United Stated government to set up the NAMRU-2 in Taipei. The NAMRU-2 studied many local diseases of Southeast Asia. It stayed in Taiwan more than twenty years until March, 1979, four months after the United States severed diplomatic relationship with Taiwan (Wu HK et al., 1980). They began studying the

\[\text{Shih-chien, Lee Wy-chan, Kau Shih-liang, Tsai Yang-te, Lo Kwang-juei, and Lee Shou-dong.}\]

\textsuperscript{14} American hepatitis B researchers in Taiwan mainly included Myron J. Tong, Berton T. Schaeffer, Karl E. Anderson, Howard S. Berg, R. Palmer Beasley, and Cladd E. Stevens.
epidemiology of hepatitis B in Taiwan circa 1970, soon after the Australia antigen was identified with the antigen of the hepatitis B virus.

American researchers had better opportunities than Taiwanese researchers to study hepatitis B in Taiwan. They not only had better medical instruments and a larger research budget,\textsuperscript{15} but they also enjoyed a better relationship with the Taiwanese government, especially the Taiwanese military. Chen Chien-jen, a researcher at National Taiwan University, calls this phenomenon "U.S. Aid residual effect."\textsuperscript{16} For example, before 1990, without special permission of the Department of Defense, Taiwanese people had almost no chance to visit the islands of Quemoy (the nearest islands to mainland China). But in 1972, the American researchers had an opportunity on the Quemoy islands to test the people’s blood from four villages (Beasley et al., 1974a & 1974b). Another example is that in 1980, American researchers received assistance from the Bureau of Military Medicine of

\textsuperscript{15}For example, in the early 1970s, Beasley and his American colleagues had used radioimmunoassay which was the third generation method to test HBsAg in serum samples, while Taiwanese researchers still used double-diffusion method which was the first generation method. Radioimmunoassay was more sensitive and much more expensive than double-diffusion method(Beasley et al., 1974a; Stevens CE et al., 1974; Sung JL et al., 1974).

\textsuperscript{16}Interview with Dr. Chen Chien-jen at National Taiwan University on October 12, 1993. He had been a research assistant of Palmer R. Beasley in the 1970s. As introduced in chapter one, the United States had a strong influence on Taiwan’s politics and economy. In addition, when most of the science policy came from the Science and Technology Advisory Group of the Executive Yuan, eight of the ten advisors were Americans in 1983. Dr. Chen Ding-shinn believed that American researchers were easier to have access to the Taiwan government. Interview with Dr. Cheng Ding-shinn at National Taiwan University on June 14, 1993.
the Department of Defense to import the Merck Sharp & Dohme’s hepatitis B plasma vaccine, which the U.S. FDA did not license until 1981, in order to do a clinical trial on Taiwanese children.\textsuperscript{17} The political context and the good relation between American researchers and Taiwan’s military helped Americans’ research on hepatitis B in Taiwan.

In addition, from 1975 to the late 1980s, Palmer R. Beasley, from the University of Washington, and his colleagues were able to access the serum samples of 22,707 government employees (civil-servants) in Taiwan from the Government Employees’ Clinic Center and the Cardiovascular Disease Study, to do a cohort study\textsuperscript{18} on the relationship between hepatitis B and hepatocellular carcinoma. They also gained monthly lists of recent deaths and newly retiring employees who had cancelled their insurance from the only government insurance bureau in Taiwan (Beasley et al., 1981).

In contrast, Taiwanese researchers had little research funding, few instruments, and little chance of gaining access to the above-mentioned data, severely

\textsuperscript{17}The clinical trial that the American researchers wanted to do on Taiwanese children in 1980 was without the knowledge of Taiwan’s Department of Health. Later sections discuss this event. Chunghua jih pao, March 20, 1980; Taiwan shinsheng pao, March 20, 1980. (All the English titles of the Taiwanese newspapers are shown in Appendix 1.)

\textsuperscript{18}The method of cohort study was to do a long-term follow-up on a group of susceptible healthy people in order to examine the relation between certain disease and some possible factors (Chen CJ, 1980:257).
limiting their hepatitis B studies. Dr. Chen Ding-shinn, for example, explained in an interview:

In the mid-1970s, Dr. Sung Juei-low wanted to do a follow-up study of liver patients in the Government Employees' Clinic Center. I gave him an estimated annual research budget of about NT$ 1,500,000 (US$ 37,500). But at that time, Dr. Sung could only get a NT$ 150,000 (US$ 3,750) research fund for one year from the National Science Council. Therefore, he failed. On the contrary, Beasley succeeded in doing a similar study.

From this discussion, we can see that in the 1970s, the political context and military desires shaped the hepatitis B research conducted in Taiwan. Whether researchers could do certain research in Taiwan depended more upon whether they had better relation with the government or whether they had more research funding rather than upon any organized system of peer review.

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19 Next section examines the details.

20 Dr. Sung Juei-low was a leading hepatitis researcher in Taiwan. He was the chairman of the Gastroenterological Society of the Republic of China in the 1970s. He has been the chairman of the Hepatitis Control Committee of the Department of Health since 1980. In 1982, he became a member of Academia Sinica, the highest academic honor in Taiwan. Chen Ding-shinn is a student of Sung Juei-low.

21 Interview with Dr. Chen Ding-shinn on December 31, 1993.
Little Support from the Government

As mentioned above, more research funds helped American researchers do hepatitis B studies in Taiwan, while Taiwan's researchers had a difficult time getting enough funding from the government. By explaining the relationship between government funding and research, we can see the importance of government funding for scientific practice.

To understand the prevalence of the hepatitis B virus in Taiwan, many researchers in the 1970s tested the prevalence of virus markers, such as HBsAg, antibody to HBsAg(anti-HBs), and antibody to hepatitis B core antigen(anti-HBc), in different populations. By using different testing methods, they reported that the HBsAg positive rate was from 2.2% to 34%, the anti-HBs rate was from 5.4% to 55%, and the anti-HBc rate was as high as 96.9% in different general populations (Shih PL et al., 1971; Sung JL et al., 1972a; Beasley et al., 1974; Tsuji et al., 1976; Sung JL, 1976a; Chen DS et al., 1978). Besides, the researchers studied the geographical distribution of two subtypes of HBsAg, adr and adw, and the possible HBsAg transmission routes from mothers to babies (Beasley et al., 1974; Stevens et al., 1974; Anderson et al., 1975; Tsuji, et al., 1976; Sung JL et al., 1976b; Chen DS et al., 1978a).

Based on the results of these hepatitis studies, liver disease researchers in Taiwan appealed to the government for support. For example, in 1976, Sung Juei-
low(1976b) publicly appealed for the establishment of an institution or a research center to study liver disease. Sung showed that the prevalence of hepatitis B was incredibly high and hepatitis B had close relation with cirrhosis or hepatocellular carcinoma. Sung continued:

If people were infected by the hepatitis B virus, it kept them from work or school at least four weeks, seven weeks on the average, until they recovered. That is, students’ studies and industries’ production would be negatively influenced....If the infected people could not recover, they might become carriers or, after several years, develop cirrhosis or hepatocellular carcinoma. Since studying hepatitis B was a promising way to understand hepatocellular carcinoma, I hoped that the government or entrepreneurs would establish a liver disease institute(Sung JL, 1976b:122).

Despite such appeals, the government showed little concern regarding hepatitis B control in the 1970s. In the first National Science and Technology Conference, held by the Executive Yuan in 1978, no one mentioned the problem of liver disease(NSC, 1978).22 The Department of Health did not involve hepatitis B control in the "most important medical fields" in this conference(NSC, 1978).23

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22To put it precisely, no hepatitis researchers were invited to the conference.

23The Department of Health said that they would make efforts to control cerebrovascular, malignant neoplasms, heart diseases, and accidents. These were the top four leading causes of death in the 1970s.
1978, Sung Juei-low(1978) suggested creating an information center which would collect the data of every digestive disease patient from all hospitals in order to let doctors and liver disease researchers easily study and trace the disease development of the patients. But the government did not fund his proposal. Later, in the July 1978 National Reconstruction Meeting, Sung Juei-low again appealed to the government to address the issue of hepatitis B control. But the government did not accept his request(Sung JL, 1985). Until mid-1980, neither did hepatitis B control appear in the "medical research fields" of the second edition of the Science and Technology Development Program, revised in June 1980(The Executive Yuan, 1980).

In addition, in March 1979, some industrial entrepreneurs, such as Tao Tzouhou and Hu Kuang-piao, proposed establishing a hepatitis research center to commemorate Yin Chung-jeng, the most important governmental official in Taiwan's economic development of the 1950s, who died of acute hepatitis in 1963. They invited Minister-Without-Portfolio Lee Kue-ting and the Secretary-General of the Executive Yuan Wang Chou-ming to attend the second organizing meeting. Despite listening to the statements of Dr. Sung Juei-low and Dr. Liaw Yun-fan, Lee Kuo-ting did not acknowledge the "severity" of hepatitis B in Taiwan and offered no

support (Hu KP, 1992:157). In other words, before 1980, although the liver disease researchers had pointed out the high prevalence of the hepatitis B virus in Taiwan and the intimate relation between hepatitis B and hepatocellular carcinoma, the KMT government showed no concern about hepatitis B control.

Formation of the Government Policy

As illustrated above, levels of government funding and access significantly influenced whether some researchers could do certain studies and others could not. Since the importance of funding for scientific research provides government with a role in scientific practice, how government agencies design science policy becomes a significant question for understanding the political dimensions of scientific practice. The KMT government displayed little concern regarding hepatitis B control during the 1970s, then suddenly announced hepatitis B control as top priority of its science policy in 1980. This section examines science policy formation in Taiwan in order to understand how government officials’ leadership, researchers’ rhetorical arguments, and economic considerations promoted the hepatitis B control program in 1980.

25 Interview with Dr. Liaw Yun-fan at Chang-Gung Memorial Hospital, Lin-kou, on December 14, 1993.

83
The Government Recognition of Hepatitis B

On July 2, 1980, when Premier Sun Yun-hsuan reviewed the DOH, he directed them to control hepatitis, and the Bureau of Communicable Disease Control of the DOH soon began planning hepatitis control. In the 1980 National Reconstruction Meeting (Kuochia chienshe huiyi, i.e. Kuochienhui), three weeks after Premier Sun announced the importance of hepatitis control, the hygiene group reached a conclusion that the DOH should organize a special group to begin hepatitis control. Then, on October 1, 1980, the DOH established the Hepatitis Control Committee. Later, on April 11, 1981, Premier Sun and Minister Lee Kuo-ting

26Chungyang jih pao, July 3, 1980. Premier Sun highlighted the hepatitis control because of Minister Lee Kuo-ting's suggestion (Lee KT, 1988). Besides hepatitis control, Premier Sun asked the DOH to pay attention to short-sight and senile diseases.

27Chungyang jih pao, July 4, 1980.

28The National Reconstruction Meeting divided the participants into groups to discuss different issues, including politics and diplomacy group, education group, culture group, economy group, science and technology group, hygiene group, and mass media group.


30The DOH document Yentao kanyen fangchih fangan huiyi chiliu (The Minutes of Hepatitis Control Meeting), October 1, 1980. The organic rule of this committee was not passed until September 17, 1982. See the DOH document 71.9.17. Wei-Shu-Jen-Tzu No. 396409. The DOH "formally" established this committee on October 1,
emphasized the importance of hepatitis B control in the Third Board Meeting of the Advisors for Science and Technology, the Executive Yuan (STAG, 1981) and again on February 8, 1982, in the Second National Science and Technology Conference (NSC, 1982). Finally, on August 26, 1982, at the 1795th Cabinet meeting, hepatitis B control was included in the revised Science and Technology Development Plan as one of the eight strategic areas of science and technology (STAG, 1988b).

Before 1980, the KMT government did not display any significant concerns about public health affairs in general. For example, the KMT government did not set up the DOH directly under the Executive Yuan until 1970. Before that time, the DOH was under the Ministry of Interior. Even after 1970, the Director General of the DOH was only a selected rank official, not a special rank official.\(^{31}\) That is, the Director General of the DOH was not a minister and could not vote in Cabinet meetings. In addition, health affairs were never in any National Reconstruction Plan

\(^{31}\) Under the Premier of the Executive Yuan, the highest rank of the officials were special rank officials, selected rank officials, recommended rank officials, and designated rank officials followed. Every minister was a special rank official. But the Director General of the DOH was only a selected rank official.
before 1980. Moreover, the DOH did not even own their own office building. As one retired DOH official said, what the KMT government emphasized was economic development and development of national defense, rather than public health affairs. Why did the government suddenly pay more attention to hepatitis B control?

The government officials' leadership and researchers' rhetorical arguments shaped the government's decision-making about hepatitis B control. A failed hepatitis B vaccine clinical trial played a role of catalyst in stimulating the government's attention to hepatitis B control. In March of 1980, many Taipei newspapers reported that the Department of Health (DOH) stopped a hepatitis B vaccine trial project because it did not apply to the DOH for approval. The trial project was held by the Medical Research Unit of the University of Washington, the New York Blood Center, and the Public Health Institute of the National Taiwan University together. The directors of this project were R. Palmer Beasley of the University of

32 Tzuli wan pao, July 28, 1980.

33 Interview with an anonymous retired DOH official at Taipei in September, 1993.

34 Before 1981, the English name of the Department of Health (DOH) was "the National Health Administration." I prefer to use the name "the Department of Health" throughout the whole dissertation in order to avoid confusion.

Washington, and Lin Chia-ching and Hwang Lu-yu\textsuperscript{36} of National Taiwan University. This vaccine trial had aimed to test the efficacy of the Merck Sharp & Dohme’s hepatitis B plasma vaccine. Its subjects were Taiwanese healthy children at ages of one to six years old.

The DOH claimed that Beasley and his colleagues did not apply to the DOH for the permission to import this vaccine; they imported the vaccines through the Bureau of Military Medicine of the Department of Defense in the name of "research usage." Beasley and his colleagues sent the proposal and consent documents of the trial project to military kindergartens in Taipei in order to recruit the trial subjects from among the kindergarten children. The DOH stopped this vaccine trial project after the Taipei Health Bureau reported this event to the DOH.\textsuperscript{37}

The directors of the trial project claimed that the U.S. FDA had approved the safety of this vaccine and this efficacy trial. But the DOH said that it would not allow Taiwanese children to be the clinical trial subjects of the vaccine without ascertaining the safety and efficacy of the vaccine. The DOH insisted that the vaccine could only be used in laboratories for academic research rather than for clinical trial in Taiwan. Therefore, the DOH announced that it would not consider the clinical trial on

\textsuperscript{36}Dr. Hwang Lu-yu was R. Palmer Beasley’s wife.

\textsuperscript{37}Chungkuo shih pao, March 17, 20, & 21, 1980; Minsheng pao, March 17, 1980; Lienho pao, March 17, 1980; Taiwan shinsheng pao, March 20, 1980.
Taiwanese people until the U.S. FDA approved the license of this vaccine.\footnote{Ibid. In fact, before this event, Beasley and Hwang Lu-yu had conducted a small hepatitis B plasma vaccine trial in the autumn of 1979 on one hundred Taiwanese children at age of six months to seven years old. This vaccine trial did not apply to the DOH for permission either. Those children received two doses of 10, 20, or 40 µg one month apart to test which dose would have better immune response. The researchers checked the children's anti-HBs response one, two, three, four, five, and twelve months after the initial injection separately. And then the children received a booster at 13 to 16 months. Few people knew about this vaccine trial at the time. The result of this vaccine trial was published in December 1983 issue of Vaccine (Hwang LY et al, 1983). An anonymous interviewee said the clinical trial in 1980 was stopped by the DOH because the scale of the trial was big and then was known by the DOH. On the contrary, the clinical trial in 1979 could be done secretly because its scale was small. Interview with the anonymous interviewee at Taipei in December, 1993.}

Beasley tried to revive his clinical trial project by means of persuading Minister Lee Kuo-ting, the key person who influenced Premier Sun to pay attention to hepatitis control. He had become the "godfather" of science and technology affairs in Taiwan from the mid-1970s to the late 1980s.\footnote{Lee Kuo-ting was the Minister of Economic Affairs and then the Minister of Finance from 1965 to 1976. This period was a time when Taiwan had a rapid economic growth and stable prices. From 1961 until the 1973 oil crisis, Taiwan enjoyed in 10%-13% annual GNP growth. Meanwhile, the rate of inflation was 1.6% measured by the wholesale price index, 2.9% by the consumer price index. Besides, regarding the income distribution, the ratio of the income share of the richest 20% to that of the poorest 20% was 5.34 in 1964, and then decreased from 4.61 in 1970 to 4.18 in 1980 (Shirley Kuo, 1983:97, 201). Therefore, Lee Kuo-ting had a strong power network in the fields of Taiwan's economic affairs and finance. Since Taiwan's science and technology policy focused upon applied science and technology which would benefit industries and economic development in the 1970s, Lee Kuo-ting had a strong influence upon the applied science and technology affairs from the 1970s.} He served as Minister-Without-Portfolio from 1976 to 1988 in charge of the Science and Technology Advisory
Group(STAG)(Lin CH, 1989:103-108). During this period, the science and technology policy was decided mainly by the STAG. Lee Kuo-ting not only initiated the hepatitis B control program but also influenced the main direction of the program until the late 1980s.40

Beasley convinced Lee Kuo-ting of the severity of hepatitis B in Taiwan.41

Lee said:

In 1980, Dr. Beasley of the University of Washington reported the severe prevalence of hepatitis B in Taiwan to me. I soon reported this phenomenon to Premier Sun and suggested the government take some measures against hepatitis B(Lee KT, 1988).

Premier Sun accepted Lee Kuo-ting’s recommendation to pay attention to hepatitis B control. Then on December 22, 1980, Beasley and Lin Chia-ching had an opportunity to present their proposal about hepatitis B vaccine trial project in the Executive

40Lee Kuo-ting was the chairman of the Hepatitis Advisory Committee of the Executive Yuan. This Committee first met on March 28, 1983. Besides, three anonymous interviewees, two from the DOH and one from National Taiwan University, believed that Lee Kuo-ting was the "informal Director General" of the DOH when Hsu Tzu-chiu was the Director General of the DOH from 1981 to 1985.

41In the summer of 1980, Beasley convinced Hu Kuang-piao, an industrial entrepreneur, of the seriousness of hepatitis B in Taiwan. Hu Kuang-piao wrote to Premier Sun on August 3, 1980, and to former President Yen Chia-kan and Lee Kuo-tsing on August 5, 1980, suggesting they visit Beasley’s laboratory in Taipei. Yen and Lee accepted Hu’s suggestion(Hu KP, 1992:157-161). But Lee Kuo-ting should have met Beasley before Hu Kuang-piao’s suggestion since Lee Kuo-ting had recommended Premier Sun pay attention to hepatitis control before June 1980, as mentioned above.
Yuan.

The government leaders' concerns about hepatitis B control did not necessarily imply the necessity and legitimacy of the vaccine clinical trial. Beasley and Lin Chia-ching had to persuade the government leaders that vaccination would be the most feasible way of controlling hepatitis B in Taiwan. First of all, Beasley and Lin Chia-ching emphasized the severity of hepatitis B in Taiwan. They stated that the carrier rate of the hepatitis B virus was 15-20% in Taiwan, but only 0.1% in the United States and 2% in Japan. Furthermore, they asserted that HBV carriers might develop hepatoma.\footnote{Mosby’s Medical, Nursing, and Allied Health Dictionary defines hepatoma as "a primary malignant tumor of the liver characterized by hepatomegaly, pain, hypoglycemia, weight loss, anorexia, ascites, and the presence of alpha fetoprotein in the plasma." (Glanze, 1992:562)}

In 1975, the University of Washington Medical Research Unit...began a long term prospective study of Chinese Government Employees to define the incidence and risk of hepatoma among HBV carriers. With more than 22,000 men who were initially and periodically tested for HBV and liver function, it is the world’s largest study of this problem or any other cancer. To date, it shows that the risk of hepatoma is more than 200 times greater among HBV carriers.\[emphasis in
Beasley and Lin Chia-ching continued that among deaths in the government employee group they studied, the proportion due to hepatoma or cirrhosis was 57% among carriers and only 1.8% among non-carriers. Especially, they stressed, HBV was a Chinese problem: three quarters of the carriers in the world were Chinese.\textsuperscript{44}

The strategies of Beasley and Lin Chia-ching focused on the issue of the vaccine efficacy and avoided the issue of the vaccine safety. They emphasized how impractical or difficult it was to prevent susceptible populations from making contact with carriers. They suggested some approaches to control HBV (direct quotations from their notes):

A. Prevention of HBV

1. HBIG for babies of carrier mothers

2. Vaccination (after demonstration of efficacy in susceptible high risk groups)

3. Blood donation control

   Extend existing screening programs to cover all transfusions

4. Injection equipment control

\textsuperscript{43}See R. Palmer Beasley's Notes on HBV in Taiwan, which was the outline of his presentation in the Executive Yuan on December 22, 1980.

\textsuperscript{44}Ibid.
Medical personnel education

Use, Sterilization, Disposal

B. Carrier identification and hepatoma screening with

AFP[α-fetoprotein]

Continued research needed

C. Public Education

D. Research

E. Program Impact Evaluation

They claimed that the most practical and feasible approach to prevent HBV infection was immunization through the vaccine. Regarding HBIG as passive antibodies, they argued:

Passive antibodies last only a few months. [They were] useful for temporary high risk situations, such as babies at birth from carrier mothers. [They were] not useful for continued high risk. Then they emphasized the efficacy of the vaccine which could initiate active antibodies:

Active antibodies last for years. HBV vaccine is new. [It is] produced in the USA by Merck and [the] NIH. [The] development began before 1972. [The] test in Americans has shown safe, immunogenic, and

\[45\]Ibid.

\[46\]Ibid.
effective. [The vaccine] efficacy in Chinese should be established.\textsuperscript{47}

That is, Beasley and Lin Chia-ching’s main purpose in this presentation was winning government endorsement for their vaccine trial project.

In the discussion, the earlier issue of vaccine safety was transformed into a budget issue by some government leaders who supported the clinical trial. According to the minutes of the meeting, no one mentioned the issue of vaccine safety. Wang Chi-wu, Director of the International Program of the NSC, said that "part of the opposition to the vaccination program stemmed from the medical researchers who believed that funds used on hepatitis prevention and control could perhaps be better used on research for cure and treatment."\textsuperscript{48} In addition, Lee Chung-tao of the Council for Agricultural Planning & Development stated, "the NIH funding of the United States was crucial to the success of the clinical trial because the NIH would support all salaries of the project employees." Therefore, they suggested that the government had better decide to implement this vaccine trial soon because the NIH might withdraw the funding at the end of 1980.\textsuperscript{49} Lee Kuo-ting also supported the clinical trial and commented that:

[The] HBV problem was inherently a Chinese problem and therefore it

\textsuperscript{47}\textit{Ibid.}

\textsuperscript{48}\textit{The STAG document The Summary Record on Discussion of Hepatitis B-Virus Vaccination Program, December 22, 1980, by Wang Chi-wu, Director of International Programs, NSC.}

\textsuperscript{49}\textit{Ibid.}

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should be accorded top priority in our R&D policy. It would be opposed by a vocal minority at the beginning, just like our family planning program had been attacked in the early years. But such opposition would diminish and disappear in time, particularly if we undertake public education measures simultaneously.\textsuperscript{50}

Premier Sun endorsed the clinical trial and concluded:

- The government should identify the HBV vaccination project as a top priority undertaking in Taiwan.
- The DOH should form a Committee of Specialists on HBV Vaccination before the end of December 1980 and come to a conclusion on this matter before the end of January 1981.
- The NSC should make known to the medical research community that other types of research, including research aiming at treatment and cure of hepatitis, would not be affected by funding to this vaccination project.
- If this vaccination project was approved, the DOH and the STAG under the stewardship of Minister Lee Kuo-

\textsuperscript{50} Ibid. The term "public education" means the DOH’s health education for hepatitis B control. Chapter four examines the details.
ting would be expected to assist this project,

including public education, maintenance of blood
donation regulations, and promotion of the use of
disposable syringes for injections.  

Although Premier Sun directed the DOH to organize a special committee to
scrutinize the vaccination project proposal, Premier Sun and Lee Kuo-ting had
decided that the HBV vaccination project should be the top priority of the
government in Taiwan. In other words, the government leaders had accepted that the
vaccine was safe—or, at least, had ignored the issue.

Before the December 1980 meeting, the DOH did not endorse the safety of
the vaccine. For example, on October 1, 1980, when the Hepatitis Control
Committee of the DOH first met, they had not accepted the hepatitis B plasma
vaccine and hepatitis B immune globulin(HBIG) and suggested examining the safety
and feasibility of the vaccine and HBIG.  

In addition, on October 1980, the Bureau of Communicable Disease Control of the DOH said in public that "we cannot try the
hepatitis B plasma vaccine now because it is made from the serum of liver disease
patients and theoretically might cause non-A, non-B hepatitis."  

51Ibid.

52The DOH document Yentao kanyen fangchih fangan huiyi chilu(The Minutes of Hepatitis Control Meeting), October 1, 1980.

53Chingnien chanshih pao, October 20, 1980.
But as soon as Premier Sun and Lee Kuo-ting endorsed the vaccine trial in the December 1980 meeting, the DOH abandoned their insistence. On January 21, 1981, the Hepatitis B Vaccine Trial Examining Committee of the DOH passed the vaccine trial project of Beasley, Lin Chia-ching, and Hwang Lu-yu. This project would use a double blind controlled trial of the hepatitis B plasma vaccine on 1600 children aged one to six years old. Some would receive vaccine and some would only receive tetanus vaccine as placebo.\(^4\) The safety of the vaccine was not an issue for the committee. The committee only wanted Beasley and his colleagues to revise their proposal to include possible side effects, the related medical treatment, and the methods of compensation. Besides, the committee wanted them to take the responsibility of monitoring the safety of the vaccinated subjects. In other words, the safety of the vaccine had become the consensus of the DOH.

The government leaders, rather than Taiwanese medical workers, decided upon the necessity of the clinical trial in Taiwan, which in turn implied that the vaccine was safe. Beasley’s cognitive arguments indeed played a role in shaping the feasibility of the clinical trial in Taiwan. However, without the endorsement of the government leaders, Beasley and his colleagues might not easily win the DOH over to their clinical trial project.

\(^4\) The DOH document B-hsing kanyen yimiao shihyung shenyi weiyüanhui huiyi chilu (The Minutes of the Hepatitis B Vaccine Trial Examining Committee Meeting), January 21, 1981.
Biotechnology as an Incentive

Besides Beasley and his colleagues’ rhetorical arguments and the leadership of Minister Lee Kuo-ting and Premier Sun, an economic consideration helped form the government’s science policy regarding hepatitis B control. This factor was that the NSC planned to promote biotechnology in Taiwan by means of producing the hepatitis B vaccines. That is, economic consideration might shape the direction of scientific practice.

As mentioned above, in the late 1970s, Taiwan faced severe economic and diplomatic frustrations. As Hsieh Chiao-chiao (1985:230-279) argued, the KMT government chose "economic- and trade- first diplomacy" to replace the traditional political relations with other countries. Meanwhile, Taiwan tried to upgrade her traditional export sectors and to diversify into new product lines. In this context, one of the major areas of development chosen by the KMT government was biotechnology, according to the criteria of high technology-intensive, low energy-consuming, high value-added, and of having a wide market(STAG, 1988a). From October 1, 1981, the NSC initiated the first large-scale research program of biotechnology\(^{55}\) in Taiwan, applying the genetic engineering techniques in the

\(^{55}\)In the NSC’s sense, biotechnology included recombinant DNA technology, hybridoma technology, enzyme technology, and fermentation technology.
production of the recombinant DNA hepatitis B vaccine (STAG, 1988a).

The NSC chose the recombinant DNA hepatitis B vaccine project as the beginning of their biotechnology research. One possible reason was that the hepatitis B control program might guarantee a big market. As Wang Yu-chung says, "our government wanted to develop biotechnology by means of launching the program of the hepatitis B control." Without the market, the new technology would have a difficult time surviving. In order to guarantee the domestic market, the government would have to promote the hepatitis B control program in order to win the acceptance of the Taiwanese people. No wonder that in the December 1980 meeting mentioned above, Wang Chi-wu, Director of International Programs of the NSC, made efforts to argue for Beasley's clinical trial project. In addition, Lan Chung-fu at the STAG suggested Lee Kuo-ting "coordinate the NSC, the DOH, and other biomedical research institutes in order to promote biotechnology by means of the

56 Wang Yu-chung is a retired DOH official. Interview with him at Washington D.C. on August 20, 1992. An anonymous NSC official has the same opinion too. Interview with the anonymous interviewee in October, 1992.

57 In order to dominate Taiwan's domestic market of the hepatitis B vaccine, the NSC set up the Development Center for Biotechnology (DCB) to transfer the technology of the hepatitis B plasma vaccine from Pasteur Institute at France. Then the NSC and the DCB established Lifeguard Pharmaceutic Company to receive the technology and produce the vaccine. Besides, the NSC asked the DOH to control the importation of foreign hepatitis B vaccines in order to let Lifeguard dominate Taiwan's market. Chapter four examines the details.
hepatitis B control program."\textsuperscript{58}

The NSC paid much attention to this program. The budget of the Biology Division of the NSC was NT$ 70,000,000 (US$ 1,750,000) in FY 1982. The recombinant DNA hepatitis B vaccine program cost NT$ 20,000,000 (US$ 500,000), nearly one third of the whole budget.\textsuperscript{59} Regarding its importance, the NSC said that:

This program is the most important project of the "Biotechnology" sector in the Science and Technology Development Program. This program will promote the development of the related bioindustry. The success of this program will be the basis of the bioindustry.\textsuperscript{60}

Before 1980, Taiwan had almost no biotechnology using recombinant DNA techniques (STAG, 1988a:1).\textsuperscript{61} The NSC displayed an interest in introducing genetic engineering into Taiwan. In 1978, it sponsored a seminar on the subject of "genetic


\textsuperscript{59} The NSC document Yich’uan kungch’eng yentaohui huivy chilu (The Minutes of Genetic Engineering Discussion Meeting), January 13, 1982.


\textsuperscript{61} Before 1980, Taiwan only had research about agricultural wastes, single cell protein, yeast, and traditional fermentation technology. The Institute of Botany of the Academia Sinica was the only one that engaged in recombinant DNA research (STAG, 1988a:12).
engineering and nitrogen fixation." But some participants felt that genetic engineering "might not be easily established because it might be too complicated a science and embody a certain degree of risk." (STAG, 1988a:18) Therefore, the NSC’s efforts in introducing genetic engineering into Taiwan did not succeed until it promoted the recombinant DNA hepatitis B vaccine program in 1981.\(^{62}\)

The budget distribution in hepatitis research offers another perspective of how the government considered biotechnology important. Even after Premier Sun announced the onset of hepatitis B control in 1980, the budget for hepatitis B control mainly went to the recombinant DNA hepatitis B vaccine program rather than to epidemiology, pathology, clinical medicine, etc. For example, as mentioned above, in FY 1982, the NSC invested NT$ 20,000,000 (US$ 500,000) in the recombinant DNA hepatitis B vaccine program. Compared to this budget, the DOH’s NT$ 4,000,000 (US$ 100,000) hepatitis research budget was much less.\(^{63}\)

Meanwhile, some outstanding hepatitis researchers, such as Sung Juei-low and Cheng Ding-shinn, still complained that the budget for the hepatitis B research was too little and often delayed even when the research project had been approved. Sung Juei-low said that "the NSC only funded the hepatitis research of National Taiwan University for NT$ 300,000 (US$ 7,500), although this amount had increased from

\(^{62}\)Ibid.

\(^{63}\)Minsheng pao, June 20 and 21, 1981; Lienho pao, June 20, 1981.
NT$ 80,000 (US$ 2,000) several years ago.”

Regarding the problem of inadequate research funds, Chen Ding-shinn said that "it is like one person without enough money to buy food when he enters a restaurant.”

In addition, in the International Symposium on Viral Hepatitis on November 10 & 11, 1981, Sung Juei-low and Cheng Ding-shinn complained that the government paid too much attention to the recombinant DNA hepatitis B vaccine and ignored other necessary hepatitis research. Chen Ding-shinn emphasized that "if we want to completely control hepatitis B, we should do further research to resolve some important problems, such as the mechanism of transmission and the mechanism from hepatitis B carrier status to chronic hepatitis or hepatocellular carcinoma.”

Besides, their excitement from a year before when the government claimed to control hepatitis B had then turned into disappointment. Their own five-year epidemiological research project still awaited approval.

From the historical development illustrated above, we can see that some

64 Minsheng pao, June 20, 1981. Besides, one anonymous DOH official believes that "what the government said was one thing, what the government gave was another thing." Interview with the anonymous interviewee at Taipei in May, 1993.

65 Ibid. Interview with Dr. Chen Ding-shinn at National Taiwan University on June 14, 1993.


67 Lienho pao, November 12, 1981. Later, the NSC refused to fund the "Information Center for Hepatitis Patients" for their five-year project. See the NSC document 71.3.30. 71-Tai-Hui-Sheng-Tzu No. 2329, March 30, 1982. Chapter four discusses the details of this event.
factors co-existently shaped the government’s science policy regarding hepatitis B control. The leadership of Lee Kuo-ting, the efforts of Beasley and his colleagues, and the NSC’s plan of launching biotechnology together revived Beasley’s clinical trial project. Although the DOH approved the clinical trial project, it did not guarantee that everyone would accept the safety of the vaccine. The next section discusses a controversy over the safety of the vaccine.

A Controversy Over the Vaccine Trial Project

This section examines the occurrence and development of a controversy over the safety of the hepatitis B vaccine and Beasley’s vaccine trial project in 1981. From various issues and strategies that participants used to argue against each other, this case displayed social contingencies of scientific knowledge. In addition, this case indicates how political operations of government officials and government scientists shaped perceptions of the "safety" of the vaccine.

Issues in the Controversy

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 Numerous participants raised ethnic, ethical, legal, technical, and economic issues to shape the 1981 controversy. The proposal of the vaccine trial project was submitted to Premier Sun after the Hepatitis B Vaccine Trial Examining Committee of the DOH passed it. Premier Sun approved it on February 17, 1981. After many newspapers reported that this project was approved, miscellaneous voices arose to debate the safety of the hepatitis B plasma vaccine and this trial project. At first, the criticism over the vaccine and the trial project involved possible suspicions of racism and uncertain medical safety. The critics came from many medical institutes and different medical disciplines. Lee Tao-shen, a surgeon at Veterans General Hospital, asked that "since the vaccine was invented and produced by Americans, why did the American researchers choose Taiwanese children, rather than American children, as the subjects of the clinical trial?" In other words, Taiwanese children should not become guinea pigs. This kind of feeling remained during the controversy. For example, Yeh Ping(1981), a researcher at Veterans General Hospital, also criticized the attitude of Americans toward Taiwanese. He mentioned that Dr. Bennett warned the KMT government on April 6, 1981 that "if Taiwan did not begin the clinical trial in two weeks, New York Blood Center and Merck would terminate their support." Yeh characterized the condition of so-called "support" as two

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68Lienho pao, February 18, 1981.

69The name "Yeh Ping" was a pseudonym of a researcher at Veterans General Hospital.
thousand Taiwanese children as the subjects of the clinical trial without an epidemiological study. Yeh used Elvis Presley’s song as an analogy: "Tomorrow is too late, It’s Now, or Never." Yeh asked, “Do we need the support of 'My Love Can’t Wait'?”

Some critics, such as Wang Chung-yi who was a physician at National Taiwan University Hospital, Lee Shih-cheng who was a science journalist, and Lin Ho-hui who was the mother of three children, asserted that though the clinical trial was necessary for a new drug, it should start with adults rather than children for the sake of ethical considerations. In addition, Liaw Yun-fan, a physician at Chang Gung Memorial Hospital, and Wang Chih-mei, a science journalist, worried that even though the clinical trial in America had shown that the vaccine was safe to Americans in general, it might not be safe to Taiwanese due to ethnic difference. Besides, many critics charged that the subjects of the vaccine trial had no comprehensive protection against possible serious side effects because Taiwan had no clinical trial regulations.

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70 Minsheng pao, February 19 & 21, 1981. Lee Shih-cheng was a science journalist at Minsheng pao. Lin Ho-hui was a otolaryngologist at National Taiwan University. But she said that she spoke in a position of three children’s mother since she did not understand the hepatitis B vaccine.

71 Chungkuo shih pao, February 17, 1981; Minsheng pao, February 21, 1981. Wang Chih-mei was a science journalist at Chungkuo shih pao.

Supporters of the vaccine trial project included the directors of the trial project, the officials and scientists of the DOH, and some hepatitis researchers from public institutes, such as National Taiwan University and Veterans General Hospital. Cheng Ding-shinn and Beasley stated that the vaccine was safe because the U.S. FDA had approved its safety; moreover, thousands of American subjects had no serious side effects in any previous clinical trial, such as the report of Wolf Szmuness and his colleagues(1981).\textsuperscript{73}

The major "scientific evidence" that the supporters cited was a paper by Wolf Szmuness and his colleagues, "Hepatitis B Vaccine: Demonstration of Efficacy in a Controlled Clinical Trial in a High-Risk Population in the United States," published in The New England Journal of Medicine, October 9, 1980.\textsuperscript{74} The subjects of this vaccine trial were 1083 homosexual men known to be at high risk for HBV infection. The DOH said that they rejected Beasley's vaccine trial proposal in March 1980 due

\textsuperscript{73}Minsheng pao, February 17, 1981; Chungyang jih pao, February 17, 1981.

\textsuperscript{74}In fact, more clinical trial reports of the hepatitis B plasma vaccine were published during the period of the controversy, such as P. Maupas and his colleagues(1981) on February 7, 1981; Jean Crosnier and his colleagues(1981a) on February 28, 1981; Szmuness and his colleagues(1981) on March 14, 1981; Jean Crosnier and his colleagues(1981b) on April 11, 1981. But no one cited these papers until the report of the Control Yuan cited the paper of P. Maupas and his colleagues(1981) on May 26, 1981. Later sections discuss the report of the Control Yuan.

In a discussion meeting regarding hepatitis B vaccine, held by Minsheng pao on February 20, 1981, a director of the vaccine trial, Hwang Lu-yu, stated that the immune response of Taiwanese children was very good, proved by the vaccine trial on 100 Taiwanese children in the fall of 1979, the critics accused Beasley and his colleagues of illegal activities. See Minsheng pao, February 21, 1981.
to the safety problem of the vaccine. The DOH continued, however, "the successful result of the clinical trial on thousands of American homosexual men had persuaded the skeptical hepatitis experts in the Hepatitis Control Committee of the DOH." The DOH concluded that on January 21, 1981, the committee passed Beasley and Lin Chia-ching's clinical trial proposal. That is, the DOH tried to argue for the vaccine by drawing support from "scientific knowledge," in the traditionally sense of objective facts.

To counter charges of racism, some members of the Hepatitis Control Committee of the DOH argued that the project chose Taiwanese rather than Americans as subjects because many Taiwanese suffered from liver diseases. Sung Juei-low, chairman of the Hepatitis Control Committee, and Yang Chao-hsiung, Director of the National Institute of Preventive Medicine of the DOH, pointed out:

[Taiwanese] have a very high incidence of hepatitis B. The liver diseases caused by the hepatitis B virus, such as chronic hepatitis, cirrhosis, and hepatocellular carcinoma, are very serious in Taiwan. Almost half of the carriers will die of the related liver diseases. Since it is [Taiwanese] who urgently need the hepatitis B vaccine, why cannot we choose Taiwanese as the subjects of the clinical trial?  

Beasley, Lin Chia-ching, co-director of Beasley's project, and Hsu Shu-tao, Director

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76 Lienho pao, February 19, 1981.
of the Bureau of Communicable Disease Control of the DOH, all argued that the project chose Taiwanese children rather than American children as subjects because most of the Taiwanese carriers were infected when they were very young.\textsuperscript{77} Lin Chia-ching said:

According the previous studies, most of the carriers were infected before the age of six. Since most of the adults have developed antibodies, it is useless to vaccinate them. Therefore, we choose children at the age of six as subjects.\textsuperscript{78}

When a journalist asked Beasley why subjects of a clinical trial were adults in America, but children in Taiwan, Beasley answered:

Almost all the persons who have the hepatitis B infection are adults in America; therefore, it is hardly possible to find [high risk] children as the clinical trial subjects. In contrast, many [Taiwanese] children were infected by the hepatitis B virus. Therefore, vaccinating Taiwanese children is the key way of solving Taiwan’s problems of liver disease.\textsuperscript{79}

In further advocacy of the vaccine trial project, Hsu Shu-tao, Director of the Bureau

\textsuperscript{77} Chungyang jih pao, February 17, 1981; Chungkuo shih pao, February 18, 1981; Lienho pao, February 19, 1981.

\textsuperscript{78} Lienho pao, February 19, 1981.

\textsuperscript{79} Chungyang jih pao, February 20, 1981.
of Communicable Disease Control of the DOH emphasized:

The trial subjects would be fully protected by the regulations of the U.S. FDA. The DOH would ask the project directors to provide free and appropriate medical care if the subjects suffer side-effects.\textsuperscript{80}

In addition, Lin Chia-ching, a co-director of Beasley’s project, claimed, "[Merck, Sharp & Dohme] would pay the subjects for any injury or loss caused by the vaccine."\textsuperscript{81} Besides, responding to the critics’ suspicions of racism, Beasley emphasized that he loved Taiwan. Anything that he did not want to do in America he would not do in Taiwan.\textsuperscript{82}

The reply of the supporters addressed the considerations of the critics, such as the safety of the vaccine, legal and medical protection, and the ethnic and ethical choice of subjects. In addition, the supporters cited some "scientific data" and the authority of the U.S. FDA to argue for the vaccine trial project. But they did not

\textsuperscript{80}\textit{Minsheng pao}, February 18, 1981.


\textsuperscript{82}\textit{Chungyang jih pao}, February 20, 1981. Beasley’s wife, Hwang Lu-yu, was a Taiwanese or a Chinese in Taiwan. This marriage became "proof" that Beasley loved Taiwan. But Beasley did not say whether he would dare to do a clinical trial without the knowledge of the U.S. FDA in the United States as he had done in Taiwan from 1979 to 1980.
succeed. In other words, "scientific knowledge" and experts were not necessarily the major arbitrators of the controversy.

Strategies of the Critics

The critics used three major strategies to counter the supporters. First, the critics tried to mobilize popular opposition. Their repeated challenges shaped a sustained controversy. Frequent appearance of the controversy in newspapers kept suspicion aroused among medical workers and the general public. Continuing debate also prevented any one party from gaining complete authority. From mid-February to mid-March 1981, the controversy appeared in many newspapers almost every day. The frequent appearance of the controversy in newspapers continued to late May 1981. Besides, beginning February 23, 1981, the controversy caused the Control Yuan to investigate this case.\textsuperscript{83} Later sections discuss the activity and the influence of the Control Yuan.

In addition, the critics asked many medical workers whether they would let their children receive the hepatitis B plasma vaccine. The answers often were

\textsuperscript{83} Chungkuo shih pao, February 24, 1981; Minsheng pao, February 24, 1981.
uncertain or negative. For example, on February 18, 1981, Minsheng pao reported that a doctor at National Taiwan University and a doctor at Veterans General Hospital both said that they would not let their children be vaccinated until the report of a mass clinical trial on healthy children was published. On February 21, 1981, Lienho pao quoted the words of the Deputy Director of National Taiwan University Hospital: "if I had a grandson, I would not let him become a subject of the clinical trial, according to my knowledge about the hepatitis B vaccine." This strategy aimed to show that informed people would not accept the vaccine at that time. What was the significance of this strategy?

Without public acceptance, the trial project would not succeed or even start. Since there were no plasma vaccine experts in Taiwan, no one medical worker had higher authority on the safety issue of the vaccine. Therefore, when many medical experts stated that they still hesitated over whether to let their children receive the vaccine, many people expressed disbelief in the safety of the vaccine. For

84 Minsheng pao, February 18, 19, 21, and March 5, 1981; Chungkuo shih pao, February 18 and March 5, 1981.


86 Lienho pao, February 21, 1981. The name of the interviewee was not shown on the report.

87 See Lin Ho-hui "A Mother's Worry," Minsheng pao, February, 19, 1981; Chungyang jih pao, February 21, 1981; Tzuli wan pao, February 27, 1981. Besides, many readers called Minsheng pao to ask whether the vaccine was safe. See Minsheng pao, February 22, 1981. Later, when the vaccine clinical trials began in October 1981, the researchers found that some carrier mothers refused to vaccinate
example, on February 23, 1981, Min Tsu Evening News reported that when many students of junior high schools, elementary schools, and kindergartens in Taipei received cholera vaccines at school, their parents nervously asked them whether the vaccine was the hepatitis B or not. Some parents even called the schools to make sure. Some kindergartens were concerned enough to send a formal letter to parents explaining what kind of vaccine their children would receive.  

This strategy seemed successful in raising widespread doubt. The hesitation over the vaccine mentioned above presented the supporters with a great problem. For example, on February 19, 1981, Lin Chia-ching said that they might have a difficult time finding clinical trial subjects because many parents had rejected this project due to the influence of the mass media.  

The negative response reported made Premier Sun angry with the DOH because the DOH "had not clearly explained the safety of the vaccine to those who were concerned with the vaccine." In addition, on March 28, 1981, the STAG under the charge of Lee Kuo-ting held a discussion meeting. Lee Kuo-ting condemned the critics and the mass media for misleading newspaper their newborns with the hepatitis B vaccine. The researchers believed that "incorrect reports" misled the publics. See Chingnien chanshih pao, October 15, 1981; Minchung jih pao, July 9, 1982; Tzuyu shih pao, August 13, 1982.

88Mintsu wan pao, February 23, 1981.

89Mensheng pao, February 19, 1981.

90Mintsu wan pao, February 27, 1981; Lienho pao, February 27, 1981; Tzuli wan pao, February 27, 1981; Chungyang jih pao, February 27, 1981.
readers. He said that "patients and the general people believed doctors and experts; therefore, doctors and experts should be careful and responsible of their statements."\(^9^1\)

The critics' second strategy was to undermine the authority of the U.S. FDA about vaccine safety. Since Taiwan had no clinical trial regulations, no plasma vaccine experts, and no ability to examine the vaccine,\(^9^2\) the U.S. FDA became an important authority over vaccine safety. Because the supporters cited FDA approval again and again, the critics tried to downgrade the credibility of the FDA by displaying some mistakes in the history of the FDA's vaccine approval. Lee Shih-cheng pointed out that the U.S. FDA could not be trusted too much because they had even "created" data; for example, the U.S. FDA had claimed that the swine influenza vaccine had 80% effectiveness, but an insider said in public that the effectiveness was only 20%. Besides, every vaccine was claimed to be safe when the FDA approved it, but some serious or dangerous side effects appeared later; for example, the swine influenza vaccine caused 223 persons reactive injuries after the U.S. FDA licensed it

\(^9^1\)The STAG document Kanyen fangchih chi yenchii tzor'anhu chihu(The Minutes of the Hepatitis Control and Research Discussion Meeting), March 28, 1981; Tzuli wan pao, March 29, 1981; Lienho pao, March 29, 1981.

\(^9^2\)The Director of the Bureau of Communicable Disease Control of the DOH Hsu Shu-tao said that "we had no budget, no experts, no vaccine technology, and no necessary instruments; we only had many hepatitis patients." Chungkuo shih pao, February 18, 1981.
in 1977. Furthermore, Chang Chung-ming, a researcher of Veterans General Hospital, asserted that the immune response of Taiwanese might be different from that of Americans to the plasma vaccine due to the ethnic difference. Even though the U.S. FDA had approved the safety of the plasma vaccine, it might not be safe to the Taiwanese. Therefore, Han Shao-hua, a researcher at Veterans General Hospital, said that "it was time that we should have our own opinions rather than accept what the U.S. FDA say without question."³⁴

Third, the critics raised some technical challenges to the supporters. Liaw Yun-fan, a physician at Chang Gung Memorial Hospital, asked that the plasma vaccine, made by HBsAg purified from the plasma of hepatitis B patients or carriers, might contain residual hepatitis B virus DNA or some unknown virus DNA which might cause hepatocellular carcinoma in the future.³⁵ As mentioned above, many hepatitis B studies had shown that the hepatitis B virus had a close relation with the development of hepatocellular carcinoma. Although researchers had not identified the mechanism of how the hepatitis B virus caused hepatocellular carcinoma, they suggested that integration of the hepatitis B virus DNA into patients' liver cell DNA might be the possible answer (Chakraborty et al., 1980; Brechot et al., 1980; Edman et al., 1980; Su YJ et al., 1981; Yen CY et al., 1981). In other words, if the

³⁴Minsheng pao, March 5, 1981.
hepatitis B vaccine contained residual virus DNA, rather than pure HBsAg only, the vaccine might cause hepatocellular carcinoma theoretically.

On February 20, 1981, Minsheng pao sponsored a public meeting to discuss the vaccine and the clinical trial. The possible long-term safety problem and Taiwanese children as the trial subjects were the main issues in the meeting. Liaw Yun-fan asked who could guarantee that the process of purifying the HBsAg positive serum would let the vaccine contain pure HBsAg only? In addition, on March 4, 1981, a group of immunologists, coming from many institutes, publicly questioned the long-term safety of the vaccine. For example, Chou Cheng-kung, a researcher at the Institute of Biochemistry of Academia Sinica, pointed out that it might be difficult to remove all the hepatitis B virus DNA if it combined with residual protein.

Besides, Wang Cheng-yi, a physician at National Taiwan University, directly questioned the paper Szmuness and his colleagues published in The New England Journal of Medicine on October 9, 1980. Wang Cheng-yi called it a "crucial paper" because it was the most important basis of the supporters' arguments for the vaccine

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96See "A Discussion Meeting on Hepatitis B Vaccine," Minsheng pao, February 21, 1981. The participants of the meeting included supporters, such as co-directors of the clinical trial Hwang Lu-yu, Lin Chia-ching, and Lee Ching-yun, government officials Hsu Shu-tao, Hsu Kuo-hsiung, Yang Chao-hsiung, and Lee Chung-hsiang; major critics were Wang Cheng-yi, a professor of National Taiwan University, and Liaw Yun-fan, a physician of Chang Gung Memorial Hospital.

97Ibid.

98Minsheng pao, March 5, 1981.
trial project. Wang Cheng-yi presented some problems. First, the placebo, which consisted of alum alone in the vaccine diluent, might be polluted because the HBsAg positive incidence rate of the controlled group was 24.4% after three doses, which was three times that of the 7.6% annual incidence of HBsAg seroconversion in the homosexual men of the previous base-line studies. Therefore, the vaccine efficacy would be over-valued.

Second, the incidence of side effects was as high as 24.3% in the vaccine group. Third, 52 trial participants got non-type B hepatitis, 34 cases in the vaccine group and 18 in the placebo group; i.e., 5% of the participants got non-type B hepatitis. In these cases of the vaccine group, fifteen were type A hepatitis, seven were associated with cytomegalovirus infection, two were Epstein-Barr virus infection, and ten were classified as non-A, non-B hepatitis. Fourth, the trial period, from eight to eighteen months, was too short to guarantee the long-term safety of the vaccine.

Wang Cheng-yi concluded that since the plasma vaccine had high incidence of the non-type B hepatitis virus and side effects, its safety was not good enough to be used in Taiwan at that time, even though Taiwan badly needed it.99 Moreover, Wang Cheng-yi said, "from a historical point of view, a medical paper was often overthrown in five years; therefore, it is not wise to approve the vaccine trial on the

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basis of one or two papers.\footnote{A Discussion Meeting on Hepatitis B Vaccine, Minsheng pao, February 21, 1981.}

Liaw Yun-fan, Han Shao-hua, and Wang Cheng-yi stated that they did not want to reject the plasma vaccine. They only wanted the government to be careful in scrutinizing the vaccine trial project. They strongly requested that the subjects of the vaccine trial should be high-risk populations, such as the medical workers or the babies of HBeAg carrier mothers, rather than 2000 healthy children under six years old. In the high-risk populations, adults had higher priority.\footnote{Minsheng pao, February 21 and March 5, 1981.}

The critics raised scientific challenges to downgrade the credibility of the "scientific knowledge" the supporters held. In addition, the critics tried to undermine the authority of the U.S. FDA about the safety of the vaccine. That is, scientific knowledge and authority were prevented from being the sole arbitrator to resolve the controversy. Furthermore, the critics used other strategies, such as sustaining the controversy and displaying the negative opinions of medical workers over the vaccine, to cause the hesitation of the concerned people over the safety of the vaccine. In other words, various participants' strategies besides scientific arguments shaped the development of the controversy.
The controversy put great pressure on the government. The pressure not only came from the arguments and strategies of the critics, but also from the confusion and hesitation of concerned people. Furthermore, the Control Yuan’s investigation beginning February 23, 1981, also denoted the uncertainty of the vaccine safety. As mentioned above, Premier Sun and Lee Kuo-ting had identified "the HBV vaccination project as a top priority;" therefore, vaccination had become the government’s policy. In a February 20 press conference, Director of the DOH Wang Chin-mao said, "it is impossible for the government to withdraw the approval for the clinical trial." Therefore, the DOH insisted on promoting the trial project, no matter how the critics opposed the trial project.

The DOH never debated the vaccine safety issue with the critics. It just promised the safety of the plasma vaccine by citing the authority of the U.S. FDA again and again. The DOH also cited an example in that as many as 22 Americans working in the American Institute in Taiwan (AIT) had received the hepatitis B vaccine because they had confidence in it. Then the DOH found help

102 Chungkuo shih pao, February 20, 1981.


104 Chungyang jih pao, February 19 & 27, 1981.
from some foreign authorities, such as Dr. Arie J. Zuckerman of London School of Hygiene and Tropical Medicine and Dr. Ivan L. Bennett, Jr. of New York University, to endorse the safety of the vaccine and the necessity of the vaccine trial.\textsuperscript{105}

After the group of immunologists questioned in public the long-term safety of the plasma vaccine, on March 9, Veterans General Hospital\textsuperscript{106} held a discussion meeting about the vaccine. The participants of the meeting were all medical workers at Veterans General Hospital. Except for two critics, Han Shao-hua and Chang Chung-ming, almost all others were heads of departments and supported the vaccine trial.\textsuperscript{107} This meeting aimed to construct a "consensus," which should be positive to the hepatitis B vaccine trial, among the medical workers of the teaching hospital. In the meeting, only Dr. Han Shao-hua and Dr. Chang Chung-ming\textsuperscript{108} questioned the long-term safety of the vaccine and opposed the vaccine trial on Taiwanese healthy children. But all other participants avoided the safety issue and backed up the vaccine.

\textsuperscript{105} Chugyang jih pao, March 7, 1981; Minsheng pao, April 7, 1981; Chingnien chanshiah pao, May 7, 1981.

\textsuperscript{106} Many KMT government leaders received medical care at this hospital. For example, former President Yen Chia-kan died at this hospital in 1993. Generally speaking, the policy of Veterans General Hospital was pro-governmental.

\textsuperscript{107} The chairman of the meeting was the Hospital Present Tsou Chi-hsun. The participants who were heads of departments included Chiang Pi-ning, Yeh Chin-lan, Chen Te-ling, and Tsai Yang-te.

\textsuperscript{108} Both of them were the members of the immunologists who questioned the vaccine on March 4.
trial on Taiwanese children. Dr. Chiang Pi-ning even cited Lee Kuo-ting’s endorsement to support the vaccine trial project. Only Dr. Lo Kuang-juei suggested to switch the trial subjects to high risk babies of carrier mothers. The hospital director Tsou Chi-hsun concluded:

Hepatitis B was a severe public health problem in Taiwan. Medical workers should face this challenge. We cannot be discouraged by some uncertain problems which may not happen even after several decades.109

Vice-director of the hospital Lo Kuang-juei added, "everyone supported the vaccine trial project." Then the minutes of the meeting were sent to all departments under the authority of the hospital director Tsou Chi-hsun.110

Later, on March 28, 1981, the STAG under the charge of Lee Kuo-ting also held a discussion meeting about hepatitis B control and the vaccine. This meeting also aimed to create a "consensus" supporting the vaccine trial project. Except Dr. Han Shao-hua, no participants questioned the safety of the vaccine and the vaccine trial project.111 Dr. Chen Pao-hui of Municipal Jen-Ai Hospital suggested that they

109 The Veterans General Hospital document B-hsing kanyen yimiao huiyi chilu(The Minutes of the Discussion Meeting About the Hepatitis B Vaccine), March 9, 1981.

110 Ibid.

111 Most of the participants of the meeting were delegates of the DOH, Government Insurance Bureau, Labor Insurance Bureau, Blood Centers, and many directors and heads of departments of state-owned hospitals.
choose highest-risk populations as subjects of the vaccine trial; respectively, in
descending order: medical workers, companions of carriers, HBeAg positive
mothers’ infants, and people planning to travel to Southeast Asia. The opinions of
these two doctors notwithstanding, Minister Lee Kuo-ting concluded:

The clinical trial is concerned about the health of our next generation.
The subjects should be volunteers. Today, most of the experts agree
that choosing children under six years old as trial subjects is
appropriate.\textsuperscript{112}

In the meeting, Lee Kuo-ting condemned the critics for not understanding
hepatitis and misleading newspapers, which in turn strongly influenced newspaper
readers. He asked every medical college and teaching hospital to educate their
doctors and students more about hepatitis. A participant suggested the clinical trial
choose adults as subjects, but Lee Kuo-ting criticized this as nonsense. The
Independent Evening Post reported, "in this atmosphere, some researchers who had
differing opinions did not speak in the meeting." Then, Minister Lee Kuo-ting

\textsuperscript{112}The STAG document Kanyen fangchih chi venchiu tzot’anhui chilu(The
Minutes of the Hepatitis Control and Research Discussion Meeting), March 28, 1981.
Besides, in order to impress the participants, Minister Lee Kuo-ting directed the
STAG staffs to add a statement of the severity of hepatitis B in Taiwan on the
minutes of the meeting which would be sent to all participants. Also see Cheng Pao-
hui, "On the Hepatitis Control," manuscript.
concluded, "everyone supported hepatitis B control." Science journalist Lee Shih-cheng observed that "under the influence of some pressure groups, critics’ voices regarding the safety of the hepatitis B vaccine gradually vanished, although the safety concerns remained."

The historical case illustrated above showed how socially contingent characteristics of scientific knowledge prevented the resolution of the controversy from being judged solely by "scientific rationality." The critics’ scientific challenges and various strategies undermined the credibility of scientific knowledge and the authority of the U.S. FDA over the vaccine safety in the controversy. Therefore, scientific knowledge alone did not arbitrate the controversy. Instead, scientific knowledge became a tool of various participants. In their role in the social contingency of scientific knowledge, government agencies used their political operations to help shape the controversy. Government scientists gave government agencies a certain degree of interpretative authority in arguing for the vaccine. In the end, it was the political operations of government agencies that resolved the controversy. The next section examines the details.

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\[113\] Ibid. Also see Lienho pao, March 29, 1981; Tzuli wan pao, March 29, 1981; Interview with an anonymous journalist at Taipei in November, 1993; Interview with journalist Lee Shih-cheng at Taipei on November 22, 1993.

\[114\] Minsheng pao, April 14, 1981.
Resolution of the Controversy

Investigating how the controversy was resolved and how the safety of the vaccine was established provides some insights into the role of government in scientific practice. When scientific knowledge was not the sole arbitrator, how was the controversy resolved? When no one could prove the safety of the vaccine in Taiwan at that time, how was the safety of the vaccine established in order to begin the vaccine clinical trial? Through examining the participation of government agencies and how supporters and critics reached a compromise, this section shows how government officials shaped the resolution of the controversy.

Investigation of the Control Yuan

The investigation and the report of the Control Yuan provided a possible way of resolving the controversy. On February 23, 1981, the Control Yuan began investigating the legitimacy of the vaccine trial project and the safety of the vaccine. What the members of the Control Yuan wanted to investigate included: the legal basis of the clinical trial, the safety and efficacy of the vaccine, various ethical considerations, and the protection of the trial subjects. The members of the Control Yuan reached a compromise on May 26, 1981.
The members of the Control Yuan, mainly Yu Ching and Wang Chueh-jung, interviewed many hepatitis researchers, including the supporters and critics of the vaccine trial. That is, the investigation and report of the Control Yuan would offer an opportunity for both the supporters and the critics to reach their goals.

The members of the Control Yuan affirmed the safety and efficacy of the plasma vaccine in their report. They cited many medical papers and quoted scientists' statements. Regarding the safety and efficacy of the vaccine, they cited the paper of P. Maupas and his colleagues (1981) and quoted the endorsement of Lee Chi-jen and Shih Wei-kuo of the U.S. FDA and Robert E. Weibel of Philadelphia Children Hospital. Regarding any possible side effect of the vaccine, they cited Edward Tabor and Robert J. Gerety (1980) and Arie Zuckerman's statements to support that the vaccine was free from non-A non-B hepatitis and the possibility of hepatocellular carcinoma. Furthermore, to show his faith in these medical experts, Wang Chueh-

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115 Yu Ching was a member of opposite group "Tang-Wai" (outside KMT). Wang Chueh-jung was a KMT member.

116 They interviewed Sung Juei-low, Chen Ding-shinn, Han Shao-hua, Wang Cheng-yi, Hsu Hui-chi, Liaw Yun-fan, Lee Feng, Lan Chung-fu, Yang Chao-hsiung, Lin Chia-ching, and Beasley at Taiwan; communicated with Arie Zuckerman at British and Lee Chi-jen, Shih Wei-kuo, and Robert E. Weibel at the United States. See the Control Yuan document 1981.6.5. 70-Chien-Tai-Yuan-Tiao-Tzu No. 1769, June 5, 1981. p.5. Chen Ding-shinn said that Yu Chin visited him twice regarding the hepatitis B vaccine. They discussed the event for a whole afternoon each time.
jung even volunteered to be vaccinated.\textsuperscript{117}

But the Control Yuan report criticized the absence of clinical trial regulations in Taiwan, the inappropriate subjects of the vaccine trial, and the lack of comprehensive protection for the subjects. Citing the 1964 Helsinki Proclamation and its 1975 Amendment, and referring to the clinical trial regulations of Germany and the United States, the report stated that scientific and social benefits should not take precedence over the welfare of the trial subjects in a clinical trial. Since the vaccine trial was a scientific test rather than a direct therapy, the healthy children as trial subjects could not get direct medical benefits. Therefore, the report asked the vaccine trial project to choose high-risk populations rather than the healthy children as trial subjects.\textsuperscript{118}

The Control Yuan report requested the DOH to give hepatitis B immune globulin (HBIG) to infants of carrier mothers immediately after birth and vaccinate them at age three months old, and then inject the second and third doses of the vaccine as boosters at ages of four and nine months old. The controlled group had better be low-risk babies rather than high-risk ones for the sake of ethical considerations. The DOH also should order the directors of the clinical trial project to insure the trial subjects against any serious side effects. Besides, the Control Yuan report asked the DOH to make a long-term hepatitis B control program, including

\textsuperscript{117}Ibid.
\textsuperscript{118}Ibid.
planning a mass vaccination program and setting up a hepatitis research institute.¹¹⁹

**The Vaccine Became Safe**

Until May 7, 1981 when the DOH approved of Beasley and his colleagues' vaccine clinical trial, the subjects of this clinical trial project were still Taiwanese children ages of six months to six years old.¹²⁰ But after the members of the Control Yuan, mainly Yu Ching and Wang Chueh-jung, reached their conclusion, the DOH soon reversed their previous position on the vaccine trial project. The DOH’s reason was that "the Control Yuan did not agree with any vaccine trial on healthy children due to the Helsinki Proclamation." The DOH added that the vaccine trial had better choose high-risk populations, such as the newborns of carrier mothers, as


¹²⁰The DOH document Hsingchengyuan Weishengshu kanyen fangchih Ti 1 tsu ti 2 tz‘u tsotanhui(The Minutes of the Second Meeting of the First Division of the Hepatitis Control Committee), May 7, 1981.
Beasley and his colleagues followed the instruction of the Control Yuan and the DOH to propose another vaccine trial project, " Interruption of Perinatal Transmission of Hepatitis B by Hepatitis B vaccine and/or Hepatitis B Immune Globulin," which chose high-risk newborns of HBeAg positive carrier mothers as trial subjects. Besides, in response to the Control Yuan's request for humanitarianism, they stopped using high-risk children as the control group. They still used Merck, Sharp & Dohme's vaccine. At the same time, Veterans General Hospital proposed a similar vaccine trial project to the DOH to test the efficacy of Pasteur's hepatitis B plasma vaccine on high-risk newborns.

121 The DOH document Hsingchengyuan Weishengshu kanyen fangchih Ti 1 tsi ti 3 tsu t'so tanhui (The Minutes of the Third Meeting of the First Task Group of the Hepatitis Control Committee), June 18, 1981.

122 Beasley and his colleagues (1983b) reported that their study involved 159 infants who received HBIG and vaccine and 84 controls. Among the 84 controls, 23 were infants whose parents declined to have them immunized, and 61 were those randomized blind to receive placebo in their previous 1978-81 HBig prophylaxis trial (Beasley et al., 1981a; 1983a). Besides, since they could not do double-blind trial, they argued for the legitimacy of their study:

[We] believe that, although our trial is not a randomized control study, serious bias is unlikely for several reasons: (1) the endpoint, HBsAg carrier state, was determined in the laboratory blind and objectively; (2) there has been remarkable consistency in the HBsAg carrier rate among infants of HBeAg positive HBsAg carrier mothers in both time and place (Beasley et al., 1983b:1100).

123 Lo Kuang-juei and his colleagues' study (1985) involved 117 infants born to mothers positive for both HBsAg and HBeAg as vaccinated subjects and 51 infants whose parents refused vaccination as control group.
DOH reported to the Executive Yuan and then the Executive Yuan replied to the Control Yuan that the DOH had followed the opinions of the Control Yuan to revise the vaccine trial projects. The DOH approved these two vaccine trial projects on July 31, 1981. They both began in late 1981.

Supporters and critics reached a compromise in the report of the Control Yuan. On the one hand, for the supporters, the safety of the vaccine and the necessity of the vaccine trial were endorsed. On the other hand, for the critics, the government promised to protect the trial subjects and to vaccinate high risk populations. But this compromise did not mean that the critics "finally accepted" the safety of the vaccine. For example, Liaw Yun-fan said that "most of the high-risk babies would become carriers and had a life-time risk of developing cirrhosis or hepatocellular carcinoma; this would be the same result if the vaccine had residual

\footnote{The DOH document to the Executive Yuan, 70.7.13. Wei-Shu-Fang-Tzu No.832353, July 13, 1981; the Executive Yuan document to the Control Yuan, 70.8.26. Tai-70-Wei No.12199, August 26, 1981. Besides, the DOH delayed the approving schedule of the Veterans General Hospital’s vaccine trial project because the DOH wanted to wait for the investigating report of the Control Yuan. See Minsheng pao, May 25 & June 2, 1981.}

\footnote{The DOH document Hsingchengyuan Weishengshu kanyen fangchih Ti 1 tsu ti 3 tz’u tsotanhui(The Minutes of the Third Meeting of the First Task Group of the Hepatitis Control Committee), June 18, 1981; the DOH document B-hsing kanyen yimiao chi HBIG shihyung hsiaokuo p’ingchien yenchiu chihua shenyihui huivy chilu(The Minutes of the Examining Meeting on the Hepatitis B Vaccine and HBIG Efficacy Trial Project), July 31, 1981.}

\footnote{But before these two three-year trial projects were finished, the DOH had begun a mass vaccination program in Taiwan beginning July 1, 1984.}
hepatitis B virus DNA." Therefore, he agreed on the clinical trial on high-risk babies, although he had not endorsed the safety of the vaccine at that time.\textsuperscript{127}

\section*{Conclusion}

The historical case of the hepatitis B control program in the early 1980s illustrated some political dimensions of scientific practice in Taiwan. The significance of government as a participant in scientific practice contributes to a more comprehensive understanding of the dynamic of scientific activities. The social contingency of scientific knowledge in the controversy suggests that "scientific rationality" may not be the sole arbiter of scientific practice. Besides scientific arguments, political operations of government agencies help shape the resolution of the controversy.

The controversy over the vaccine safety displayed the social contingency of scientific knowledge. The safety of the vaccine was not decided by some elite scientists. Rather, government officials, journalists, legal advisors, newspaper readers, scientists, and other concerned people all participated in the controversy.

\textsuperscript{127}Interview with Liaw Yun-fan at Chang Gung Memorial Hospital, Lin-Kou, on December 14, 1993.
They brought different legal, ethical, racial, and technical issues into the controversy and shaped the scientific status of the vaccine safety.

Scientific knowledge was not the sole arbitrator in resolving the controversy. When numerous participants used contradictory scientific knowledge to argue against each other, the credibility of scientific knowledge was downgraded. Furthermore, the critics used various strategies to undermine the authority of the U.S. FDA over the vaccine safety issue. Therefore, scientific knowledge per se failed as the judge over the vaccine safety.

However, scientific knowledge did not totally lose its credibility since both supporters and critics used scientific arguments (including the rhetoric of scientific methods) and cited scientific papers to challenge each other. That is, both sides held certain "scientific knowledge," in the traditional sense of objective facts, to argue against each other. The supporters cited the authority of the U.S. FDA and the paper of the clinical trial on American homosexual men to argue for the vaccine. The critics questioned the paper and challenged the supporters with some technical problems, such as the possibility that the vaccine might contain residual virus DNA, which in turn would likely cause hepatocellular carcinoma. But regardless of these kind of scientific arguments, they did not resolve the controversy.

Through funding, science policy, and government scientists, the government agencies became significant participants rather than outsiders intervening in scientific practice. In addition, the leadership of government officials played a significant role
in the hepatitis B control program. The DOH did not accept the vaccine until
government leaders endorsed it. When government leaders, such as Premier Sun and
Minister Lee Kuo-ting presented hepatitis B control as the top priority of the
government’s science policy, government scientists and government agencies began
arguing for this policy in order to promote the vaccine clinical trial. The government
scientists gave the government a certain degree of interpretative authority in the
controversy over the safety of the vaccine. Both the approval of the U.S. FDA over
the vaccine safety and the positive result of the clinical trial over American
homosexual men strongly supported Beasley’s argument for his proposal. But without
the endorsement of Premier Sun and Lee Kuo-ting, Beasley might not have easily
received the permission of the DOH to do the clinical trial before the U.S. FDA
licensed the vaccine.

Political operations of government agencies resolved the safety issue of the
vaccine as a scientific problem. In the discussion meeting of Veterans General
Hospital on March 9, 1981, and in the one of the STAG on March 28, 1981, the
government won the desired "consensus" over the safety of the vaccine. Finally, after
the Control Yuan released its report, the voices of the critics vanished. It was not
that top-down political power silenced the opposition voices. It was not that the
critics’ voices died. Rather, the Control Yuan’s investigation and report provided a
technical feasibility and political acceptability for the supporters and critics to reach a
compromise, and thereby resolved the controversy. The assertions of scientific papers
and scientists' statements were part of the Control Yuan's considerations. Also, legal and ethical factors influenced the Control Yuan's final decision. In this case, social, cognitive, institutional, and material factors interacted with each other and shaped the safety issue of the vaccine.

The controversy ended when the critics’ voices vanished from public discourse over the safety of the vaccine. But this did not mean that the vaccine safety was "scientifically proved." Neither did it mean that the critics had privately accepted the safety of the vaccine. Rather, some critics considered that the risk of having an uncertain vaccine was no worse than the existing risk of HBeAg carrier mothers’ newborns. In this situation, although they still had some reservations about the safety of the vaccine, they compromised by endorsing high-risk newborns as subjects for the clinical trial. As soon as the voices of the critics vanished, the controversy ended, and the vaccine became "safe" in public discourse.

The resolution of the controversy did not guarantee that all Taiwanese people would accept the vaccine. If Taiwanese people had reservations about the vaccine, the government’s biotechnology program, which started from the research of producing the recombinant DNA hepatitis B vaccine, might face trouble in the domestic market. The next chapter examines how the government agencies and governmental scientists made efforts to convince Taiwanese people of certain "correct knowledge" in order to promote the hepatitis B control program.
Chapter Four

The Hepatitis B Control Program

In chapter three, we saw that political operations of government agencies shaped and resolved the controversy. When the controversy was resolved, the vaccine was considered safe in public discourse. But there was no guarantee that all Taiwanese people would pay attention to hepatitis B control. Neither would they automatically accept the vaccine. Therefore, how to persuade Taiwanese people to accept the hepatitis B control program became important for government agencies and government scientists. This chapter focuses upon how the government designed and promoted the hepatitis B control program.

This chapter continues investigating political dimensions of scientific practice through two perspectives. First, this chapter examines how the government agencies and governmental scientists made efforts to convince Taiwanese people of certain "correct knowledge" in order to promote the hepatitis B control program. If the Taiwanese people did not consider hepatitis B as a severe problem, and showed no interest in its control, the government would have a difficult time in promoting the hepatitis B control program. If Taiwanese people had some reservations about the
vaccine, the government's biotechnology program, which started from the research of producing the recombinant DNA hepatitis B vaccine, might face trouble in the domestic market.

Second, this chapter discusses the social contingencies of scientific knowledge, which displays how political operations of government agencies shaped scientific knowledge. I focus on how policy considerations shaped and reshaped certain "correct knowledge" regarding hepatitis B control. When government agencies designed a policy regarding hepatitis B control, the policy implied certain "correct knowledge," which was the basis of the policy. The change of the DOH's policy meant the change of its "correct knowledge." Various politicians and government leaders, social pressures and social problems all might influence the direction of the DOH’s policy, which in turn would change the content of the DOH’s "correct knowledge."

This chapter begins by examining the formation of "correct knowledge" that hepatitis researchers asserted in order to shape the "severity" of hepatitis B in Taiwan. I discuss the importance of rhetorical techniques in shaping the "severity" of hepatitis B in Taiwan. In addition, I display how policy considerations shaped certain "correct knowledge" which was open to question at that time. Then I illustrate how the government designed the hepatitis B control program, including the organizational structure and the content of the DOH’s Intensive Hepatitis B Control Plan. Next, I investigate how the DOH and governmental scientists tried to persuade Taiwanese to
accept "correct knowledge," using the strategies of "learning by practicing" and "learning by participating." Finally, I examine how the "correct knowledge" changed the Taiwanese people's lifestyle, which in turn produced some social problems. Government agencies and government scientists responded to the social problems by changing the content of certain "correct knowledge."

The Formation of "Correct Knowledge"

This section investigates the formation of certain "correct knowledge" regarding hepatitis B control in Taiwan from 1970s to 1990s. Was the prevalence of HBV in Taiwan severe? Almost all the hepatitis researchers in Taiwan would have said "yes." As discussed in chapter three, in the 1970s, the Taiwanese hepatitis B researchers failed in convincing the government of the "severity" of hepatitis B in Taiwan. But in mid-1980, Beasley suddenly succeeded. Why? This section analyzes the rhetorical techniques and the strategies of the hepatitis researchers in order to understand how the "severity" of hepatitis B in Taiwan was formed in public discourse. In addition, this section examines how policy considerations shaped the formation of certain "correct knowledge" regarding hepatitis B control, such as the
mode of HBV transmission.

The "Severity" of Hepatitis B in Taiwan

The first kind of "correct knowledge" of the hepatitis B control program concerned the "severity" of hepatitis B in Taiwan; otherwise, the hepatitis B control program would have a difficult time emerging. During the 1970s, the ten leading causes of death remained stable. During 1979, a total number of 81,014 people died, and the leading causes of death in Taiwan were as follows: 13,069 for cerebrovascular, 12,215 for malignant neoplasms, 11,146 for accidents, 7,034 for heart disease, 3,256 for pneumonia, 3,091 for hypertensive disease, 2,947 for chronic liver disease and cirrhosis(The DOH, 1979:21). Meanwhile, during the same year, only 7 people died of infectious hepatitis. In the late 1970s, it seemed understandable that the government paid most of its attention to cerebrovascular, malignant neoplasms, heart disease, and accidents rather than to liver diseases, especially under the condition of limited budget for public health(NSC, 1978:809).

From the DOH’s vital statistics, the mortality of liver diseases seemed not

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1 The 81,014 deaths accounted for a 468.09(per 100,000) mortality rate among Taiwan’s 17,307,000 population. In 1981, the category of infectious hepatitis was renamed to be viral hepatitis in the DOH’s Health Statistics.
severe, compared to other leading causes of death. But when we examine the DOH’s taxonomy of mortality,\textsuperscript{2} the "severity" of liver diseases might change. In the DOH’s vital statistics, virus hepatitis, cirrhosis, and hepatoma were put in different groups. Hepatoma was categorized into malignant neoplasms. Cirrhosis and chronic liver diseases were classified together. Viral hepatitis was an independent category. Therefore, the "severity" of hepatitis B prevalence in Taiwan seemed "diluted."

However, when all the mortality of liver diseases, including chronic liver diseases, cirrhosis, and hepatoma, was counted together, the mortality of liver diseases would rank fifth among the leading causes of death in 1979(Table 4-1). The "severity" of liver diseases looked higher in the new category. But it still remained far behind other four leading causes of death.

In the 1970s, many researchers who studied hepatitis B focused upon two research directions of the hepatitis B epidemiology. One direction studied the geographic distribution of the HBsAg prevalence. Another direction examined the HBsAg prevalence in liver disease patients. Researchers expected that HBV would be a source for understanding liver disease, especially cirrhosis and hepatoma. Therefore, many researchers studied the HBsAg prevalence in hepatoma, cirrhosis, chronic aggressive hepatitis, and chronic persistent hepatitis(Myron J. Tong et al., 1971; Shih PL et al., 1971; Sung JL et al., 1972a, 1972b, 1974, 1975, 1976b,

\textsuperscript{2}The DOH used the WHO’s taxonomy of mortality(DOH, 1980).
1977b; Liaw YF et al., 1973, 1977; Chen CY et al., 1973; Liu HW et al., 1975; Chen DS et al., 1978a, 1979; Liu CT et al., 1978). Most of these hepatitis researchers were clinicians. Although they also examined the HBsAg prevalence in healthy people, they only regarded asymptomatic carriers as a control group to verify that HBV had an intimate relation with chronic liver diseases. In other words, they did not relate asymptomatic carriers to chronic liver diseases.

In the 1970s, many hepatitis researchers had pointed out that Taiwan had many asymptomatic carriers. But at that time researchers often called asymptomatic hepatitis B carriers "healthy carriers" since researchers thought that HBV peacefully coexisted with the immune system of the carriers and carriers hardly had liver disease symptom(Chen DS et al., 1978a, 1979; Sung JL et al., 1979). If HBV would not damage the liver function of healthy carriers, millions of healthy carriers would not be a severe problem of public health.

Healthy Carriers and Hepatoma

It was Beasley who related healthy carriers with hepatoma, and in turn created the "severity" of many carriers as a public health problem in Taiwan. As illustrated in chapter three, in the 1970s, Beasley as an American researcher had a better opportunity than Taiwanese researchers in studying hepatitis B in Taiwan. He had
better medical instruments and a larger research budget. In addition, he had access to
the serum samples of 22,707 governmental male employees from the Government
Employees’ Clinic Center at Taipei. Furthermore, he acquired the monthly report of
recent deaths of the government employees from the government’s insurance bureau.
But Taiwanese hepatitis researchers were unable to obtain this data. Without these
significant resources, Beasley might have a difficult time doing a long-term follow-up
and therefore establishing his assertion about the relationship between carriers and
hepatoma.

In 1975, Beasley and his colleagues(1981b) began a cohort study\(^3\) of 22,707
male government employees in Taiwan to evaluate the risk of hepatocellular
carcinoma(HCC) among HBsAg carriers. After carrying out approximately 75,000
man years of follow-up, an average of 3.3 years per man, their results showed that
the relative risk estimate of HCC was 223 for HBsAg carriers compared with non-
carriers(Table 4-2). They asserted that:

*Alternative explanations of the very high relative risk among HBsAg
carriers are that HBV is a cofactor with another etiological agent or is
simply a risk factor. The very high relative risk found in this study and
many case-control studies in various part of the world, however,*

\(^{3}\)The method of cohort study was to do a long-term follow-up on a group of
susceptible healthy people in order to examine the relation between certain disease
and some possible factors(Chen CJ, 1980:257).

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suggests that HBV is closely associated with the process leading to primary hepatocellular carcinoma and is not simply a risk factor (Beasley et al., 1981b: 1132).

That is, Beasley and his colleagues wanted to prove that HBV was the direct cause of HCC. But they did not examine whether other possible factors, such as aflatoxin (Peers & Linsell, 1973; Wogan, 1975; Chang FY, 1981), were not related to the development of HCC in carriers. Later, Beasley (1982; 1988), Wang Chun-ming & Liaw Yun-fan (1985), and Hsu Hsu-mei (1990) all reported some indirect evidence to strengthen the relation between HBV and HCC. Besides the results of the cohort study, they raised some evidence from the studies of geographic correlation between carrier rate and HCC incidence, case-control studies, excess maternal HBsAg among HCC cases, animal models, and molecular biology.

As discussed in chapter three, after Premier Sun and Lee Kuo-ting endorsed Beasley's clinical trial proposal in December 1980, the hepatitis B control program became the top priority of the government's public health policy. Then, in the discourse of the hepatitis B control program, Beasley's concept of progression from carriers to chronic hepatitis, cirrhosis, and then HCC became a main argument about the severity of hepatitis B and the necessity of hepatitis B control. In the 1980s

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4 See Beasley's Notes on HBV in Taiwan, which was the outline of his presentation in the Executive Yuan on December 22, 1980. Details were discussed in chapter three.
and the early 1990s, this argument appeared in almost all the DOH's educational and training materials which included leaflets, booklets, slides, posters, video tapes, and 16 mm films regarding hepatitis B control. For example, the DOH's Chüanmin weisheng chiaoyü hsüantaotzuiliao 78 nientu(Education Materials for Public Health in FY 1989) said:

Cirrhosis and hepatoma are among the main causes of death in Taiwan.

Hepatitis B carriers may develop cirrhosis or hepatoma in the future.

Carriers not only may suffer from liver diseases, but also may infect others. Therefore, everyone should pay attention to hepatitis B control.\(^5\)

In addition, many governmental scientists, such as Lin Chao-chiung(1981) and Lee

Ti-yun(1981), held the same argument.\textsuperscript{6} That is, the assertion that carriers had a high risk of developing cirrhosis or HCC became part of the "correct knowledge" in the hepatitis B control program.

But it is interesting to note that in the 1981 report of the cohort study, Beasley and his colleagues admitted that "although this study strengthens the argument that hepatitis B virus may be a cause of primary hepatocellular carcinoma, it does not prove it."(Beasley et al., 1981b:1132) That is, they had not identified how HBV caused HCC. Many hepatitis researchers also had some reservations about the relation between carrier status and HCC. For example, Sung Juei-low and Chen Ding-shinn(1980) reported that "the HBV infection in our patients results from vertical transmission from their carrier mothers probably long before the development of HCC, but it does not prove unequivocally that HBV is an etiologic agent of HCC." After reviewing some research on HBV DNA, Yen Chung-yang and his colleagues(1981) concluded that although epidemiological studies suggested a possible relation between HBV and HCC, "current knowledge still does not know the role of HBV in the mechanism of developing HCC." Later, the studies of Ting Ling-pai(1984), Wang Chun-ming & Liaw Yun-fan(1985), Tsai Shun-lung & his colleagues(1986), Chu Chien-tzu(1990), Chen Chien-jen & his colleagues(1991), and Yu Ming-whei & Chen Chien-jen(1992; 1993) all reported that the exact mechanism

\textsuperscript{6}Both Lin Chao-chiung and Lee Ti-yun served as Deputy Director-General of the DOH in 1981.
of HBV causing HCC was still unclear.

After reviewing current molecular studies on HBV DNA and HCC, Yu Ming-whei and Chen Chien-jen(1993) concluded that:

No evidence for a specific cellular integration site of HBV DNA has been reported to date. In addition, there were only a limited number of documented HCC cases reported to have HBV insertions within or next to cellular genes associated with cell growth control and differentiation program. This indicated that the insertional mutation accounts for a tiny fraction of human hepatocellular carcinoma.

In other words, that HBV might cause HCC still remained as an unsubstatiated hypothesis from the 1970s to the early 1990s.

Besides the uncertainty of how HBV caused HCC, Beasley's assertion that HBV was the direct cause of HCC(Beasley, 1988) faced additional challenges. Some researchers, as presented in the following sections, asked whether the carrier rate was correlated with HCC in geographic distributions, whether there were more risk factors causing HCC, and whether Beasley's cohort study was appropriate.

W. Szmuness(1978) illustrated his world map to show the strong coincidence between the geographic distributions of HBsAg carrier rate and the HCC incidence.  

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7P. Skinhoj and his colleagues(1978) reported that the population of Greenland Eskimos had a high HBsAg prevalence without a high HCC incidence. Beasley(1982b:22s) believed that "PHC was overlooked in the Greenland mortality data," although he did not show any "correct data."
Figure 4-1 shows that middle and southern Africa, southeast China, Taiwan, and Southeast Asia were high incidence areas of HCC. But Lin tung-ming & his colleagues(1986) and Chen Chien-jen & his colleagues (1988) pointed out an inconsistent geographical variation in HCC mortality and HBsAg carrier rate in Taiwan. They indicated that HBsAg carrier rates were almost the same everywhere in Taiwan, but Penghu Islets, eastern mountainous areas, and some of the western coastal areas, especially the endemic areas of blackfoot disease,\(^8\) had significantly higher HCC rates, while western mountainous areas had significantly lower rates of HCC(Figure 4-2).

Besides Taiwan, southeast China had a high incidence of both HCC and HBsAg carrier rate in Szmuness’s world map. Beasley and his colleagues(1982c) argued that there was positive correlation between HBsAg prevalence and HCC incidence in China(Figure 4-3). Beasley admitted that there were some exceptions. For example, Kiangsu(Jiangsu) province had a very high HCC mortality but relatively low HBsAg carrier rate. In addition, Manchuria had a low HBsAg carrier rate but moderately high HCC mortality. However, Beasley concluded that "some inconsistencies notwithstanding, these observations are basically in accord with the general worldwide correlation of HBsAg prevalence and primary hepatocellular carcinoma incidence."

\(^8\)Blackfoot disease is a peripheral vascular disease induced by chronic arsenic exposure(Yu MW et al., 1988).
But Chen Chien-jen and his colleagues (1988; 1991) indicated that high HCC mortality was mostly located on the warm and humid southern coast of China (Figure 4-4 & 4-5), rather than equivalently distributed among southeast China as HBsAg carrier rate was (Table 4-3). For example, Szechwan (Sichuan) province, Kweichow (Guixhou) province, Hunan province, and Kiangsi (Jiangxi) province had high HBsAg carrier rates but relatively low HCC mortality. Kwangsi (Guangxi) province had very high HCC mortality but moderate HBsAg carrier rate (Yeh FS et al., 1989). In addition, in every province, HCC mortality was different in different administrative areas, as the case of Taiwan. It is interesting to note that when Beasley and his colleagues (1982c) argued for the coincidence of HCC mortality and HBsAg carrier rate in geographic distribution in China and when Chen Chien-jen and his colleagues (1988; 1991) argued against Beasley’s assertion, both of them cited the same data of Li J. & his colleagues (1979) and then reached opposite conclusions.

Besides the inconsistent geographical variations in HCC mortality and HBsAg carrier rates in Taiwan and China, Lin Tong-ming and his colleagues (1986) observed that from 1957 to 1980, HCC mortality for males increased but had no change for females in Taiwan. In addition, in 1980, HCC mortality was 26.10 for males but 8.14 for females (per 100,000 population), while HBV infection rates and carrier rates were similar for the two sexes. Therefore, Lin Tong-ming and his colleagues

\[9\] The column "(3)/(4)" of the Table 4-3 indicates that Guangxi, Fujian, Jiangsu, Zhejiang, Shannxi, and Shanxi all had relatively high HCC rate.
concluded that "the large difference in mortality rates between males and females and the increasing trends in the sex ratio suggest that other factors besides hepatitis B virus are involved in the aetiology of hepatoma and cirrhosis of liver."

Based upon this understanding, Lin Tong-ming & his colleagues (1988) and Chen Chien-jen & his colleagues (1991) reported that HBV infection, chemical substances, aflatoxin, cigarette smoking, habitual alcohol consuming, and immediate family HCC history all might be significantly associated with the development of HCC. These researchers suggested considering the roles of both genetic and environmental factors instead of just HBV in the development of HCC. Besides, Lu Jheng-nan and Chen Chien-jen (1991) suggested that arsenic might increase the risk of developing HCC among HBsAg carriers in the endemic area.

Beasley’s strongest argument for considering the causal role of HBV in the etiology of HCC was his cohort study on 22,707 Taiwan’s government employees. When Beasley and his colleagues argued for the severity of HBV in Taiwan, they often said that compared to non-carriers, HBsAg carriers were 200 times more likely to get HCC, and 50% to 60% of male carriers would die of cirrhosis or HCC (Beasley et al., 1981b, 1981c; Hwang LY, 1981; Beasley 1982d). But this cohort study faced challenges.

Chen Chien-jen & his colleagues (1991) and Yu Ming-whei & Chen Chien-jen (1993) pointed out that the relative risk of developing HCC among carriers in Beasley’s cohort study might be over-valued. For example, the relative risk value
was 390 in the report of Beasley & his colleagues (1982b) and 98.4 in the paper of Beasley (1988), compared to 10-20 in other studies in China, Taiwan, and Hong Kong. Besides, Yu Ming-whei & Chen Chien-jen (1992) observed some problems in Beasley’s cohort study. For example, Beasley’s study recruited many "non-healthy" carriers (Table 4-4); therefore, the relative risk of developing HCC among healthy carriers was over-valued. In addition, Yu & Chen pointed out that Beasley’s study ignored other possible risk factors which might contribute to the pathogenesis of HCC; therefore, the role of HBV was over-valued. Besides, Beasley and his colleagues needed to explain why the relative risk of developing HCC among HBsAg carriers decreased significantly among their long-term follow-up studies, from 390 in their 1982 report to 98.4 in their 1988 report.10 Furthermore, they needed to explain why the HCC mortality in their total male study subjects (313/100,000) was much higher than that of general male Taiwanese (26/100,000) circa 1980 (Lin TM et al., 1986).

As illustrated in the above discussion, more and more epidemiologists pointed out that factors in addition to HBV infection were important in the etiology of HCC. That is, as many researchers (Lin TM et al., 1986 & 1988; Chen CJ et al., 1988; Yu MW et al., 1988) pointed out that although HBV was a possible risk factor of developing HCC, its role should not be over-emphasized; otherwise, other possible

10 Interview with an anonymous professor in October 1993 at Taipei.
risk factors would be ignored. However, regarding possible risk factors of developing HCC, the "correct knowledge" of the hepatitis B control program only included HBV infection rather than other possible factors (DOH, 1981, 1992 & 1993). If the DOH said that HBV was only one of many risk factors of developing HCC, the "severity" of hepatitis B in Taiwan would decrease, which in turn would downgrade the importance of the hepatitis B control program. Therefore, the hypothesis that "HBV was the etiological agent of HCC" became "correct knowledge" in the hepatitis B control program. Later sections examine the influence of this "correct knowledge" on Taiwanese life.

The Mode of Transmission

If hepatitis B was a severe disease as the DOH and many researchers asserted, what was its mode of transmission? Since there was no method to cure chronic liver diseases, prevention was the only way to control hepatitis B. Except vaccination, knowing the mode of transmission was the precondition of preventing hepatitis B. In 1981, the DOH taught people "correct knowledge" concerning the modes of HBV transmission:

Carriers are the sources of the HBV infection. HBV is transmitted through (1) wounds of skin or mucous membranes, touching carriers’
blood, saliva, semen, or other body fluids; (2) injection with needles
contaminated by HBV; (3) blood transfusion.¹¹

Before 1981, what were the research results regarding the mode of hepatitis B
transmission?

Shih Ping-ling and his colleagues(1971) found that hepatitis associated
antigen(HAA) was absent in 120 cord-bloods and 36 sera collected from the
newborns with hyperbilirubinemia before blood exchange. But HAA was found in
4.2% of 71 related mothers at the time of delivery and in 8.1% of the general
population. This evidence supported that HAA was not inherited and also not
transmissible via placenta.

According to vertical transmission, Beasley and his colleagues(1974b), Cladd
E. Stevens and his colleagues(1974; 1975), and Karl E. Anderson & his
colleagues(1975) proposed that hepatitis B antigen positive mothers frequently
transmitted infection to their offsprings. From the prevalence of the subtypes of
HBsAg, mainly adw and adr, Sung Juei-low and his colleagues(1976b; 1976c; 1977a)
argued that the intra-familial spreading from parents, especially from carrier mothers,
was an important factor in HBV infection.

Regarding horizontal transmission, Shih Ping-ling and his colleagues(1971)
said that since three cases of HAA negative newborns became HAA positive after

¹¹The DOH’s leaflet Yüfang Yi(B)hsing kauyen(Preventing Hepatitis B),
published in June 1981.
they had blood exchange and their donors were HAA positive, HAA could be transmitted via blood. Later, Shih Ping-ling and his colleagues (1972) stated that HAA could be transmitted via saliva. Beasley and Stevens (1974a) asserted that the antigenemia rates were a function of geography and socioeconomic status. Karl E. Anderson and his colleagues (1975) believed that improperly sterilized needles were an important source of infection since injections were frequently given for minor illnesses in Taiwan. Chen Ding-shinn and Sung Juei-low (1976a; 1978a) suggested that body fluids, such as saliva and urine, were possible ways of horizontal infection. The condition of sanitation (which was related to socioeconomic status) would influence the HBV infection. In addition, Anthony K. T. Lee and his colleagues (1978) asserted that carrier mothers' breast milk was a reservoir of HBV.

But there were many opposite opinions, compared to the assertions mentioned above. Contrary to the report of Shih Ping-ling & his colleagues (1971), Chen Ding-shinn & his colleagues (1976a) proposed that HBV might be transmissible via placenta. Contrary to the study of Beasley & Stevens (1974a), Chen Ding-shinn & his colleagues (1977; 1978d) asserted that socioeconomic status did not seem to influence the HBV infection. According to the prevalence of HBsAg subtypes adw and adr in Taiwan, contrary to 78% vs. 22% in the research of Sung Juei-low & his colleagues (1976b; 1976c; 1977a), it was 52.6% vs. 47.4% in the research of Liaw Yun-fang & his colleagues (1977). Contrary to the observation of Chen Ding-shinn & Sung Juei-low (1976a; 1978a), Wu Jau-hsin (1978) thought that saliva hardly played a role in the
HBV infection. Contrary to the essay of Anthony K. T. Lee & his colleagues (1978), Beasley & Stevens (1978) did not find any correlation between breast feeding and carrier outcome of babies. Chen Ding-shinn & his colleagues (1978b; 1978c) concluded that the exact mode of transmission was not yet clear.

It is interesting that from the late 1970s to the early 1990s, many researchers reported that the mode of transmission was unclear—except for transmission by blood (Beasley et al., 1983a; Sung JL et al., 1984; Chen DS, 1987; Wu TT, 1991; Chan CY et al, 1992). But in 1981, the DOH’s health education for hepatitis B control explicitly told people that the mode of transmission included injection, blood, saliva, semen, or other body fluids. Based upon this "correct knowledge", the DOH told people many "correct ways" to prevent HBV.

Regarding injection, the DOH wanted Taiwanese people "to avoid unnecessary injection." Regarding blood, the DOH asked people "not to share toothbrushes, razors, and towels with others, and not to have unnecessary blood transfusions." Regarding saliva, the DOH suggested that people "wash hands before eating and after evacuating, avoid premasticating food for children, and avoid buying food from hawkers." In addition, the DOH suggested that people change their dining

12 The DOH document Hsingchengyuan Weishengshu kanyen fangchih Ti 3 tsuchihua tsaoan (The Proposal of the Third Task Group of the Hepatitis Control Committee), January 15, 1981; B-hsing kanyen fangchih weisheng chiaoyü chiaoch’ai shengch’a huiyi (The Minutes of Health Education Materials for Hepatitis B Control Examining Meeting), May 27, 1981; The DOH’s leaflet Yüfäng yi(B)-hsing kanyen (Preventing Hepatitis B) published in June 1981.
manner to "Chinese food, Western style," that is, use common chopsticks and spoons rather than one's own to get food from common dishes.\textsuperscript{13}

Policy Considerations and "Correct Knowledge"

Was saliva "really" a way of HBV transmission? The DOH said "yes" in its health education materials for hepatitis B control as mentioned above. But the DOH gave the opposite answer at other places. In June 1982, many legislators asked the Director General of the DOH Hsu Tzu-chiu to control hepatitis B by means of improving public hygiene. Hsu replied that "up-to-date knowledge has not yet proved that dietetic hygiene is related to HBV transmission."\textsuperscript{14} In August 1982, someone suggested promoting disposable thermometers in order to prevent HBV transmission. The Hepatitis Control Committee of the DOH replied that saliva might transmit HBV only when a large amount of saliva was injected into a person. Therefore, it was not

\textsuperscript{13}The DOH document B-hsing kanyen fangchih weisheng chiaoyü chiaoch’ai shengch’a huiyi(The Minutes of Health Education Materials for Hepatitis B Control Examining Meeting), May 27, 1981; The DOH’s leaflet Yüfang yi(B)-hsing kanyen(Preventing Hepatitis B) published in June 1981.

necessary to use disposable thermometers.\textsuperscript{15}

In addition, in June 1983, a citizen, Tien Hsin-jan, wrote a letter to the DOH, asking whether he should sterilize utensils by boiling in order to prevent HBV. The DOH replied that whether saliva transmitted HBV or not was as yet unclear. The DOH suggested that he only needed to clean utensils by water.\textsuperscript{16} In January 1984, the Taiwan’s representative office(non-official) in Sydney, Australia sent the DOH a newspaper report about hepatitis B prevalence in Australia. The DOH replied that HBV was transmitted via wounds, blood transfusion, and injection rather than via diet.\textsuperscript{17}

Furthermore, on December 20, 1985, Chingnien jih pao reported that Feng Chia University organized a dietetic hygiene committee because 10\% of the students who donated blood were HBsAg positive.\textsuperscript{18} Then Chen Ding-shinn told Minister Lee Kuo-ting that it was hepatitis A virus rather than hepatitis B that was related to

\textsuperscript{15}The DOH document Chiach\’iang B-hsing kanyen fangchih chihui niantu chiant’ao huiyi chilu(The Minutes of Annual Examining Meeting of the Intensive Hepatitis B Control Program), August 12, 1982.

\textsuperscript{16}The DOH’s letter to Mr. Tien Hsin-jan 72.6.4. Wei-Shu-Kung-Kuan-Tzu No. 423419, June 4, 1983.

\textsuperscript{17}The DOH document 73.1.30. Wei-Shu-Fong-Tzu No. 463794, January 30, 1984.

\textsuperscript{18}Chingnien jih pao, December 20, 1985.
dietetic hygiene.\textsuperscript{19} From these examples, it was clear that the DOH understood that HBV might not be transmitted via saliva. But why did the DOH’s health education materials for hepatitis B control tell Taiwanese people that saliva would transmit HBV and give the opposite answers at other places?

There were at least two possible reasons. One was that the DOH wanted to control hepatitis A at the same time that it promoted the hepatitis B control program.\textsuperscript{20} In contrast to the unclear mode of HBV transmission, there was little question that dietetic hygiene was the main mode of hepatitis A virus transmission(Shou Lien, 1981; Lee SP, 1981; Lin CC, 1981; Lee TY, 1981). In other words, if people would improve dietetic hygiene in order to prevent HBV, the DOH would decrease the hepatitis A prevalence in Taiwan. On December 6, 1988, the chairman of the Hepatitis Control Committee of the DOH Sung Juei-low said in public that "HBV is hardly ever transmitted via diet." Then he confessed that "the statement that diet would transmit HBV was due to the policy consideration which wanted to improve hygiene and in turn control hepatitis A by hitching a ride of the

\textsuperscript{19}The STAG document Kanyen ch’uanjan yü ts’anyin weisheng(The Report of Dr. Chen Ding-shinn to Minister Lee Kuo-ting Regarding the Dietetic Problems in School), January 8, 1986.

\textsuperscript{20}Hepatitis A virus prevalence in Taiwan was about 95% among the population who were more than 35 years old(Lee Ti-yuan, 1981).
hepatitis B control program." He apologized for this "white lie."\textsuperscript{21}

In the 1980s, that HBV would be transmitted via saliva, contaminated utensils, and diet was "correct knowledge." But in 1992, the DOH began revising the "correct knowledge." In the 1987 edition of \textit{B-shing kanyen fangchih wenta shouts'e} (Questions and Answers Regarding Hepatitis B Control), the "correct knowledge" said that saliva and contaminated utensils and diet would transmit HBV (DOH, 1987a:3). But in the 1992 edition, the new "correct knowledge" was that to use disposable utensils and to use common chopsticks & spoons in common dishes would prevent hepatitis A rather than hepatitis B (DOH, 1992:3). Finally, on March 2, 1993, the Hepatitis Control Committee of the DOH decided to tell the people "correct knowledge" that saliva transmitted HAV rather than HBV. The members of the committee Wu Jau-hsin and Lin Chao-ching admitted that to teach the people that saliva transmitted HBV was due to policy consideration.\textsuperscript{22}

The other possible reason was that the DOH had to make some achievements to meet the requests of the legislators before the mass vaccination program beginning in 1984. Since the DOH began promoting the hepatitis B control program in 1981,

\textsuperscript{21} \textit{Lienho pao}, December 7, 1988. Besides, one DOH official thought that it was a good policy. See \textit{Lienho pao}, December 8, 1988. Meanwhile, the Director of the Bureau of Food Sanitation Liu Ting-ying also said in public, "the DOH promoted disposable utensils in order to prevent the hepatitis A infection rather than the hepatitis B infection." See \textit{Lienho pao}, December 8, 1988.

\textsuperscript{22} \textit{Chungkuo shih pao}, March 3, 1993.
many legislators asked the DOH to control hepatitis B effectively. But there was no method to cure hepatitis B. Because almost all the legislators believed that HBV was transmitted via saliva, contaminated utensils, and contaminated food, the DOH could have concrete achievements by educating people to change their dining manner to "Chinese food, Western style" and in promoting disposable utensils and chopsticks. That is, political considerations shaped the DOH's policy which in turn shaped the "correct knowledge" regarding hepatitis B control.

There were two other examples of "correct knowledge" resulting from policy considerations. One example was regarding "how to prevent hepatitis B." In 1981, the DOH advised carriers not to donate blood in order not to infect others via blood. But in 1984, when the NSC was planning to establish Lifeguard to produce the plasma vaccine and would need lots of carrier blood, the DOH changed its advice.

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24 Ibid.

25 The DOH document 71.8.17. Wei-Shu-Kung-Kuan-Tzu No. 388457, August 17, 1982. This document was the DOH's answers to the possible questions regarding the hepatitis B control that the legislators might ask Premier or the Director General of the DOH in the Legislative Yuan. Also see 71.8.19. Wei-Shu-Fang-Tzu No. 389254, August 8, 1982. This was the reply of the DOH to the questions of the Control Yuan about the hepatitis B control.

26 The DOH leaflet Yüfang yi(B)-hsing kanyen (Preventing Hepatitis B). June 1981.
for carriers from "not to donate blood" to "not to transfuse blood to others." 27 Otherwise, Lifeguard would have a difficult time finding the resources of vaccine raw materials.

The other example concerned the subjects of vaccination. In August 1983, the DOH designed a ten-year Hepatitis B Immunization Plan. According to priority, the subjects of vaccination were HBeAg carrier mothers’ newborns, HBsAg carrier mothers’ newborns, all newborns, children under four years old & susceptible medical workers, susceptible family members of carriers & susceptible people under nineteen years old, susceptible people under forty years old, and finally susceptible people older than forty years old. The consideration of the vaccination priority was based upon the relative risk of HBV infection one the one hand, and the estimated maximum vaccine production of Lifeguard in the NSC’s vaccine production plan on the other. 28

But the DOH’s vaccination priority plan was disturbed by the pressure of legislators, such as Hung Wen-tung and Tsai Sheng-pang, who asked the DOH to

27 The DOH document 73.2.20 Wei-Shu-Fang-Tzu No. 460963, February 20, 1984; Also see Yingerh B-hsing kanyen yüfang chiehchung k’a(The Hepatitis B Immunization Card for Infants).

28 The DOH document B-hsing kanyen yüfang chushe shihshih chihua ts’aoan(The Draft of the Hepatitis B Immunization Plan), August 1983; B-hsing kanyen yüfang chushe shihshih chihua(The Hepatitis B Immunization Plan), November 10, 1983.
open the vaccine market for free importation and for all susceptible people. The DOH compromised to let all susceptible people receive the vaccine at their cost on March 12, 1985, but the DOH still insisted on controlling the importation of the vaccine. At first, the DOH did not encourage susceptible people who were not within the DOH’s schedule to receive the vaccine. For example, in March 1987, Sung Juei-low said at Kao-Hsiung City’s "Hepatitis B Control Study Course for School Teachers" that only 1.5% of susceptible adults were infected annually, and only 2.7% of the infected adults might become carriers. He then emphasized that "adults’ HBV infection rate is low and few people will become carriers; therefore, we don’t need to encourage every person to receive the vaccine."  

But when Lifeguard could mass produce the vaccine and the DOH’s immunization schedule came closer to the priority of vaccination for susceptible adults, the DOH changed the "correct knowledge" regarding adult infection. In 1988, the DOH emphasized that the result of adult infection was severe: about 30%-40%  


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adults who were infected by HBV would have acute hepatitis B; about 5%-10% infected adults would become carriers. Therefore, the DOH asked susceptible adults to receive the vaccine soon.32

Was hepatitis B severe? Was saliva a mode of HBV transmission? Could carriers donate blood? Did susceptible adults need to receive the vaccine? When the DOH offered answers to these questions, their policy consideration played an important role in shaping the "correct knowledge."

The Triangular Structure of the Hepatitis B Control Program

When the "correct knowledge" mentioned above was established in the DOH, it did not mean that Taiwanese people accepted it automatically. If the Taiwanese people rejected certain "correct knowledge," such as the "severity" of hepatitis B in Taiwan, the DOH would have a difficult time promoting the hepatitis B control program. The following sections examine how the KMT government designed the hepatitis B control program, including the organizational structure and the content of

the DOH's Intensive Hepatitis B Control Plan.

Institutional infrastructure was an important element in the hepatitis B control program. The absence of the necessary institutional infrastructure might prevent the occurrence of certain scientific research. Although the DOH was in charge of disease control, it did not control all of the hepatitis B control program. Rather, both the STAG and the NSC also played important roles in this program. The hepatitis B control program had a triangular structure (Figure 4-6): the STAG promoted and coordinated this program; the DOH executed the hepatitis B immunization plan and the Intensive Hepatitis B Control Plan; the NSC directed the hepatitis B plasma vaccine production and sponsored some research.

The STAG as a Coordinator

When an inter-departmental program emerged, coordinating the various participants in the appropriate network became an important issue. The role of the STAG in the hepatitis B control program provided a good example for understanding the importance that institutional infrastructure can play in scientific practice.

In 1982, when the NSC was planning to produce the hepatitis B plasma vaccine, the NSC recognized the necessity and the difficulty of enrolling other government agencies in its program. Therefore, on June 28, 1982, the NSC
recommended that Minister Lee Kuo-ting set up a "task force" to coordinate and
direct all the necessary government agencies, such as the STAG, the NSC, the DOH,
and the Ministry of Economic Affairs in order to promote the NSC's vaccine
program.\textsuperscript{33} Later, according to the recommendation of Dr. Ivan Bennett Jr., the
Executive Yuan established a Hepatitis Advisory Committee on March 28, 1983 in
order to coordinate the growing number of organizations that now included the
Ministry of Defense, the Ministry of Education, Blood Centers, and the Government
Information Office.\textsuperscript{34} The chairman of this committee was Minister Lee Kuo-ting.
In fact, this committee was the incarnation of the STAG in the hepatitis B control
program. The committee dealt with major directions of the control program and some
controversial issues, such as animal testing and the clinical trial of the Lifeguard's
plasma vaccine (discussed in chapter five).

Before the Hepatitis Advisory Committee was established, in early 1981, the
STAG had expressed the power of coordination in the controversy of the hepatitis B
vaccine trial project, as mentioned in chapter three. With the help of many
Taiwanese and internationally famous hepatitis B experts in the Hepatitis Advisory
Committee, the STAG now would have more interpretative authority in the affairs of

\textsuperscript{33}The NSC document Chihchao B-hsing kuyen yimiao chihua much\textquotesingle\en
chihhsing chienpao (The Report of the Current Progress of the Hepatitis B Vaccine
Producing Program), June 28, 1982.

\textsuperscript{34}The STAG document Kuyen fangchih kuyen weiyuanhui ti 1 tz\textquotesingle\u Huiyi (The
Minutes of the First Meeting of the Hepatitis Advisory Committee), March 28, 1983.

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the hepatitis B control program. The following is an example.

As illustrated in chapter three, the NSC wanted to promote biotechnology by means of studying and producing recombinant DNA hepatitis B vaccine. Before recombinant DNA vaccine was produced, the NSC’s strategy was to buy the technology of Pasteur’s hepatitis B plasma vaccine for Lifeguard\textsuperscript{35} in order to dominate the Taiwanese market before foreign vaccine entered Taiwan. If the DOH did not support the vaccination program, buy Lifeguard’s vaccine, or control the importation of foreign vaccine, the NSC’s vaccine program would not succeed. In order to get the cooperation of the DOH, the NSC asked the help of the STAG.

At first, the NSC wanted the DOH to control the importation of hepatitis B vaccine in order not to let foreign vaccine dominate the Taiwanese market. Under the direction of the STAG, the DOH agreed to do this in August 1982.\textsuperscript{36} But some legislators, such as Hung Wen-tung, repeatedly criticized the control of the vaccine importation.\textsuperscript{37} Therefore, the DOH held another meeting on May 17, 1984 to discuss this trouble. In the meeting, the NSC delegate Peng Ching-tzu said that “if

\textsuperscript{35}On August 23, 1984, Lifeguard Pharmaceutical Incorporation was established by the NSC and Development Center for Biotechnology to produce the hepatitis B plasma vaccine. The formation of Lifeguard is introduced in a later section.

\textsuperscript{36}The DOH document Chiach’iang B-hsing karyen fangchih chihua niantu chient’ai hu i chiu (The Minutes of the Annual Examination of the Intensive Hepatitis B Control Plan Meeting), August 12, 1982.

\textsuperscript{37}Lifayuan kungpao(The Communiques of the Legislative Yuan), Vol. 73, No. 19, pp.23-24. The Executive Yuan document 73.4.26_Tai-73-Shih-Tzu No. 6464, April 26, 1984.
the domestic vaccine market is open, foreign vaccines may damage Lifeguard's business." The DOH and the NSC could not reach an agreement in this meeting because the DOH did not want to take political responsibility for the NSC. The Hepatitis Advisory Committee resolved this trouble, especially through the mouth of Dr. Krugman, deciding that the DOH should control the importation of hepatitis B vaccine as before.

In addition, the NSC wanted to make sure that the DOH would promote a mass vaccination program in the near future and wanted to know the scale of the program in order to negotiate with foreign companies about establishing a hepatitis B vaccine firm in Taiwan. Under the direction of the Hepatitis Advisory Committee, the DOH held a meeting on May 19, 1983 to "discuss how to design a long-term mass vaccination program in order to offer the NSC the necessary information." This meeting decided that the DOH would have a mass vaccination program as the NSC wanted and that the DOH would buy the vaccine coming from the NSC's vaccine producing program.

38The DOH document Kanyen fangchih weiyüanhsu 73 nientu ti 4 tz'u huiyi(The Minutes of the Fourth Meeting of the Hepatitis Control Committee in the 1984 FY Year), May 17, 1984.

39The STAG document Kanyen fangchih kuwen weiyüanhsu ti 3 tz'u Huiyi(The Minutes of the Third Meeting of the Hepatitis Advisory Committee), July 14, 1984.

40The DOH document Yenshang B-hsing kanyen mianyi chiehchung ch'angch'i chihua chih kueihua shihyi huiyi chilu(The Minutes of the Long-Term Hepatitis B Vaccination Program Planning Meeting), May 19, 1983.
In this example of the NSC's vaccine producing program, with the help of the STAG, the NSC got what it wanted from the DOH. In chapter five, more examples show the role of the STAG as a coordinator, involving such issues as whether the dosage of vaccination might be reduced and whether the Lifeguard's vaccine should do animal tests and a clinical trial. The role of the STAG in the hepatitis B control program not only showed the importance of institutional infrastructure in scientific practice, but also displayed how government agencies' participation significantly influenced the development of the hepatitis B control program.

The Organization of the NSC System

As discussed in chapter three, the NSC participated in the hepatitis B control program in order to promote the development of biotechnology in Taiwan. When the NSC designed the strategy of promoting genetic engineering research, it adopted the idea of the assembly-line model of science-technology relationship. In this model, the beginning operation was basic science; applied science, invention, development, engineering, and innovation followed.\(^1\) According to this strategy, the action was

\(^1\)This assembly-line model reflected the basic thought mode of the KMT bureaucracy. Economic growth and stabilization were an important basis of the KMT regime. Industrialization was what the government wanted to pursue, as discussed in chapter one. In industries, the up-stream level meant affording basic materials, such
divided into three levels: up-stream, mid-stream, and down-stream. At the up-stream level, the NSC sponsored the "Recombinant Hepatitis B Vaccine Research Program" as mentioned above. At the mid-stream level, on March 14, 1984, the NSC set up a Development Center for Biotechnology (DCB) to develop hepatitis B vaccines and reagents. This center was supposed to adopt and develop the research results of the up-stream research level, and to transfer its outcomes to the down-stream level for manufacturing and commercialization. At the down-stream level, on August 23, 1984, Lifeguard Pharmaceutical Incorporation was established by the NSC and the DCB to produce hepatitis B vaccines. At first, Lifeguard would transfer the plasma vaccine technology of Pasteur Institute. Then it would wait for the DCB's technology of the recombinant DNA hepatitis B vaccine (STAG, 1988a & 1988b).

Why did the NSC create Lifeguard rather than promote Taiwanese medical industries to receive the technology of the DCB in the NSC's assembly-line design? One possible explanation was that Taiwanese pharmaceutical industries showed no interests in investing in R&D to develop new drugs. Compared to other industries, the Taiwanese pharmaceutical industries were strangers to the export-oriented economy of Taiwan. As mentioned in chapter one, Huang Weng-foung, Director of

as cotton; the mid-stream level meant producing semi-products, such as textiles; the down-stream level meant manufacturing final products, such as clothes. The NSC showed the same image of industrialization in the design of the research program in the science policy.
the Bureau of Pharmaceutical Affairs of the DOH, observed that they had little achievement in terms of exporting business and heavily relied on the domestic market. They were based upon formulation of generic drugs and had price-oriented competition rather than quality-oriented competition. In addition, Huang Weng-foung pointed out that the Taiwanese pharmaceutical industries were small scale manufactures and had few incentives and funding resources for R&D.\textsuperscript{42} The NSC had a difficult time finding any hope for R&D in the existing Taiwanese pharmaceutical industries.\textsuperscript{43} If the NSC's vaccine program succeeded, the NSC not only could develop biotechnology in Taiwan, but also could create new pharmaceutical industries which would be R&D-oriented in Taiwan.

The characteristics of Lifeguard were special: the KMT government designed it as a "controllable private company" and ordered the NSC to supervise it.\textsuperscript{44} In this design, Lifeguard was a private company since the Development Funds of the Executive Yuan and government's Bank of Communications only held 37.5% shares. But the government could control Lifeguard since the Development Funds of the

\textsuperscript{42}The STAG document \textit{The Development of Pharmaceutical Industry in Taiwan, R.O.C.}, by Huang Weng-foung, the Director of the Bureau of Pharmaceutical Affairs of the DOH. Huang's paper was presented in the STAG interim meeting November 14, 1986. Also see the STAG document \textit{The Statement by Dr. Ivan L. Bennett, Jr. at the Interim STAG Meeting}.

\textsuperscript{43}The NSC had tried to develop R&D-oriented pharmaceutical industries in Taiwan in the 1970s. But it failed (Lin CH, 1989).

\textsuperscript{44}The Executive Yuan document \textit{73.7.23. Tai-73-Wei No. 12254} to the National Science Council, July 23, 1984.
Executive Yuan, the government’s Bank of Communications, KMT’s Central Investment Company, pro-governmental Miscellaneous Goods Funds, and the DCB all together held 52% shares of Lifeguard. The government wanted to control Lifeguard because it was designed by the government to monopolize the hepatitis B vaccine market in Taiwan. In this design, the government could control Lifeguard on the one hand and Lifeguard could avoid the inflexibility of the state-owned enterprises on the other. However, these special characteristics of Lifeguard would undermine the scientific status of Lifeguard’s hepatitis B plasma vaccine in a big controversy in 1991. Chapter five discusses this event.

The establishment of the DCB and Lifeguard showed the government’s active participation in the hepatitis B control program. The interests of the NSC and the DCB significantly influenced the directions of the initial stage of the recombinant DNA research in Taiwan. Besides, the economic structure of Taiwan’s pharmaceutical industries and the NSC’s interests formed the characteristics of Lifeguard which in turn would shape the development of the hepatitis B control program in the early 1990s.

**The Organization of the DOH System**

From the organization and activities of the DOH system in the hepatitis B
control program, we also can see the importance of institutional infrastructure in scientific practice. On October 1, 1980, the DOH organized a Hepatitis Control Committee in the Bureau of Communicable Disease Control after Premier Sun Yun-hsuan directed the DOH to control hepatitis B, as mentioned in chapter three. The committee had three task groups: laboratory diagnosis, clinical and epidemiology, and health education.\textsuperscript{45} Besides, health organizations at different levels such as the county or city health bureaus, the township health stations, and health rooms throughout Taiwan were all involved in a hepatitis control network(Figure 4-7). Their responsibilities mainly were immunization and health education. Without them, the hepatitis B control program was impossible.

In order to promote the hepatitis B control program, the DOH found help from other organizations and government agencies. First, the military was a very large collective group. The Ministry of Defense set up a Military Hepatitis Control Center in Tri-Service General Hospital in the July of 1985 to promote hepatitis control in the military. Second, the Ministry of Education promoted hepatitis B prevention and education at school. For example, in September 1984, the Ministry of Education ordered all schools in Taiwan to use disposable utensils in school restaurants, to use disposable needles and syringes in student immunization programs,

\textsuperscript{45}The DOH document Penshu kanyen fangchih chihua yentaohui huivi chilu(The Minutes of the Hepatitis Control Program Discussing Meeting), January 8, 1981; the DOH document 71.9.17. Wei-Hsu-Zen-Tzu No. 396409, September 17, 1982.
and to teach knowledge regarding hepatitis B control to students in class or any group meeting.\textsuperscript{46} Third, the Government Information Office promoted public education about hepatitis control through mass media. Fourth, the Blood Centers screened donated blood in order to prevent infection through blood transfusion. Fifth, the NSC funded some hepatitis research.

On June 6, 1981, the DOH proposed an Intensive Hepatitis B Control Plan to the Executive Yuan, under the pressure of the Control Yuan in the controversy discussed in chapter three. On August 13, 1981, the Executive Yuan approved this control program at the 1743th Cabinet meeting.\textsuperscript{47} On November 10, 1983, the Executive Yuan approved the DOH’s Hepatitis B Immunization Plan to begin on July 1, 1984 starting with high-risk newborns and eventually to include all of the uninfected as well (STAG, 1988b).

The Hepatitis Control Committee of the DOH gave the government a certain degree of interpretative authority in scientific affairs regarding hepatitis B control. The numerous health stations promoted immunization and health education which aimed to convince Taiwanese people of certain "correct knowledge." Some organizations and government agencies helped the DOH promote immunization, health education, hepatitis B research, and blood screening. Without this institutional

\textsuperscript{46}The Ministry of Education document 73.9.17. Tai-73-Tzu No. 36475, September 17, 1984.

\textsuperscript{47}The Executive Yuan document 70.8.24. Tai-70-Wei-Tzu No. 12099, August 24, 1981.
infrastructure, the DOH would have a difficult time launching the hepatitis B control program.

The Intensive Hepatitis B Control Plan

The DOH’s actions concerning the hepatitis B control program was outlined in the Intensive Hepatitis B Control Plan. This plan had four measures to control hepatitis B: to establish a Hepatitis Patient Information Center, to strengthen health education for hepatitis control, to prevent horizontal infection, and to do hepatitis research (DOH, 1981). Later, in August 1982, the NSC asked the DOH to add the clause "to manufacture hepatitis B vaccine" into the plan as the fifth measure. The following sections describe the content of the measures in the Intensive Hepatitis B Control Plan in order to understand how the DOH designed and promoted the hepatitis B control program, especially the "correct knowledge" mentioned above.

48The NSC document 71.8.30 (71) Tai-Hui-Chi-Tzu No. 6874 to the DOH on August 30, 1982. Part of the reasons might be that the NSC wanted to make sure that the DOH would buy the hepatitis B vaccine which would be produced by the NSC’s vaccine program. After the vaccine had been routinely produced by Lifeguard and purchased by the DOH, "to manufacture hepatitis B vaccine" as a measure disappeared in the Second Intensive Hepatitis B Control Plan of 1987.
From the development of these measures of the plan, we can see how political operations of government agencies and government scientists shaped scientific practice.

**The Hepatitis Patient Information Center**

As mentioned in chapter three, in 1978, when Sung Juei-low served as the chairman of the Gastroenterological Society of the Republic of China, he proposed to establish a liver patient information center which would register and could trace any liver patient of any hospital. He wanted to set up an information pool in response to the particular inclination among Taiwanese patients to change hospitals often (Sung JL, 1978). But his proposal failed because the government did not fund it.49 After the DOH set up the Hepatitis Control Committee in 1980, Sung Juei-iow’s proposal resurfaced.50 Later, in the Intensive Hepatitis B Control Plan, the Hepatitis Patient

49 Interview with Dr. Chen Ding-shinn at National Taiwan University on June 14, 1993. Besides, see Chunhua jih pao, August 14, 1981.

50 The DOH document Yentao kanyen fangchih fangan huiyi chilu (The Minutes of Hepatitis Control Meeting), October 1, 1980; Hsingchengyuan Weishengshu kanyen fangchih Ti 2 tsu chihua tsaoan (The Proposal of the Second Task Group of the Hepatitis Control Committee), January 15, 1981.
Information Center became the first priority.\textsuperscript{51}

The objective of the Hepatitis Patient Information Center reflected the research interests of Sung Juei-low and other committee members as physicians. This center aimed to follow up liver disease patients to find early hepatoma patients for early treatment on the one hand, and to study the natural history of liver diseases on the other hand (DOH, 1981:5).\textsuperscript{52} But this center did not register the information of asymptomatic carriers at the beginning even though the DOH taught people that asymptomatic carriers might develop cirrhosis or HCC. In other words, the Hepatitis Control Committee of the DOH showed no concern about asymptomatic carriers at first.

In late 1981, this center applied to the NSC for research funding. But the NSC rejected its request for the reason that "the Information Center aims to collect

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51 The DOH document *Yent’ao t’uihsing chiach’iang B-hsing kanyen fangchih chihua yukuan shihyi huiyi* (The Minutes of Promoting Intensive Hepatitis B Control Plan Meeting), September 7, 1981.

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data only rather than to do research." The Hepatitis Control Committee found that the NSC had to identify the source of carrier serum for its vaccine program, they soon added the information of carriers in the center's data base in order to get the NSC's funding in mid-1982. Finally, they succeeded. In other words, the center could get the support of the NSC because it met the interest of the NSC's biotechnological program.

Sung Juei-low's idea about the information center faced many problems. Many hospitals and doctors complained that the five-page liver disease patient registration form was too complex for their busy business. Besides, the methods and criteria of diagnosis were different in different hospitals. Furthermore, many

53 The NSC document 70.10.21. (71) Tai-Hui-Sheng-Tzu No. 7679 to the DOH on October 21, 1981, the DOH document 70.11.5. Wei-Shu-Fang-Tzu No.347824 to the Executive Yuan on November 5, 1981, and the NSC document 71.3.30. (71) Tai-Hui-Sheng-Tzu No.2329 to the DOH on March 30, 1982.

54 The DOH document Hsiuting kanyen huanche tzuhsün chunghsin chihua ts'aoan huivy chilu (The Minutes of Modifying the Hepatitis Patient Information Center Plan Meeting), May 22, 1982; Sung Juei-low said, "the registration of healthy carriers information could serve as the source of finding approipriate serum for vaccine production." See the DOH document 72.4.13 Wei-Hsu-Fang-Tzu No.422453, April 13, 1983. Besides, Dr. Chen Ding-Shinn reported to Minister Lee that "the liver disease information registry of military aims to collect the necessary carrier serum for the vaccine production in the near future." See the STAG document Weishengshu kanyen tzuhsün tsoyeh shishi ch'inghsing chienpao (The Report of the Current Development of the Hepatitis Patient Information Program of the Department of Health), August 7, 1985.

55 The DOH document Kanyen fangchih weiyüanhui ti 2 tsu 75 nientu ti 2 tz'u huivy (The Minutes of the Second Meeting of the Second Division of the Hepatitis Control Committee in FY 1986), December 12, 1985.
hospitals did not cooperate with the DOH very well.\textsuperscript{56} Although Sung Juei-low repeatedly emphasized the importance of the information center for studying liver diseases and argued that the patient registration form could educate young doctors, he did not get much support from other hospitals and doctors.\textsuperscript{57} Therefore, the original ideas of Sung Juei-low failed again.\textsuperscript{58}

From this case, we also can see the importance of the institutional infrastructure in scientific practice. Whether the information center worked well would influence the development of some research regarding liver disease patient follow-up or the natural history of liver disease. Whether the necessary institutional infrastructure endured depended upon whether the participants’ political operations worked well or not. The center rose after it compromised its original aims by adding healthy carriers’ information in order to receive the NSC’s research funding. The NSC granted the research funding, but the center declined when it failed to enroll enough hospitals and doctors.

\textsuperscript{56}The DOH document \textit{Kanyen fangchih weiyüanhuî ti 2 tsu 78 nięntu ti 2 tz’u hsiaotsu huîyi chîlu}(The Minutes of the Second Meeting of the Second Task Group of the Hepatitis Control Committee in FY 1989), January 19, 1989.

\textsuperscript{57}The DOH document \textit{Yiyü karping huanche tenglupiao t’ienhsieh shihyi huîyi chîlu}(The Minutes of Discussing the Hepatitis Patient Registration Form Meeting), April 4, 1983, and \textit{72.4.13. Wei-Shu-Fang-Tzu No. 422453}, April 13, 1983.

\textsuperscript{58}The DOH document \textit{Kanyen huanche tzuhsün hsit’ung--karping huanche tenglupiaoke chi tsøyeh fangshih hsüting huîyi chîlu}(The Minutes of Revising the Hepatitis Patient Information Center Meeting), November 20, 1990. The subjects of the center were changed to acute hepatitis A and acute hepatitis B.
The Prevention of Horizontal HBV Infection

The DOH's "correct knowledge" taught that the hepatitis B virus was transmitted by blood, saliva, semen, or other bodily fluids. However, many medical papers held that the exact mode of horizontal transmission was still unclear (Beasley, 1983; Sung JL et al., 1984; Chen DS, 1987; Wu, TT, 1991). But the DOH still made efforts in the possible ways of interrupting hepatitis B virus infection.

First, since the hepatitis B virus could be transmitted through blood transfusion, the Blood Centers screened donated blood. In addition, the DOH supervised the laboratory tests for HBsAg in the Blood Centers. Second, the DOH wanted to use disposable syringes and needles in all vaccination programs. Also, the DOH requested medical associations to encourage their members to use disposable syringes and needles and minimized the frequency of injection (DOH, 1981:5-6).

Third, the DOH ordered licensed hawkers and restaurants to use disposable chopsticks and disposable utensils. The DOH also suggested that Taiwanese people not buy food from unlicensed hawkers.\textsuperscript{59} Fourth, the DOH asked food handlers to

\textsuperscript{59}The DOH document Feng hsingchengyuanchang chihshih chiach’iang kuting t’anfan weisheng kuanli huiyi (The Minutes of Licensed Hawker Health Control Meeting). August, 11, 1982; the DOH document 71.8.19, Wei-Hsu-Fang-Tzu No. 389254 to the Executive Yuan on August 19, 1982; the DOH document 72.5.13, Wei-Hsu-Shih-Tzu No. 422781 on May 13, 1983.
receive personal health examinations periodically. Fifth, the DOH suggested that Taiwanese people use common chopsticks and spoons rather than one's own to get food from dishes.\textsuperscript{60}

These measures reflected the knowledge base of the DOH. Whether the "knowledge" of the DOH for hepatitis B control was "correct" or not, these measures influenced the Taiwanese way of life, which I discuss later. Besides, these measures were not only the DOH's methods of preventing HBV from infecting people, but also were related with many economic interests, and produced environmental problems. I discuss these facets later.

The Hepatitis Research

The DOH's policies created some mission-oriented research. In other words,

\textsuperscript{60}The DOH document 71.8.17. Wei-Hsu-Kung-Kuan-Tzu No. 388457 to the Executive Yuan on August 17, 1982; the STAG document Hsingchengyuan kechitsu yenshang chiach'iang B-hsing kanyen fangchih chihua yukuan went'i huiyi(The Minutes of the Promoting the Intensive Hepatitis B Control Plan Meeting), August 31, 1983. At first, in the measure of "the prevention of horizontal hepatitis B virus infection," the DOH only focused upon screening blood and promoting disposable syringes & needles. On August 13, 1981, when the DOH reported the Intensive Hepatitis B Control Plan at the Executive Yuan, Premier Sun directed the DOH to pay attention to the mode of transmission via saliva and dietic hygiene. See Minister Lee Kuo-ting's statements on the STAG August 22, 1981 document.
the DOH policy considerations would influence the direction of hepatitis B research in Taiwan. Sometimes, the research aimed at backing up or assessing the existing policies, such as the hepatitis B plasma vaccine clinical trials in 1981. Whether to announce the research results or not depended upon whether they were positive to the policies or not. Sometimes, the research was one kind of *ad hoc* project which was to handle certain social pressure rather than to solve a scientific problem (Gerstenfeld, 1982), such as the study of the interchangeability of the hepatitis B vaccines in 1990. The time scale of the *ad hoc* research and the timing of announcing the research results became very sensitive. The meaning of the mission-oriented research might change or even disappear when the DOH’s policies changed, such as the studies of low-dosage vaccination in 1985. The meaning of the research sometimes might be decided collectively by the Hepatitis Control Committee of the DOH, such as the case of the Lifeguard’s vaccine clinical trial in 1987. Some results might be ignored attentively, especially when the interpretation of the results were related with statistics. Chapter five discusses the details of these research.

In the Intensive Hepatitis B Control Plan, which was executed from 1981 to 1987, there were six topics under the title "hepatitis research":

1. Two vaccine trial programs on high-risk newborns:
   - one was carried out by National Taiwan University
   - and the University of Washington that used HBIG and
   - Merck’s hepatitis B plasma vaccine; the other was
performed by the Veterans General Hospital that used HBIG and Pasteur's hepatitis B plasma vaccine.

2. Study on the mode of transmission, development, disease mechanism, prevention, and treatment of hepatitis B.

3. Supervising local governments to do hepatitis B research.

4. Developing test reagents.

5. Studying the treatment of HBsAg positive blood.


In the "Second Intensive Hepatitis B Control Plan," which was executed from 1987 to 1992, the hepatitis research became:

1. Studies on the effect of small doses on HBsAg negative mothers' newborns: these studies tried to establish the most cost-beneficial dose for a mass immunization program.

2. Assessment of the effect of hepatitis B immunization: this study would decide whether to boost the immunized subjects after four or five years.
3. Study on the mode of transmission, development, disease mechanism, prevention, and treatment of hepatitis B.


5. Related studies on δ hepatitis pathogens and other studies.

6. Using animal mode to study the change from non-reaction to reaction to HBsAg.

7. Supervising local governments to do hepatitis B research (DOH, 1987b:7-9).

Following the development of the hepatitis B control program, there were some changes in the hepatitis research that the DOH supported. First, since the plasma vaccine was expensive, the studies on the effect of small doses became necessary; in other words, economic considerations promoted this kind of research. Second, no one knew how long the vaccine would last at the time of immunization; therefore, long-term assessment of the effect of hepatitis B immunization would decide the future development of the immunization plan. Third, part of the attention turned to new fields, such as non-A non-B hepatitis or δ pathogen, though the mode of transmission, development, disease mechanism, and treatment of hepatitis B were still unclear. New fields meant that everyone could begin at almost the same time. In the 1970s and the early 1980s, Taiwanese research on hepatitis B was limited by the
small budget and inadequate research personnel. But from the mid-1980s on, both the 
budget and research personnel for hepatitis research increased significantly. 
Therefore, Taiwanese researchers wanted to compete with foreign researchers in the 
new fields.

**Health Education for Hepatitis Control**

Besides the immunization program, health education was the most important 
measure in the hepatitis B control program. Health education for hepatitis control 
appeared almost everywhere. When the Hepatitis Control Committee of the DOH met 
for the first time on October 1, 1980, they concluded by setting health education for 
hepatitis control as one of their top priorities. In early 1981, when the vaccine 
controversy was hot, Minister Lee Kuo-ting asked every medical institute and 
hospital to educate their doctors, nurses, and medical students for "correct 
knowledge."61 In 1981, when the DOH began promoting the usage of disposable 
needles and syringes, the DOH enforced health education to persuade medical

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61 The STAG document *Kanyen fangchih chi yenchiu tzot’anhui chiliu* (The Minutes 
of the Hepatitis Control and Research Discussion Meeting), March 28, 1981.
workers, patients, and their families to use disposable needles and syringes. The DOH planned to begin the mass vaccination program on July 1, 1984, the DOH found help from the Government Information Office to educate Taiwanese people to accept the vaccine. In May 1987, when the second controversy over the hepatitis B plasma vaccine occurred, which is discussed in chapter five, Dr. Chen Ding-Shinn condemned the critics for their misunderstandings and subjectivity. He suggested that the government make more efforts in health education for hepatitis control. All these events showed that the DOH, the STAG, and governmental scientists showed interests in using health education to convince various people of some "correct knowledge" regarding hepatitis B control.

The ways that the DOH promoted health education for hepatitis control included:

1. group meeting: organizing meetings in communities, hospitals, and schools, patient education at

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62 The DOH document Yent’ao suchiao chihshe ch’ich’ai ch’üanmian t’ui kuan chih kohsinghsing chi chüansüeh chunghsin shuhsüeh chienyen tangfa kaichin shihyi yi chiach’iang kanyen fangchih kungtsø hsieht’iaohui(The Minutes of Promoting Disposable Needles and Syringes Meeting), May 23, 1981.

63 The DOH document Kanyen fangchih weiyüanhui 73 nientu ti 4 tz’u hu yi(The Minutes of the Fourth Meeting of the Hepatitis Control Committee in the 1984 FY Year), May 17, 1984.

64 The STAG document Tui yangming yihsüehyuan och’ün chiaoshou chih chengwuweiyüan han chih fenhsi yu vichien(The Report of Dr. Chen Ding-Shinn to Minister Lee Kuo-ting), May 20, 1987.
clinics, exhibits, and home visits.

2. use of mass media: using radio, TV, and newspapers to educate the public.

3. training: organizing short term training programs for journalists, health and hospital staff, medical practitioners, food handlers, and school teachers; using the liver disease patient registration form to educate physicians.

4. educational and training material production: producing leaflets, booklets, slides, posters, video tapes, and 16 mm films regarding hepatitis B control.

5. control of advertisements: advising the public to consult doctors concerning hepatitis problems and controlling the misleading advertisements of Chinese medicine on the cure of hepatitis.  

65The DOH document Hsingchengyuan Weishengshu kanyen fangchih Ti 3 tsu chihua tsaoan(The Proposal of the Third Task Group of the Hepatitis Control Committee), January 15, 1981; the DOH document B-hsing kanyen fangchih weisheng chiaoyü chiaoch'ai shengch'a huiyi(The Minutes of Health Education Materials for Hepatitis B Control Examining Meeting), May 27, 1981; the DOH document Yent'ao t'uihsing chiach'iang B-hsing kanyen fangchih chihua yuksuan shihiyi huiyi(The Minutes of Promoting Intensive Hepatitis B Control Plan Meeting), September 7, 1981; the DOH document Kanyen fanchih weiyüanhui 72 nientu ti 3
The aim of health education for hepatitis control was to teach everyone "correct knowledge" regarding hepatitis B control. The "correct knowledge" that the DOH taught included:

- In Taiwanese people, the hepatitis B virus carrier rate was 15-20%.
- Most of the carriers were infected before six years old. As high as 50% of the carriers were infected through perinatal vertical transmission.
- Some carriers might become cirrhosis or hepatoma.
- The modes of transmission included injection, blood, saliva, semen, or other body fluids.
- The ways of preventing hepatitis B virus infection included: to wash hands before eating and after evacuating, not to share toothbrushes, razors, and towels with others, not to have unnecessary injection or blood transfusion, not to chew food to feed children, not to buy food from hawkers, and not to

从胡辉炎,《第三次肝炎控制委员会会议纪要》(The Minutes of the Third Meeting of the Hepatitis Control Committee in FY 1983), February 24, 1983.
eat from common dishes.\textsuperscript{66}

After the mass vaccination program began in 1984, more "correct knowledge" was included in the health education:

- If mothers were carriers, newborn babies had better receive vaccine.
- Besides vaccine, the HBeAg positive mothers’ newborn babies needed to receive one dose of HBIG within 24 hours after they were born.\textsuperscript{67}

There was no guarantee that various Taiwanese people would automatically accept anything the DOH said. Since whether or not these people accepted the DOH's "correct knowledge" regarding hepatitis B control would significantly influence the development of the hepatitis B control program, the DOH made efforts to convince these people of the "correct knowledge." The following sections examines the details.

\textsuperscript{66}The DOH document B-hsing kanyen fangchih weisheng chiaoyü chiaooch’ai shengch’a hu yi (The Minutes of Health Education Materials for Hepatitis B Control Examining Meeting), May 27, 1981.

\textsuperscript{67}See DOH(1987a) and the DOH’s leaflet entitled Fangchih B-hsing kanyen (Preventing Hepatitis B), printed in October 1981.
The Promotion of "Correct Knowledge"

The DOH and governmental scientists made efforts to convince Taiwanese people of some "correct knowledge" regarding hepatitis B control through two mechanisms: "learning by participating" and "learning by practicing." In "learning by participating," the DOH created an environment to let Taiwanese people participate in and learn "correct knowledge" regarding hepatitis B control. In this environment, people might change their lifestyle after learning certain "correct knowledge." By contrast, in "learning by practicing," medical workers and food hawkers learned certain "correct knowledge" after changing their ways of professional practice under the order of certain authorities, such as the DOH and state-owned hospitals. In the new practice, certain "correct knowledge" became part of their life.

Promoting "Correct Knowledge" to Medical Workers

Medical workers, including doctors, nurses, and health workers, stood at the front line of the hepatitis B control program. If they did not recognize the "severity" of hepatitis B and if they did not endorse the hepatitis B vaccine, the control program would progress only with difficulty. In the 1981 controversy, most of the critics were
medical workers. As mentioned in chapter three, on March 28, 1981, Minister Lee Kuo-ting condemned the critics in the meeting held by the STAG. Lee asked every medical college and hospital to educate their doctors and medical students for up-to-date hepatitis "knowledge" because "patients and the general people believed doctors and experts."68 Later, on August 13, 1981, when the Executive Yuan was examining the DOH’s Intensive Hepatitis B Plan, Lee Kuo-ting directed the DOH to edit booklets regarding hepatitis B control particularly for medical workers.69

Besides distributing leaflets and booklets, the DOH asked city & county health bureaus and health stations to hold short-term training courses for health workers and nurses at least once a year.70 This request of the DOH became part of the evaluation criteria of annual service.71 Through participating in the training courses, medical workers had an opportunity of learning "knowledge" regarding hepatitis B control. The content of the training courses usually included "the severity of hepatitis B

68 The STAG document Kanyen fangchih chi yenchiu tzot’anhui chilu (The Minutes of the Hepatitis Control and Research Discussion Meeting), March 28, 1981.
69 The Executive Yuan document 70.8.24. Tai-70-Wei-Tzu No. 12099, August 24, 1981.
70 The DOH document 75 nientu chiach’iang B-hsing kanyen fangchih weisheng chiaoyü kungtsō shihshih chihua (The Plan of the Health Education of Hepatitis B Control in FY 1986), July 1, 1985.
71 The DOH document 75 nientu B-hsing kanyen weisheng chiaoyü shihshih chihua chinhsing hsienkuang shihch’a paokao (The Review Report on the Health Education in FY 1986), 1986. The Department of Health of Kao-Hsiung City was graded lower than the one of Taipei City because of the absence of training course regarding hepatitis B control for medical workers.
control," "the immunization of hepatitis B," and "the health education of hepatitis B control." Speakers of the training courses often included governmental scientists.\textsuperscript{72}

Another way of letting Taiwanese medical workers learn "correct knowledge" was to let them participate in international conferences and learn from international authorities. On August 13, 1981, when Lee Kao-ting examined the DOH's Intensive Hepatitis B Control Plan, he observed that "now all the clinicians have agreed on the clinical trial, but many researchers of basic medicine still do not endorse it; therefore, to promote it might not be easy."\textsuperscript{73} One solution of the government was to hold an international conference.\textsuperscript{74} The STAG and the DOH held an "International Symposium on Viral Hepatitis" on November 10 & 11, 1981. Some foreign experts of the conference, such as Dr. Ivan L. Bennett Jr., said that they "wanted to make efforts to persuade Taiwan's people to accept the vaccine."\textsuperscript{75}

The chairman of the symposium was Bennett, the medical advisor of the

\textsuperscript{72}The document of the Department of Health of Taipei City Taipei shih weishengchū 74 nientu chiach'iang B-hsing kanyen yūfang chushe kungtso jenyüan weisheng chiaoyü yenhsihüi(The Health Education Plan of the Hepatitis B Immunization Health Workers Training Course in FY 1985), February 5, 1985.

\textsuperscript{73}The Executive Yuan document 70.8.24. Tai-70-Wei-Tzu No. 12100, August 24, 1981.

\textsuperscript{74}Interview with Chou Cheng-kung, at Veterans General Hospital on April 17, 1993. Interview with an anonymous hepatitis researcher at Taipei in April, 1993.

\textsuperscript{75}Lienho pao, November 9, 1981.

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STAG. With his help, the STAG invited many hepatitis B plasma vaccine experts to convince Taiwanese medical workers of the vaccine safety. Although Liaw Yun-fan, Chang Chung-ming, and Lin Jen-hun asked questions regarding the safety of the vaccine, the answers of the foreign experts were all positive. All the foreign experts endorsed the vaccine. In other words, through participating in an international conference, which was part of scientific practice, Taiwanese medical workers got answers for their questions and learned "correct knowledge" from international authorities. Lee Kuo-ting seemed satisfied that this symposium was "successful in correcting the opinions of the Taiwanese scholars regarding hepatitis B

76 Most of the foreign experts were invited by Bennett. See the NSC document A Letter of Bennett to Wang Chi-wu, July 27, 1981.

77 The foreign experts included Saul Krugman of New York University, Maurice R. Hilleman of Merck Institute of therapeutic Research, Arie J. Zuckerman of London School of Hygiene & Tropical Medicine, Pierre Tiollais of Institute Pasteur, Cladd E. Stevens of New York Blood Center, and others. It is interesting to note that this symposium did not invite any recombinant DNA hepatitis B vaccine expert. See the STAG document Lei Yu Hsiu-hua tui Lee chihwuweiyuan so hsihui IPP B-hsing kanyeh yimiao tzuliao chih yentu chaivyao(The Report of Lei Yu Hsiu-hua Regarding IPP Hepatitis B Vaccine), November 2, 1981. If any recombinant DNA vaccine expert attended the symposium and promised "better safety" of the recombinant DNA vaccine, it might bring many troubles to the DOH, the NSC, and the STAG.

78 Minsheng pao, November 12, 1981. Also see Cheng Ding-shinn(1982). One interviewee admitted that he was persuaded by the foreign experts because of their authority. Interview with him in December, 1993.

After Lifeguard began producing the hepatitis B plasma vaccine, the DOH made efforts to create medical workers' confidence in Lifeguard's vaccine. The DOH's strategy was to let medical workers "see" the process of vaccine production. When they saw how the vaccine was manufactured, it might seem that they participated in the process of vaccine production. The DOH scheduled some visits to Lifeguard for the members of the Hepatitis Control Committee of the DOH, the members of training courses held by the DOH, and the officials of county or city health bureaus. The DOH also requested Lifeguard to make some tapes regarding the process of vaccine production and sent them to county & city bureaus and health stations. In addition, Lifeguard invited workers of hospitals and clinics to visit

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80 The STAG January 12, 1982 document. Besides, in the evaluation of the DOH service in FY 1982, the Executive Yuan gave "Excellent" grade(4.9 in 5) to the "International Symposium on Viral Hepatitis" because "it promoted the publics' attentions to hepatitis B control and increased the confidence of medical workers in the safety of the vaccine. See the document of the Research, Development and Evaluation Commission 71.10.28. (71)-Hai-Kuan-Tzu No. 2684, October 28, 1982.

81 In the 1987 controversy over the safety of Lifeguard's vaccine (discussed in chapter five), one interviewee admitted that he felt confident of Lifeguard's vaccine after seeing the process of vaccine production. Interview with the anonymous interviewee in November 1993.

82 The DOH document Kanyen fangchih weivüanhuï ti 3 tsu 75 nientu ti 3 liz'u huixi chhub(TThe Minutes of the Third Meeting of the Third Task Group of the Hepatitis Control Committee in FY 1986), April 24, 1986.
Lifeguard.\textsuperscript{83} 

Besides the DOH's actions illustrated above, the DOH directly ordered all state-owned hospitals to change some of their medical operations in order to control hepatitis B. In August 1981, the DOH ordered all the state-owned hospitals to use disposable needles and syringes. In addition, the DOH asked every medical association to advise their members to use disposable needles and syringes and avoid unnecessary injection(DOH, 1981:6).\textsuperscript{84} In other words, no matter whether medical workers of state-owned hospitals accepted the "correct knowledge" that HBV was transmitted via blood, they should shift to new medical practice based upon the "correct knowledge."

Besides, in November 1981, Yi-Lan Provincial Hospital announced to let all their liver patients use disposable utensils in order to "cut the routes of HBV

\textsuperscript{83}The DOH offered Lifeguard a list of hospitals and clinics which had contracts with the DOH for immunization. The DOH document 75.3.5. Wei-Shu-Fang-Tzu No. 582601, March 5, 1986.

\textsuperscript{84}Also see the DOH document Yent’ao t’uihsing chiach’jiang B-hsing kanyen fangchih chihua yukuan shihyi huiyi(The Minutes of Promoting Intensive Hepatitis B Control Plan Meeting), September 7, 1981. The DOH asked the state-owned hospitals to use domestic products, which were mostly produced by the Central Medical Instrument Corporation of the Vocational Assistance Commission for Retired Servicemen, the Executive Yuan. But at that time there were many complaints about the bad quality of the domestic products. See the DOH document P’eiho B-hsing kanyen fangchih chihua futao kuots’an suchiao chushe chich’ai chih ch’anchih niting shihyung fangan huiyi(The Minutes of Improving the Quality of Domestic Disposable Syringes Meeting), February 19, 1981.
infection." Later, the Department of Health of Taiwan Province ordered every provincial hospital to sterilize liver patients' utensils. This decision changed the medical practice in the hospital too, no matter whether their medical workers thought that HBV was transmitted by saliva. But when the medical workers changed their medical practice, the "correct knowledge" became part of their life.

Promoting "Correct Knowledge" to Mass Media

In early 1981, the subjects of the DOH's health education included medical workers, food handlers, students, and other general people. But in the 1981 controversy, Lee Kuo-ting charged the mass media with conveying incorrect information and misleading newspaper readers. Later, when the vaccine clinical trials began in October 1981, the researchers found that some carrier mothers refused to vaccinate their newborns with the hepatitis B vaccine "because incorrect reports

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85 Tzuli wan pao, November 3, 1981.
86 Taiwan jih pao, May 13, 1982.
87 The DOH document Hsingchengyuan Weishengshu kanyen fangchih Ti 3 tsu chihua tsaoan(The Proposal of the Third Task Group of the Hepatitis Control Committee), January 15, 1981.
88 Lienho pao, March 29, 1981; Tzuli wan pao, March 29, 1981.
misled them." Therefore, how to "educate" the mass media to report "correct knowledge" regarding hepatitis B control became an important issue for the DOH.

On August 13, when Lee Kuo-ting examined the DOH's Intensive Hepatitis B Control Plan, he asked the Government Information Office to promote the mass media reporting the hepatitis B control program. The DOH soon decided to hold study courses regarding hepatitis B control for journalists in order to let them report "correct knowledge." In other words, the journalists might learn "correct knowledge" by participating in the study courses. In the November 1981 "International Symposium on Viral Hepatitis" mentioned above, the DOH held a press conference every day after the symposium. In the press conferences, the DOH invited Taiwanese hepatitis researchers to explain the content of the symposium to journalists, in order to minimize any possible negative report.

After Lifeguard began producing the hepatitis B vaccine, the DOH invited medical journalists to visit Lifeguard too. The DOH tried to convince them of the

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89 Chingnien chanshih pao, October 15, 1981; Minchung jih pao, July 9, 1982; Tzuyu shih pao, August 13, 1982.

90 The Executive Yuan document 70.8.24, Tai-70-Wei-Tzu No. 12099, August 24, 1981.

91 The DOH document Yent’ao t’uihsing chiach’iang B-hsing kanyen fangchih chihua yuksan shihiy i huiyi(The Minutes of Promoting Intensive Hepatitis B Control Plan Meeting), September 7, 1981.

quality of Lifeguard’s vaccine by letting them "see" the process of vaccine production.\textsuperscript{93} In July 1988, the DOH announced that it might open part of the domestic market to the foreign recombinant DNA hepatitis B vaccine at the end of 1988.\textsuperscript{94} But the DOH still wanted to partly protect Lifeguard.\textsuperscript{95} Therefore, in August 1988, the DOH invited many medical journalists, at their own expense, to visit some big European pharmaceutical companies in order to persuade the journalists to support the DOH’s vaccine policy, the NSC’s biotechnological program, and Lifeguard’s plasma vaccine.\textsuperscript{96} After they saw the huge R&D budgets that the European pharmaceutical giants spent, most of the journalists showed sympathy to the poor basis of Taiwan’s new bioindustry, and then supported the DOH’s vaccine policy.\textsuperscript{97} Their endorsement to the DOH’s vaccine protection policy indicated their acceptance of the Lifeguard’s plasma vaccine.

\textsuperscript{93}The DOH document Katrien fangchih wei\-y\-\-\-\-hui ti 3 tsu 75 nientu ti 3 tz’u huiyi chiu (The Minutes of the Third Meeting of the Third Task Group of the Hepatitis Control Committee in FY 1986), April 24, 1986.


\textsuperscript{95}ibid. After importing the new vaccine, the DOH would still vaccinate newborns, who received the vaccine with no charge, with Lifeguard’s plasma vaccine. Other civilians might choose alternatives at their own expense.

\textsuperscript{96}Interview with Huang Weng-foung, the Director of the Pharmaceutical Affairs of the DOH in 1988, at National Laboratories of Foods & Drugs on December 27, 1993.

\textsuperscript{97}Tzuli war pao, August 8, 9, & 10, 1988; Chungkuo shih pao, August 12, 13, & 15, 1988; Minsheng pao, August 9, 10, 11, 12, 13, 14, & 15, 1988.
Promoting "Correct Knowledge" in Schools

When the hepatitis B control program began in 1981, the DOH did not pay much attention to schools, although the DOH edited a booklet and make a film regarding hepatitis B control for school students (DOH, 1981:17). The DOH mostly focused upon the sanitation of school cafeterias & restaurants and the food hawkers outside school.  

But in May 1983, the DOH decided to "involve schools in the field of health education regarding hepatitis B control in order to avoid carriers being discriminated against in some organizations, groups, or companies."  

In September 1984, the Ministry of Education ordered all schools in Taiwan to do the following:

- School restaurants should use disposable utensils or sterilized utensils.
- When a school offered group diet, students should use common chopsticks in common dishes.
- Schools should use the help of local health bureaus.

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99 The DOH document Kanyen fangchih weiyüanhui 72 nientu ti 4 tz’u huivyi chilu (The Minutes of the Fourth Meeting of the Hepatitis Control Committee in FY 1983), May 26, 1983.
to supervise the sanitation of hawkers around
schools.

- Schools should use disposable needles and syringes in
  students' immunization programs.
- Schools should teach knowledge regarding hepatitis B
  control to students in class or any group meeting.
- Schools should cooperate with local health bureaus to
  promote hepatitis B control at school.\textsuperscript{100}

In other words, when students used disposable utensils or used common
chopsticks in common dishes, the "correct knowledge" that saliva and contaminated
food were modes of HBV transmission became part of their life.

With the cooperation of the Ministry of Education, the DOH promoted
hepatitis B control at school. The class of health education in junior high schools
added "knowledge" regarding hepatitis B control. Every school held experts’
speeches and let students see movies regarding hepatitis B control. Furthermore,
every school provided "knowledge" to students' parents when schools held parent
meetings.\textsuperscript{101} In order to let students have some contact with information of hepatitis

\textsuperscript{100}The Ministry of Education document \textit{73.9.17. Tai-73-Tzu No. 36475},
September 17, 1984.

\textsuperscript{101}The DOH document \textit{75 nientu chiach’iang B-hsing kauyen fangchih weisheng
chiaoyü kungtsuo shihshih chihua}(The Plan of the Health Education of Hepatitis B
B control, the DOH even distributed 2,500,000 class-schedule bookmarks to students (Figure 4-8).

In addition, the DOH helped local government hold short-term training courses or seminars for school teachers and health workers. The DOH offered training materials and some members of the Hepatitis Control Committee of the DOH came to seminars to give talks.\textsuperscript{102} On March 4, 1987, Lifeguard even offered teachers a free examination of HBV at a Kao-Hsiung City hepatitis B control seminar.\textsuperscript{103}

Some schools designed some "learning by participating" strategies to promote hepatitis B control at school. For example, some schools at Yun-Lin County and Tao-Yuan County offered health care seminars, experts' addresses (Figure 4-9), poster exhibition (Figure 4-10), movies, teacher study courses, question-answer contests with prizes (Figure 4-11), a composition contest, a calligraphy contest (Figure 4-12), and a wall poster contest (Figure 4-13)--all in order to "increase the knowledge of

\textsuperscript{102} For example, Lee Ching-yun went to Kao-Hsiung City's seminar for teachers on March 4 & 5, 1987; Sung Juei-low and Lin Chao-ching went to Tao-Yuan County's study course on April 27 & 28, 1988. See the Kao-Hsiung City document \textit{Kaohsiungshih 75 hs{"u}ehnientu hs{"u}ehhsiao chiao{"o}shih B-shing kanyen fangchih chiaoy{"u} yenhsihui tzuliaog} (The Materials of the Hepatitis B Control Seminar for Teachers in FY 1986), March 4, 1987; the Tao-Yuan County document \textit{Chiao{"o}shih B-shing kanyen fangchih chiaoy{"u} yenhsihui tzuliao shouts'et} (The Materials of the Hepatitis B Control Seminar for Teachers), April 1988.

\textsuperscript{103} The Kao-Hsiung City document \textit{Kaohsiungshih 75 hs{"u}ehnientu hs{"u}ehhsiao chiao{"o}shih B-shing kanyen fangchih chiaoy{"u} yenhsihui tzuliaog} (The Materials of the Hepatitis B Control Seminar for Teachers in FY 1986), March 4, 1987.
teachers and students regarding hepatitis B control." If teachers or students wanted to gain prizes in any contest, they needed to be familiar with the "correct knowledge" regarding hepatitis B control, usually offered by the DOH. In this case, the "correct knowledge" included:

- HBV was transmitted by blood, saliva, semen, and other bodily fluids.
- Avoid eating food of hawkers.
- Liver patients' clothes and utensils should be sterilized by boiling.
- Avoid sharing utensils with others.  

Finally, the DOH introduced a most effective measure to jet all new students receive the hepatitis B vaccine. In 1991, the DOH asked every new student of elementary schools to submit an immunization registration form with full records of vaccination. If a student did not complete the full immunization, she or he could not

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104 The Health Bureau of Yünlin Hsien document Yünlinhsien weishengchü 82 neintu t'uihsing B-hsing kanyen fangchih weisheng chiaoyü chihua(The Health Education Plan of Promoting Hepatitis B Control in FY 1993), July 1, 1992; the Taoyüan County document Chiaoshih B-shing kanyen fangchih chiaoyü yenhsihui tzuliao shouts'e(The Materials of the Hepatitis B Control Seminar for Teachers), April 1988. The budget for the prizes of "the contest for soliciting answers to questions with prizes" came from recycling aluminum cans and iron cans at Ta-Cheng Junior High School.

105 Ibid.
enter school. That is, through the DOH’s policy considerations and administrative order, "receiving the hepatitis B vaccine in order to prevent hepatitis B" became part of the "correct knowledge."

Promoting "Correct Knowledge" to Food Handlers

As discussed above, regarding "correct knowledge" in the hepatitis B control program, the DOH asserted that saliva was a mode of HBV transmission, even though the Hepatitis Control Committee knew this "fact" remained unclear. In June 1981, the DOH published a leaflet to advise people to have good sanitation. The DOH’s advice included: to wash hands before eating and after evacuating, not to buy food from hawkers, not to share utensils with others, and not to eat from common dishes.107

At first, the DOH suggested Taiwanese people change their dining manner to "Chinese food, Western style." But In June 1982, many legislators, such as Cheng


107The DOH’s leaflet Yüfang yi(B)-hsing kanyen (Preventing Hepatitis B), a DOH leaflet, June 1981; the DOH document B- hsing kanyen fangchih weisheng chiaoyü chiaoch’ai shengch’a huiyi(The Minutes of Health Education Materials for Hepatitis B Control Examining Meeting), May 27, 1981.
Yu-cheng, Wen Chin-lan, Lee Yo-chi, Tsai Tsan-hsiung, Yang Pao-lin, Liu Pi-liang, and Lin Jung-kuo, asked the DOH to effectively improve the sanitation of food hawkers because they believed that HBV was transmitted via saliva and contaminated utensils and food.\textsuperscript{108} Legislator Yang Pao-lin suggested that "although the DOH has promoted common chopsticks and spoons in dining, Japanese dining style is even better: they use disposable chopsticks."\textsuperscript{109} Later, in July 1982, in a follow-up investigative report of the 1981 hepatitis B vaccine clinical trial case, Control Yuan member Wang Chueh-jung also suggested that the DOH promoted paper-made disposable utensils and wooden disposable chopsticks, in the Japanese manner, to all cafeterias, restaurants, and food hawkers.\textsuperscript{110} In August, 1982, Premier Sun ordered the DOH to request food hawkers to use disposable utensils.\textsuperscript{111} Later, in May 1983, 


\textsuperscript{111}The DOH document Feng hsingchengyuanchang chihshih chiach'iang t'anfan weisheng kuanli huiyi)(The Minutes of Licensed Hawker Health Control Meeting), August, 11, 1982. In December 1982, in order to improve food sanitation, Premier Sun even directed the DOH and the National Police Administration to prohibit unlicensed food hawkers and to advise licensed food hawkers to change occupations. See the DOH document \textit{71.12.31. Wei-Shu-Fang-Tzu No. 410646}, December 31, 1982. But the DOH and the National Police Administration did not
the DOH ordered all the cafeterias and restaurants to do as such if they had no running water.\textsuperscript{112} In this case, the political decisions shaped the DOH's policy, which in turn enforced the status of the "correct knowledge" that HBV was transmitted via saliva and contaminated utensils.

At first, the DOH tried to promote paper-made utensils and wooden disposable chopsticks to food hawkers. Because of economic and technological factors,\textsuperscript{113} the DOH's new policy did not succeed until early 1983 when the mass production of polystyrene-made disposable utensils and bamboo-made disposable chopsticks became possible in Taiwan.\textsuperscript{114} In March 1983, the Department of Health of Taiwan Province began promoting polystyrene utensils and bamboo

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succeed. Later, the DOH decided that "the final goal of improving the sanitation of food hawkers is to let them use disposable utensils." See the DOH document \textit{72.4.9, Wei-Shu-Huan-Tzu No. 422387}, April 9, 1983.

\textsuperscript{112}The DOH document \textit{72.5.13, Wei-Hsu-Shih-Tzu No. 422781}, May 13, 1983.

\textsuperscript{113}Much Chinese food or Taiwanese food is mixed with broth or sauce. If paper-made disposable utensils were not strong enough, juicy food would destroy the utensils very soon. Besides, Taiwan needed to import wood to make paper. Therefore, either paper-made utensils or wooden chopsticks were not cheap in Taiwan.

\textsuperscript{114}Taiwan began developing a petrochemical industry in the 1970s, as mentioned in chapter one. Besides, Taiwan was rich in bamboo, especially at Tsushan(Bamboo-Mountain), Nantou Hsien. Most of the bamboo-made disposable chopsticks factories were located at Tsushan. In the early 1980s, there were about 100 such manufacturers at Tsushan(Tang Jung, 1991:42).
chopsticks. In April 1983, the International Association of Lions Clubs at Taipei donated 180,000 disposable utensils and chopsticks to four cafeterias to promote this new manner of dining and test the reaction of the customers.

Food hawkers, cafeterias, and restaurants welcomed polystyrene utensils and disposable chopsticks in order to create a good sanitation image. When the DOH asked people not to buy food from unlicensed food hawkers because of their bad sanitation, the unlicensed food hawkers could not but use disposable utensils in order to show that they could offer clean food. Besides, in April 1984, when Tamkang University and the Health Bureau of Taipei County evaluated the sanitation of cafeterias and restaurants around the university, the availability of disposable utensils became an important criterion.

In the DOH’s advice concerning hepatitis B control, although the dining manner of "Chinese food, Western style" was not fully successful, it still influenced many people’s manner of dining. Some persons accepted it; others did not; some

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115 Taiwan shinsheng pao, March 8, 1983; Taiwan jih pao, March 18, 1983; Minsheng pao, March 18, 1983.

116 Taiwan shinsheng pao, March 31, 1983.

117 In the 1980s, the image of the sanitation of food hawkers in Taiwan’s mass media was usually negative (Figure 4-14).

118 Lienho pao, April 13, 1983.
accepted part of it, such as only using common spoons.\textsuperscript{119} But disposable utensils were popular in Taiwan. In 1987, the Director of Communicable Disease Control of the DOH Chuang Cheng-hua observed that:

[The DOH] has promoted the use of disposable chopsticks to prevent the transmission of some infectious diseases. Through five years effort, bamboo-made chopsticks have been widely used in Taiwan. Above 95\% restaurants and 100\% hawkers are using disposable chopsticks. Only quite few high-level atmosphere restaurants use ivory-made chopsticks. Part of families also adopt disposable material to avoid cross infection.\textsuperscript{120}

When disposable utensils were widely used in Taiwan, the "correct

\textsuperscript{119}Tan Wen-hai and Sheng Wen-yuan(1984) reported that about 64.6\% of 1717 junior high school students used common spoons in dining with others. Tan Wen-hai and his colleagues' study(1987) showed that 59\% of 600 Hsin-Chuang City citizens agreed to use common chopsticks and spoons in dining; only 4.2\% thought that it was not necessary to do so. Huang Yu-hua(1988) reported that 76.5\% of 405 National Sun Yat-Sen University freshmen did not usually used common chopsticks and spoons. Kuo Hsien-wen and his colleagues (1992:117) reported that about 36\% of 341 junior college students usually used common chopsticks & spoons or disposable utensils in dining; 57\% of the subjects sometimes did as such; only 7\% never did as such.

\textsuperscript{120}The DOH document \textit{The Letter of Chuang Cheng-hua to Dr. Goh Kee Tai}, October 20, 1987. Go Kee Tai was the head of Quarantine & Epidemiology Department, Ministry of the Environment, Singapore. Besides, in 1988, the National Institute of Preventive Medicine and the Bureau of Food Sanitation of the DOH reported that hepatitis A prevalence in Taiwan significantly decreased from 90\% in 1978 to 20\% in 1986 among children of fourteen years old. The DOH scientists and officials believed that the improvement of sanitation was the result of successfully promoting disposable utensils. See \textit{Minsheng pao}, August 8, 1988.
knowledge" that saliva and contaminated food and utensils were modes of HBV transmission became part of some Taiwanese people's life. For example, Dr. Ko Fu-te observed that "many people believe that if they have good diet sanitation, they will not get hepatitis B."\(^{121}\)

In this case, the opinions of politicians and government leaders significantly influenced the DOH's policy. According to the DOH’s policy considerations, the DOH made efforts to convince Taiwanese people of some "correct knowledge," such as using disposable utensils to prevent hepatitis B infection. Accepting "correct knowledge" modified some people's ways of life. Later sections examine how the "correct knowledge" caused social problems in Taiwan.

Promoting "Correct Knowledge" to Pregnant Women and Their Families

Besides medical workers, the mass media, school teachers and students, and food handlers, the DOH promoted "correct knowledge" regarding hepatitis B control to pregnant women and their families. In the hepatitis B control program, how to vaccinate all newborns was top priority. A successful immunization program was not only an important measure of preventing HBV infection, but also a guarantee of

\(^{121}\)Minsheng pao, March 7, 1987. Ko Fu-te was a pediatrician at Provincial Chi-Lung Hospital.
Lifeguard's survival. The DOH not only tried to persuade pregnant women but also their husbands and parents since all of them might influence the final decision about whether to let their newborns receive the hepatitis B vaccine.\textsuperscript{122}

As mentioned above, at the beginning of the vaccine clinical trial, some carrier mothers refused to vaccinate their newborns because they showed no confidence of the vaccine safety. In September 1983, Lin Ching-ching reported that only 19.7\% of the pregnant women at Kao-Hsiung City who had prenatal examinations at health stations agreed to do blood tests. Some pregnant women refused to do blood tests because of certain cultural taboos.\textsuperscript{123} When the mass immunization program began on July 1, 1984, only 67\% of the carrier mothers' newborns received the vaccine and HBIG.\textsuperscript{124} Therefore, the DOH had to make efforts to persuade the pregnant women and their families. In the DOH's 75 nientu chiach'iang B-hsing kanyen fangchih weisheng chiaoyū kungtso shihshih chihua(The Plan of the Health Education of Hepatitis B Control in FY 1986), the aim was to

\textsuperscript{122}Yen Han-wen, Lee Lan, and Chiang Yung-sheng(1988) showed that husbands, parents, and gynecologists were the most important factors that influenced the Taiwanese pregnant women to decide whether to let their newborns receive the hepatitis B vaccine.

\textsuperscript{123}Lienho pao, September 25, 1983. One public health nurse, Chang Chiu-lu, agreed with Lin Ching-ching's observation. Chang said that "the taboos expressed concern over the effects of drawing blood on unborn children." Interview with Chang Chiu-lu at the Health Bureau of Yünlin Hsien, Touliu, on January 5, 1994.

\textsuperscript{124}Chunghua jih pao, August 21, 1984; Taiwan shih pao, August 21, 1984; Chungkuo shih pao, August 21, 1984; Minsheng pao, August 22, 1984.
increase the acceptance of pregnant women for HBV test and newborn vaccination.\textsuperscript{125}

The DOH asked every health station to do home visits for pregnant women. Public health nurses would visit every pregnant women on their lists and teach them "correct knowledge." In addition, health stations held many discussion meetings regarding hepatitis B control in village or community political meetings (Figure 4-15). Some health stations held question-answer contests with prizes in order to attract public interests(Figure 4-16). For example, In 1991, for hepatitis B control, the Health Bureau of Yun-Lin County held 34 poster exhibits, 42 discussion meetings, 46 study courses, 56 speeches in community or village meetings, 107 tape or movie shows, and 173 community mobile broadcasts.\textsuperscript{126} Besides health stations, the DOH also used the help of farmer associations and the Parasite Control Association to locate pregnant women and promote hepatitis B control.\textsuperscript{127}

Though the DOH spent much money on booklets, leaflets, and mass media advertisements, they could not be certain whether this information reached pregnant

\textsuperscript{125}The DOH document 75 nientu chiach'iang B-hsing kanyen fangchih weisheng chiaoyü kungtsu shihshih chihua(The Plan of the Health Education of Hepatitis B Control in FY 1986), July 1984.

\textsuperscript{126}The Yünlin Hsien document B-hsing kanyen fangchih chiaoyü kungtsu ch'engkuo(The Report of the Health Education for Hepatitis B Control), November 1991.

\textsuperscript{127}The DOH document 75 nientu chiach'iang B-hsing kanyen fangchih weisheng chiaoyü kungtsu shihshih chihua(The Plan of the Health Education of Hepatitis B Control in FY 1986), July 1, 1985.
women and their families. But the efforts of the health stations, including home visits, study courses, discussion meetings, and speeches at community meetings, increased the possibility that the participants might learn some "correct knowledge" regarding hepatitis B control.

From the discussion illustrated above, we can see that scientific knowledge was not taken for granted by everyone, even though elite scientists had endorsed it. If Taiwanese people did not accept the DOH's "correct knowledge," the DOH's hepatitis B control program would fail. In this case, government agencies and government scientists made efforts to convince various Taiwanese people of "correct knowledge" regarding hepatitis B control through two mechanisms: "learning by practicing"--learning knowledge after changing lifestyle--and "learning by participating"--changing lifestyle after learning knowledge. Institutional infrastructure, such as numerous health stations, was also important in promoting the "correct knowledge." The health station officials used various strategies, such as home visits, movie shows, and question-answer contests with prizes, to inform the audience regarding hepatitis B control. All their activities reflected that scientific knowledge was not automatically accepted by everyone.
Social Problems From the "Correct Knowledge"

As mentioned above, if Taiwanese people did not accept the DOH's "correct knowledge" regarding hepatitis B control, the DOH would have a difficult time promoting the hepatitis B control program. But when various Taiwanese people accepted the DOH's "correct knowledge," some unanticipated social problems developed. Responding to these social problems, the DOH changed its "correct knowledge" regarding hepatitis B control. The social contingencies of scientific knowledge in this case provides an understanding about political dimensions of scientific practice in Taiwan.

Environmental Pollution

As discussed above, when the DOH ordered the licensed hawkers and restaurants to use disposable utensils to prevent hepatitis B, disposable utensils and chopsticks became a symbol of dietetic hygiene. In the 1980s, disposable utensils usually meant polystyrene utensils in Taiwan. The consumption of polystyrene utensils and disposable chopsticks increased quickly. From March 1983 to May 1983, the consumption of polystyrene utensils jumped from about 60,000,000 units per
month to about 150,000,000 units per month. In April 1983, Chungkuo shih pao (China Times) reported that about 70% of food hawkers and cafeteria around colleges used disposable utensils and chopsticks. In 1987, as mentioned above, the Director of Communicable Disease Control of the DOH Chuang Cheng-hua observed that "Above 95% of restaurants and 100% of hawkers are using disposable chopsticks." Although the huge consumption created economic benefits for about 30 polystyrene utensil manufacturers and hundreds of disposable chopsticks manufacturers in Taiwan, polystyrene utensils created a big environmental problem.

Millions of polystyrene utensils meant millions of pieces of garbage every day. The new garbage became a heavy burden on the Bureau of Environmental Protection of the DOH. If the DOH wanted to burn the polystyrene, it would pollute the air. Since there were few incinerators in Taiwan, burying was the main method of treating garbage. But polystyrene utensils not only occupied a lot of space, but also did not decompose. In other words, the 600 tons of polystyrene utensils generated


129 Chungkuo shih pao, April 15, 1983.


131 The government did not have a law to control the usage of polystyrene until 1991. See the Environmental Protection Administration document 80.8.30. (80)-Huan-Shu-Fei-Tzu No. 34551, August 30, 1991.
every month became a severe pollution problem. Therefore, the DOH could not but change its policy which in turn changed the "correct knowledge" regarding hepatitis B control.

In 1987, in order to diminish disposable utensil use, the Bureau of Food Sanitation of the DOH began promoting either a high-temperature dishwasher or a three-tank washing device to big dietetic groups, especially schools.\textsuperscript{132} The Director of Communicable Disease Control of the DOH Chuang Cheng-hua reported that:

For the environment protection reason, we do not encourage institute and school food service to use polystyrene-made utensils instead of good washing facilities. Polystyrene-made utensils are expected to restricted in certain users, such as hawkers.\textsuperscript{133}

Later, in 1988, the DOH asked Taiwanese people to use bamboo-made utensils or paper-made utensils on the one hand, and propagated that polystyrene utensils were not safe enough for food on the other hand.\textsuperscript{134} Finally, in March


\textsuperscript{133}The DOH document The Letter of Chuang Cheng-hua to Dr. Goh Kee Tai, October 20, 1987.


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1993, the Hepatitis Control Committee of the DOH decided to revise the "correct knowledge" of saliva transmitting the hepatitis A virus rather than the hepatitis B virus. In other words, using disposable utensils to prevent hepatitis B infection was not "correct knowledge" anymore.

The thousands of tons of used polystyrene utensils became a social problem as a result of the "correct knowledge" of hepatitis B control. To resolve this social problem, the DOH revised its policy and finally changed the content of the "correct knowledge." The DOH’s policy was not independent of its own "correct knowledge." For the DOH policy to have existed at all implied certain "correct knowledge." Thus the revision of a policy denoted the change of certain "correct knowledge." The DOH changed its policy regarding hepatitis B control not only in response to the environmental pollution, but also in response to a social problem involving discrimination against carriers. The next section discusses the details.

**Discrimination Against Carriers**

As discussed above, when the DOH promoted the "correct knowledge"

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expensive than polystyrene ones, many restaurants and hawkers still used polystyrene ones until 1993.

regarding hepatitis B control to various people, the DOH emphasized the "severity" of hepatitis B in order to attract the publics’ attention. Although there was no proof yet, among the DOH’s arguments lay a big concern that carriers might develop cirrhosis or hepatoma in the future. This statement appeared everywhere. Through this kind of strategy, the DOH seemed successful in attracting much public attention to hepatitis B control. But some social problems emerged when many Taiwanese people accepted the "correct knowledge."

In 1981, Hsu Chu-tao, Director of the Bureau of Communicable Disease Control of the DOH, told a story about one of his friends, an old physician, who worried about where to find a "healthy" girl to be a candidate for his son’s wife. This physician said that his only requirement was that she not be a carrier. Hsu Chu-tao continued that "from this story, you know how terrible hepatitis B is."\(^{136}\) Hsu Chu-tao wanted to argue for the hepatitis B control program because hepatitis B was a severe disease from a physician’s point of view. But his story also revealed that hepatitis B carriers in particular might be discriminated against because they might transmit HBV, which in turn might cause cirrhosis or hepatoma.

In July 1982, some newspapers reported that China Ship Corporation fired some food handlers and hundreds of part time employees because they were carriers. The corporation asked the full time employees who were carriers not to enter the

\(^{136}\) Chingnien jih pao, August 15, 1981.
corporation’s restaurants and cafeterias until they recovered.\textsuperscript{137} In August 1982, \textit{Minsheng pao} reported that some gynecologists refused to deliver the babies of carrier mothers, one hospital excluded carriers as nursing candidates, and one surgeon refused to operate on a carrier.\textsuperscript{138} In March 1983, one of Taiwan Province’s assemblyman Hung Chen-tsung even asked the Department of Health of Taiwan Province to prohibit carriers from kissing their lovers(Figure 4-17).\textsuperscript{139} Later, in April 1983, Taipei Blood Center said that it planned to change the way of mailing donors’ blood test reports because some donors complained that their friends began keeping away from them when the test reports showed that they were carriers.\textsuperscript{140}

The negative image about carriers also existed among the government’s officials. In September 1982, one STAG official Lei Yu Hsiu-hua wrote a report regarding HBV prevention to Minister Lee Kuo-ting. She pointed out that although the exact mode of HBV transmission was still unclear, carriers had better avoid dining in restaurants. She also suggested that carriers avoid serving as food


\textsuperscript{139}\textit{Taiwan jih pao}, March 18, 1983; \textit{Minsheng pao}, March 18, 1983.

\textsuperscript{140}\textit{Minsheng pao}, April 17, 1983.
handlers.\textsuperscript{141}

In August 1983, the Hepatitis Control Committee of the DOH discussed a case concerning the Ministry of Interior(MOI) asking whether or not HBeAg carriers should be allowed to serve as food handlers. The committee asked every member to offer their opinions before the meeting in writing regarding the question of the MOI. There were various opinions among the members. Two members asserted that the MOI should prohibit carriers from being food handlers because they might transmit HBV. One thought that although saliva hardly transmitted HBV, carriers had better not be food handlers since they might have open wound. Two members stated that the MOI should prohibit hepatitis A patients rather than HBV carriers from being food handlers since HAV was transmitted via saliva. Two members did not take any position.\textsuperscript{142}

In the August 25, 1983 meeting, however, the committee members showed no concern about the modes of HBV transmission. Hsu Shu-tao said, "the Bureau of Communicable Disease Control does not want carriers to be prohibited from being food handlers since the prohibition will influence too many people." Lin Chao-ching said, "if carrier food handlers take care of themselves, they may not infect others."

\textsuperscript{141}The STAG document \textit{Juho yüfang B-hsing kanyen}(How To Prevent Hepatitis B Virus), by Lei Yu Hsiu-hua, September 4, 1982.

\textsuperscript{142}The DOH document \textit{Kanyen fang chih weiyüanbui 73 nientu ti 1 tz'u huiyi chilu}(The Minutes of the First Meeting of the Hepatitis Control Committee in FY 1984), August 25, 1983. The members who submitted their opinions regarding the MIO's question before the committee meeting were anonymous.
Chen Ding-shinn asserted, "[The DOH] had better not ban carriers from serving as food handlers in order to avoid social problems." In addition, Chen Ding-shinn added, "since most of the Taiwanese people have anti-HBs, carriers serving as food handlers will not cause contagious problems." Finally, the committee members reached a consensus and replied to the MOI that "if carriers’ GOT, GPT, and CCF values are under a acceptable limit—that is, their HBV transmission possibility is low—they can serve as food handlers."\textsuperscript{143}

Among the members’ opinions submitted before the meeting, whether to ban carriers from serving as food handlers or not were based upon their "knowledge" about the modes of HBV transmission. Their opinions focused upon whether saliva would transmit HBV or HAV. In contrast, in the meeting, the members mostly showed concerns about the possible social impact if MOI prohibited millions of carriers from serving as food handlers. In other words, the committee reached their consensus based upon their social considerations rather than "scientific knowledge."

On the one hand, the DOH emphasized the "severity" of hepatitis B in order to convince Taiwanese people of the importance of the hepatitis B control program. On the other hand, the DOH worried about the discrimination against carriers due to the over-emphasized "severity" of hepatitis B. The DOH appealed to Taiwan’s

\textsuperscript{143}Ibid. GOT, GPT and CCF were liver function indexes. GOT is glutamic-oxaloacetic transaminase. GPT is glutamic-pyruvic transaminase. CCF is cephalin cholesterol flocculation.
companies not to discriminate against carriers; otherwise, "the discrimination against 2,800,000 carriers may cause social problems." The DOH also enforced its health education in order to spread "correct knowledge," advocating that if people followed the DOH's advice to prevent HBV, people did not need to be afraid of carriers or even discriminate them. But discrimination against carriers still happened again and again.

**Taking Advantage of Discrimination?**

On June 11, 1990, the Ministry of Defense (MOD) announced that if a man had acute hepatitis or abnormal liver function, or was HBsAg & HBeAg positive, his military grade of physical fitness would be "E." He would need to wait for one year to be re-examined. If he remained in the same condition for one year, he would be

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145 The DOH document Kanyen fangchih weiyüanhui 72 nientu ti 4 tz’u huiyì chilu (The Minutes of the Fourth Meeting of the Hepatitis Control Committee in FY 1983), May 26, 1983.

146 For example, the DOH reported that a woman banned her daughter-in-law from dining with the family because she was a carrier. This woman even forced her son to divorce with his wife. See Chunghua jih pao, February 26, 1988.
graded "C" and would only need to serve as a civilian soldier for three months.\textsuperscript{147}

It seemed that the regulation discriminated against carriers, since carriers’ "rights" of serving in military were compromised. But some draftees welcomed this kind of "discrimination." In August 1990, \textit{Lienho pao} reported that some students of medical colleges used their knowledge to counterfeit HBeAg carrier certificates which waived their compulsory military service.\textsuperscript{148} One physician also said that some parents made efforts to get HBeAg certification for their sons who were only HBsAg carriers.\textsuperscript{149}

The DOH and some hepatitis researchers did not endorse the decision of the MOD. One member of the Hepatitis Control Committee of the DOH, Chen Ding-shinn, pointed out:

18\% of Taiwanese draftees are HBsAg carriers, and half of them are HBeAg carriers.... Asymptomatic carriers can act as normal people in the military. Only carriers who have cirrhosis or chronic active hepatitis need to take more rest. If draftees do not share towels, razors,
and toothbrushes, carriers would hardly infect others.\textsuperscript{150}

The Deputy Director of the Bureau of Communicable Disease Control Hsu Hsu-mei also said that the knowledge of the MOD regarding hepatitis B was out-of-date because "now it is well known that HBV does not infect people through saliva or food."\textsuperscript{151} Both Chen Ding-shinn and Hsu Hsu-mei thought that the MOD’s decision was based on "wrong concepts" and would compromise the justice of the compulsory military service system.\textsuperscript{152}

But the Bureau of Military Medicine showed no concern over these criticisms at first. Rather, it planned to revise the regulation of the military physical fitness, giving draftees who were HBeAg carriers grade C rather than E. That is, they did not need to wait for one year to be re-examined. The Bureau of Military Medicine explained that since most HBeAg carriers retained the same status for more than one year, they didn’t need to waste time in waiting even a single year.\textsuperscript{153}

In September 1990, Chiang Kai-shek Military Cadre Preparatory School dropped 105 new high school students because they were HBeAg carriers. They could not get readmission until they recovered one year later. The school said that

\textsuperscript{150} Lienho wan pao, August 22, 1990.

\textsuperscript{151} Ibid.

\textsuperscript{152} Ibid.

\textsuperscript{153} Lienho wan pao, August 25, 1990; Chunhua jih pao, August 26, 1990; Taiwan jih pao, August 30, 1990.
their decision was based upon the standard of draftees' physical fitness of the MOD. The Bureau of Military Medicine explained that "since carriers may develop cirrhosis of hepatoma in the future, the military school cannot but drop carrier students in order to purify the military cadres at the beginning." In addition, the bureau added that "carriers do not fit in the military well since they may infect others on the one hand, and the military cannot offer them the necessary rest for their recovery on the other."154

The Director of the Bureau of Communicable Disease Control of the DOH Chuang Cheng-hua criticized "the military school’s decision as unreasonable." He pointed out:

More than 90% of teenagers infected by HBV produce antibodies and recover. Therefore, the military does not need to worry about the infection problem in a group. Even if a person is infected by HBV and becomes a carrier, the possibility of developing cirrhosis or hepatoma is very low. Even though carriers may develop cirrhosis or hepatoma, it will not happen until forty or fifty years later. At that time, the

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carrier military students will have retired from the military.\textsuperscript{155}

Chuang Cheng-hua also cited a research report of Dr. Shou Lien, who served in the National Defense Medical Center, to argue against the military school's decision. The 832 research subjects of Shou Lien's research report were also high school students.\textsuperscript{156} On the basis of this research result, Chuang Cheng-hua said that 1.4\% of carriers would recover and produce antibodies annually. He concluded that "if other schools and companies have the same attitude as the military school toward carriers, the carriers' social rights of survival will be deprived."\textsuperscript{157}

Some hepatitis researchers, such as Chu Chia-min, a physician at Chang Gung Memorial Hospital, and Lee Ching-yun, a pediatrician at National Taiwan University, also supported Chung Cheng-hua's arguments. Lee Ching-yun said that if all schools excluded carrier students, 15\% of the Taiwanese population would be deprived of their rights of education. He said that "the military school's decision is not humanitarian."\textsuperscript{158}


\textsuperscript{156}In fact, all the research subjects of Shou Lien's study were students of Chiang Kai-shek Military Cadre Preparatory School. See the report of DOH research project DOH-H7808, June 1989. But Chuang Cheng-hua and journalists covering the story did not point out this point.

\textsuperscript{157}Lienho pao, September, 4, 1990; Chunghua jih pao, September 4, 1990; Tzuli tsao pao, September 4, 1990.

\textsuperscript{158}Minsheng pao, September 4, 1990; Chungkuo shih pao, September 10, 1990.
Responding to the parents' anger of the dropped students and the criticism of the DOH and some hepatitis researchers, the Dean of National Defense Medical Center Yin Tsai-hsin held a dinner meeting on September 27, 1990, inviting DOH officials and some researchers to communicate with each other.¹⁵⁹ Later, in January 1991, the Bureau of Military Medicine, the DOH, and some hepatitis researchers reached a compromise. Among hepatitis B carriers, graded C of the draftee's physical fitness scale would only include HBeAg carriers whose abnormal liver function remained for one year, and whose liver function ALT index was two times more than normal value.¹⁶⁰

This new decision of the Bureau of Military Medicine opened the door wider for carriers to attend the military. In other words, the degree of discrimination against carriers would be less severe than before. But many carriers did not welcome this "improvement." In 1990, there were about 5000 men graded E in the draftees' physical fitness scale because they were HBeAg carriers. They had waited for one year to be re-examined.¹⁶¹ If they retained HBeAg carrier status, they would be re-graded C and only serve in the military for three months, according to the old

¹⁵⁹Lienho pao, September 28, 1990; Lienho wan pao, October 5, 1990; Chingnien jih pao, October 6, 1990. The invited hepatitis researchers included Chen Ding-shinn and Shou Lien, and Han Shao-hua.


standard. But the new standard was much stricter than the old one; that is, many of them might be re-graded B and need to serve in military for two years.

Many of the HBeAg carrier draftees' parents organized to strive for their sons' "rights." Contrary to the opinions of the parents of the dropped military school students, these HBeAg carrier draftees and their parents argued that the military should refuse HBeAg carriers because carriers would infect others, and an addition, that military practice was dangerous to carriers. They wanted the old standard back.  

Finally, the MOD compromised putting the new standard in force from July 1991, but admitting the 5000 HBeAg carriers who were graded E in 1990, who would be re-examined with the old standard.  

In this case, both the "severity" of HBeAg carrier status and the infection possibility of carriers were the focus of the debate. At first, on the basis of the DOH's "correct knowledge," the Bureau of Military Medicine thought that HBeAg carriers were not good for the military, since hepatitis B was a severe disease which might develop cirrhosis and hepatoma in the future, and since carriers would infect others. But when the DOH found that the MOD's standard of draftees' physical fitness was too loose and thereby influenced some carriers' future, the DOH argued that hepatitis B was not so terrible, the possibility of developing cirrhosis or

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hepatoma from carriers was low, and that carriers could act as healthy people could. The "severity" of hepatitis B suddenly disappeared.

Conclusion

In this chapter, the social contingency of scientific knowledge and the participation of government agencies and government scientists in proposing and promoting "correct knowledge" regarding hepatitis B control provide insights into the political dimensions of scientific practice in Taiwan. When the DOH designed a policy regarding hepatitis B control, the policy implied certain "correct knowledge." The change of the DOH's policy meant the change of its "correct knowledge." Various politicians and government leaders, social pressures and social problems all influenced the direction of the DOH's policy, which in turn changed the content of the DOH’s "correct knowledge."

In order to promote the hepatitis B control program, the DOH proposed some "correct knowledge," such as the "severity" of hepatitis B, the mode of HBV transmission, and how to prevent HBV infection. The DOH stated that carriers would likely develop cirrhosis or hepatocellular carcinoma in the future. Without this
"correct knowledge," the "severity" of hepatitis B would be downgraded. But in the 1980s, no direct evidence supported this "correct knowledge." However, when many carriers were discriminated against, the DOH changed its "correct knowledge" and emphasized that for asymptomatic carriers, the possibility of developing cirrhosis or hepatocellular carcinoma was very low. In other words, hepatitis B was not severe enough anymore.

In the 1980s, except by blood, the modes of HBV transmission remained unclear. But under policy considerations, the DOH stated that HBV could be transmitted via saliva and contaminated utensils. Therefore, the DOH promoted disposable utensils and a new dining manner, "Chinese food, Western style." On the one hand, the DOH could improve dietetic hygiene and control hepatitis A by hitching a ride on the hepatitis B control program. On the other hand, these measures could meet the requests of some politicians. But when polystyrene utensils created a big environment problem and many carriers were discriminated against in restaurants or family dining tables, the DOH changed its policy, which in turn changed the "correct knowledge."

Although the DOH's "correct knowledge" regarding hepatitis B control shifted when its policy changed, one kind of "correct knowledge" could never be compromised: the safety of the hepatitis B plasma vaccine. Without this "correct knowledge," the DOH's hepatitis B control program and the NSC's biotechnology program would fail. In chapter three, I discussed how the safety of the vaccine was
established in public discourse after the 1981 controversy was resolved. In this chapter, I have shown how some "correct knowledge" provided the basis of the hepatitis B control program. The government agencies and government scientists made efforts to promote this "correct knowledge" to various populations. But in 1987 and in 1991, Lifeguard's hepatitis B plasma vaccine was challenged, even though no reports surfaced of severe side-effects or injury. The next chapter examines the details.
Chapter Five

Reshaping the Safety of the Plasma Vaccine

In chapter four, we saw how DOH policy considerations and social problems shaped and reshaped certain "correct knowledge" regarding hepatitis B control. This chapter explores social contingencies of the safety of the hepatitis B plasma vaccine from the perspective of two controversies--one in 1987, the other in 1991, both over vaccine safety. In the controversies, political operations of government officials and politicians reshaped the concepts of vaccine safety again and again.

As discussed in chapter three, the KMT government advocated the hepatitis B control program partly for the sake of promoting biotechnology in Taiwan. Public acceptance of the hepatitis B plasma vaccine guaranteed Taiwan's domestic market for the NSC's on-going hepatitis B vaccine production program. Therefore, the scientific status of the plasma vaccine safety could never be downgraded.

This chapter investigates how politicians, pharmaceutical companies, and the changing political and economic context in Taiwan together reshaped the "safety" of the plasma vaccine, even though no reports surfaced of serious injury resulting from the plasma vaccine in the 1980s. Also, this chapter examines how government
officials and government scientists developed various strategies to protect and argue for the Lifeguard’s plasma vaccine.

The Recombinant DNA Hepatitis B Vaccine

How to choose a vaccine might depend upon specific criteria, such as safety, efficacy, duration of the immunity, and cost. When no one could tell the significant difference between two vaccines according to these criteria, how could anyone choose either? This section examines how the recombinant DNA hepatitis B vaccine beat the plasma vaccine when both of them met the same criteria. The competition between the two vaccines would significantly influence the development of the 1987 and 1991 controversies.

Potential Crisis

Since the hepatitis B plasma vaccine was the first vaccine made by human serum, safety concerns for this vaccine remained. For example, in 1986, Donald
Francis and his colleagues (1986:869) observed that "although over 1 million Americans have received the hepatitis B vaccine, many others have been reluctant to be immunized for fear of contracting acquired immunodeficiency syndrome (AIDS)."

They offered some possible reasons for this phenomenon:

This reluctance stems from the fact that (1) persons at risk of acquiring AIDS, especially homosexual men, are known to have donated plasma used to manufacture hepatitis B vaccine; (2) the causative virus of AIDS is known to circulate in the plasma of persons at risk for acquiring AIDS as well as those with AIDS; and (3) donor plasma, concentrated into another plasma product (factor VIII concentrate for the treatment of hemophilia A), has infected recipients, some of whom subsequently have developed AIDS (Francis et al., 1986:869).

In other words, the AIDS issue became a "potential crisis" of the plasma vaccine.

Besides AIDS, whether the plasma vaccine contained any unknown virus was another safety concern. In 1986, George F. Grady (1986:250) observed that "because the use of human plasma containing abundant viral components is unprecedented in vaccine production, one can understand why the licensing authorities have had to take special pains in answering their standard questions about purity, potency, efficacy, and safety." Although the U.S. FDA had licensed the plasma vaccine and the U.S. Centers for Disease Control repeatedly endorsed its safety (Centers for Disease Control, 1982; 1983; 1984; 1985), many reports observed that the plasma vaccine
was poorly accepted in the United States because of the fear of possible AIDS or other unknown virus infection through the vaccine (Centers for the Disease Control, 1984; 1985; Grady, 1986; FDA Consumer, 1986).

The appearance of the recombinant DNA hepatitis B vaccine threatened the plasma vaccine. Many researchers (Linnebank, 1983; Stevens et al., 1984; McAleer et al., 1984) expected that the recombinant DNA hepatitis B vaccine would be much cheaper than the plasma vaccine since the source of serum was limited and the safety tests were expensive. In addition, increased vaccine trials reported that the new vaccine was as good as the plasma vaccine in safety, immunogenicity, and efficacy (Jilg et al., 1984; Scolnick et al., 1984; Dandolos et al., 1985; Stevens et al., 1987). Most importantly, the supporters of the new vaccine emphasized that it had no concerns over AIDS (Scolnick et al., 1984; Dandolos et al., 1985; Castro, 1986; Hoppe & Hamilton, 1986; Stevens et al., 1987). For example, Edward M. Scolnick and his colleagues raised the AIDS issue as a "potential crisis" of the plasma vaccine in favor of the new vaccine:

Even though multiple inactivation treatments used in the antigen purification process have been shown to inactivate representatives of all major groups of animal viruses, concern over the theoretical possibility of a living organism such as the etiologic agent of acquired immune deficiency syndrome being present in plasma and surviving the purification and inactivation procedures has slowed acceptance of
hepatitis B vaccine. A promising alternative to infected human plasma as a source of HBsAg for vaccine is the use of recombinant DNA technology to effect synthesis of the surface antigen by a culture of microorganisms (Scolnick et al., 1984:2812).

Summarizing the advantages of the recombinant DNA vaccine over the plasma vaccine, E. Dandolos and his colleagues showed optimism about the new vaccine:

[T]he high cost and limited availability have prevented widespread use of these vaccines, especially in the less developed areas where they are needed most. … [A]cceptance may have been affected by unfounded loss of confidence in the safety of the vaccine, following expression of fear of transmission of AIDS because of the inclusion of infectious plasma obtained from homosexual donors in the initial pool, even all the evidence shows that there is no such risk. A hepatitis B vaccine produced by recombinant technology may offer a solution to these difficulties (Dandolos et al., 1985:57).

But the recombinant DNA vaccine did not soon replace the plasma vaccine because of either better safety or expected cheaper price. In 1986, when the U.S. FDA licensed the recombinant DNA vaccine, Janice Castro (1986) reported that "for the time being, both vaccines will cost patients $110 for a course of three inoculations." Richard Hoppe & Joan O'C Hamilton (1986) also reported that "for now, at least, Merck says it plans to sell the two for the same price and keep both
forms of the vaccine on the market." After one year, F. Blaine Hollinger discussed whether or not to switch from the plasma vaccine. He compared these two vaccines in safety and cost:

Both vaccines are safe. Adverse reactions are limited to mild discomfort or erythema at the injection site in 10% to 20% of the recipients. Systemic reaction, e.g. [sic], fever, occur in fewer than 1% and rarely exceed 1°C above an individual’s baseline temperature. No serious long-term side effects have been observed.... It is unfortunate that no initial cost reduction is anticipated for the yeast-recombinant vaccine, which employs state-of-the-art technology for its development (Hollinger, 1987:2634).

Hollinger (1987:2635) suggested that the choice of a vaccine depended upon the considerations regarding safety, efficacy, duration of the immunity, and cost. He concluded that "physicians and health care providers should not hesitate to recommend the plasma derived vaccine." (Hollinger, 1987:2636) Until 1991, Peter M. Ndumbe (1991: 1136) still reported that "the world’s poorer countries have not benefited from the [hepatitis B] vaccine because of its prohibitive cost." Since the safety, efficacy, duration of the immunity, and cost of the two vaccines had no significant difference, it seemed that the fear of transmitting AIDS gradually drew the plasma vaccine off the market. As Dori Stehlin (1990:16) reported in FDA Consumer:

The original plasma-derived vaccine, licensed in 1982, is no longer
being manufactured. Because the vaccine was made from the plasma of chronic carriers of hepatitis B, many of whom are also at high risk for AIDS, there was concern that the vaccine might transmit the AIDS virus.

This kind of fear of transmitting AIDS from the plasma vaccine also appeared in Taiwan and created a controversy over the safety of Lifeguard’s plasma vaccine in 1987. Later sections examine the details.

The New Vaccine in Taiwan

As discussed earlier, the government supported the hepatitis B control program partly because the NSC could take advantage of this program to develop biotechnology. Since the NSC promoted a recombinant DNA hepatitis B vaccine producing program as the initial basis of developing biotechnology, the NSC paid attention to the worldwide development of the new vaccine.

Since it would take two to three years for the NSC to establish Lifeguard’s factory and produce the first batch of the plasma vaccine, when the recombinant DNA vaccine would be available became crucial. On August 22, 1983, Tien Wei-cheng, Director of Biology Development Programs of the NSC, reported to Minister Lee Kuo-ting that:
The NSC is collecting the information regarding the development of the recombinant DNA hepatitis B vaccine. The estimation of its marketing schedule will significantly influence our plan of establishing a plasma vaccine factory.\(^1\)

After the NSC had planned to established a plasma vaccine plant, the NSC still kept in touch with foreign pharmaceutical companies about the technology of the new vaccine. On September 15, 1983, Wang Chi-wu, the Vice-Chairman of the NSC told A. E. Cohen of Merck:

I wish to clarify that we are not disinterested about your present HBV technology but that it will take us a little time to make a trade-off study on whether we should contract your current technology now or should we wait a year or two and then contract your new technology.\(^2\)

In 1983, Chen Ding-shinn estimated that the new vaccine would be on the market in 1985 or in 1986. He suggested Minister Lee Kuo-ting consider establishing a new vaccine factory because "the new vaccine was expected to be cheaper than the plasma

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\(^1\)The NSC document *Tien Wei-cheng paokao* (The Report of Tien Wei-cheng to Minister Lee Kuo-ting) on August 22, 1983.

\(^2\)See the NSC documents: the telegram of Wang Chi-wu to A. E. Cohen of Merck on September 15, 1983. Also see the telegram of A. E. Cohen of Merck to Wang Chi-wu on September 14, 1983; the telegram of Wang Chi-wu to Iain P. N. Buchanan of Biogen on September 14, 1983.
vaccine and would be free from AIDS." In other words, the government officials and government scientists recognized that the recombinant DNA vaccine might be the potential competitor of the plasma vaccine and the AIDS issue might be the potential crisis of the plasma vaccine.

In early 1984, several months after the NSC contracted with Pasteur for the technology of the plasma vaccine, the result of a clinical evaluation in healthy adults of Merck’s recombinant DNA vaccine was published. Edward M. Scolnick and his colleagues (1984:2815) reported, "the results of this study indicate that an alum-absorbed hepatitis B vaccine formulated using HBsAg of subtype adw synthesized by recombinant yeast cells is safe and immunogenic for men." That is, the development of the new vaccine put more pressure on the Lifeguard’s plasma vaccine.

Soon Director General of the DOH Hsu Tzu-chiu expressed his interest in the new vaccine. He emphasized, "for public health, the government has the responsibility of providing a safer and cheaper vaccine to every citizen." The NSC reacted strongly to Hsu Tzu-chiu’s consideration. Wang Chi-wu reported to Minister Lee Kuo-ting that "the NSC is negotiating with Genentech, Biogen, Merck, and Pasteur about the recombinant DNA vaccine and plans to use a uniform protocol to

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3See the STAG documents: Chen Ding-shinn’s comments on the report of Tien Wei-cheng to the Minister Lee Kuo-ting about vaccine production on August 22, 1983; the report of Chen Ding-shinn on September 28, 1983 to Minister Lee Kuo-ting about the discussion meeting regarding producing hepatitis B vaccine on September 20, 1983.

do a clinical trial in Taiwan in 1985." Wang Chi-wu suggested that "the government had better keep silent about the new vaccine before the negotiation is settled." In other words, the NSC showed interest in keeping the development of the new vaccine in Taiwan under its control.

Inside the STAG, the reaction was moderate. One member, Lan Chung-fu, suggested that "the government consider the development of the new vaccine to decide whether to revise the plasma producing plan or not." Another member, Chen Ding-shinn, commented on Hsu Tzu-chiu's consideration, "if the new vaccine has gained the FDA's IND (Investigative New Drug), it is necessary to do a clinical trial of the new vaccine in Taiwan in principle because the new vaccine is the trend." However, Chen Ding-shinn added that "the government should consider whether or not the clinical trial of the new vaccine influences the current mass vaccination program, the plasma vaccine producing program, and the future program of transferring biotechnology."

Since the government felt the threat of the new vaccine to Lifeguard's plasma

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5See the STAG document: the comment of Wang Chi-wu on the August 5, 1984 report of Minsheng pao, which was submitted to Minister Lee Kuo-ting on August 20, 1984. Lee Kuo-ting directed the STAG "to follow Chi-wu's opinions."

6The STAG document: Lan Chung-fu's comment about Tien Wei-cheng's report to Minister Lee Kuo-ting, August 22, 1983.

7See the STAG document: the comment of Chen Ding-shinn on the August 5, 1984 report of Minsheng pao, which was submitted to Minister Lee Kuo-ting on August 16, 1984.
vaccine, the clinical trial of the recombinant DNA vaccine in Taiwan was not smooth. As mentioned in chapter three, in 1981, when Beasley wanted to do the clinical trial of the plasma vaccine, he got the full support of the government. He also got research grants from the NSC to do a follow-up efficacy study of the clinical trial and another clinical trial of low-dose plasma vaccine from 1984 to 1989. But in 1984, when he proposed a clinical trial of the recombinant DNA hepatitis B vaccine, the DOH delayed approval until 1986. In addition, he could not get the research grant for the new clinical trial from the NSC or the DOH.

In Beasley's first proposed clinical protocol, he called the plasma vaccine "the first generation vaccine" and called the recombinant DNA vaccine "the second generation vaccine." These terms implied that "the second generation" would be better than "the first generation." Besides, Beasley said that "the second generation

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8The grants that Beasley and his colleagues got from the NSC were NSC70-0412-B043-04, NSC70-0412-B43-05, NSC73-0606-B43-02, NSC75-0610-B004-54, NSC76-0610-B002-61, NSC77-0610-B002-85 etc.

9See the DOH documents: University of Washington Medical Research Unit Applying for Clinical Trial of the Recombinant DNA Hepatitis B Vaccine in Taiwan, URMRU/RPB: CT 84-153, August 10, 1984; the comment of Sung Juei-low on Beasley's letter on September 21, 1984; 75.8.20. Wei-Shu-Yao-Tzu No. 607143, August 20, 1986.

10The Director of the Bureau of Pharmaceutical Affairs of the DOH Huang Weng-Foung appealed to correct the name of hepatitis B vaccines from "the first generation vaccine" to "the plasma vaccine" and from "the second generation vaccine" to "the recombinant DNA vaccine." See Minsheng pao, May 14, 1987. He argued that the names "first generation" and "the second generation" would mislead the audience into thinking that "the second generation" would be better than "the first generation." I interchangeably use these terms in the text, depending upon the context.
vaccine would be free from plasma contamination and more immunogenic than the first generation vaccine, "implying that the plasma vaccine might be contaminated by some virus. What Beasley said about the new vaccine made the AIDS issue more likely a "potential crisis" of the plasma vaccine and contradicted the interests of the current hepatitis B control program. The DOH asked Beasley "to delete the statements that the second generation vaccine is better and safer than the first generation vaccine, because these statements would mislead the parents and seriously influence the mass vaccination program."

In the circumstance that the government felt the threat of the new vaccine to Lifeguard’s plasma vaccine, Beasley’s clinical trial of the new vaccine was welcomed not as warmly by the government as his previous clinical trials of the plasma vaccine. The DOH did not allow this trial to enroll HBsAg positive mothers’ infants, who had been enrolled in the mass vaccination program from 1984. So this trial was forced to enroll non-carrier mothers’ infants. In addition, when the trial began on August

where actors used it.

11The DOH document University of Washington Medical Research Unit Applying for Clinical Trial of the Recombinant DNA Hepatitis B Vaccine in Taiwan, URMRU/RPB: CT 84-153, August 10, 1984.


13If the subjects of this clinical trial were non-carrier mothers’ infants, even though the result was excellent, it would be difficult to use this result to apply for license because the efficacy of this vaccine on high-risk infants was unknown. So the Director of the Bureau of Pharmaceutical Affairs Huang Weng-foung said, "the result
18, 1986 in Taipei, the DOH and the Government Information Office did not
calculate it as they did for the trial of the plasma vaccine in 1981. Therefore, few
people were enrolled in this trial.\textsuperscript{14}

\textbf{The Second Controversy Over the Plasma Vaccine}

This section investigates how the AIDS issue, the newspapers’ reports
regarding the licensing examination of Lifeguard’s vaccine, and the rhetorical
arguments of some critics shaped a controversy over the safety of the Lifeguard’s
vaccine in 1987. By looking at the license examination process of Lifeguard’s
vaccine, this section displays how the power structure of the Hepatitis Control
Committee shaped the interpretative flexibility of statistical data, which in turn
decided the safety and efficacy of Lifeguard’s vaccine. From the 1987 controversy,

\textsuperscript{14}Minsheng pao, August 19, 1986.
this section examines the socially contingent characteristics of the vaccine safety and how the political operations of government agencies reestablished the safety of the vaccine.

Informal Barriers

Government agencies set up certain informal barriers to the importation of the foreign vaccines. As mentioned in chapter four, in 1984, under the direction of the STAG and through the mouth of the Hepatitis Advisory Committee, the DOH agreed to control the importation of foreign plasma vaccine in order to meet the NSC's interest in protecting Lifeguard. However, after the U.S. FDA licensed Merck's recombinant DNA vaccine in 1986, the possibility of freely importing it would become a threat to Lifeguard's plasma vaccine. During 1987 and 1988, when Lifeguard failed in supplying vaccine in time on several occasions, many legislators repeatedly asked the DOH to open the domestic market to the recombinant DNA vaccine. Especially during the trend of liberalization in Taiwan from the mid-

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"See the statements of legislators on The Communique of the Legislative Yuan: Huang Cheng-yi et al. on May 30, 1987; Pan Chih-cheng et al. on November 6, 1987; Hung Wen-tung on November 27, 1987; Chiu Lien-hui on December 15, 1987; Hung Wen-tung on March 25, 1988; Hung Wen-tung on April 5, 1988; Hsu-chang Ai-lien on April 6, 1988; Hung Wen-tung on April 6, 1988."
1980s (Wang JH, 1989), it was not easy to find a legitimate reason to prohibit the importation of the new vaccine.

On March 20, 1987, the STAG held a meeting, chaired by Minister Lee Kuo-ting, to discuss the development of the NSC’s recombinant DNA vaccine research program.\textsuperscript{16} The participants included the delegates of the NSC, the DOH, the DCB, the Ministry of Economic Affairs, and Lifeguard. Lee Ti-yuan, the Deputy-Director of the DOH, said, "the DOH feels bothered about how to examine the foreign recombinant DNA vaccine in order to balance the policy of promoting domestic pharmaceutical industries and the interests of foreign companies." Chang Tien-hung of Lifeguard emphasized that "Lifeguard hopes to get the license of its plasma vaccine in May;" in addition, "our recombinant DNA vaccine is scheduled for Phase II in September 1989 and then we would apply for the approval of a clinical trial."

Chang Tien-hung continued arguing for Lifeguard’s plasma vaccine:

Worldwide experts praised our hepatitis B control program. On May 26, 1986 in WHO’s London meeting regarding hepatitis B vaccines, Pasteur of France suggested a cooperation [with Taiwan] that proposed a "comprehensive hepatitis B control service" to the WHO. This plan included using hepatitis B plasma vaccine, public health education

\textsuperscript{16}The STAG document Wokuo tzuchih B-hsing kanyen yimiao fachan chianpao huivy chilu(The Minutes of the Meeting Regarding Self-Made Hepatitis B Vaccine Producing Program), March 20, 1987.
counsels, and establishing organizational infrastructure.\textsuperscript{17}

In other words, according to Chang’s arguments, if Taiwan wanted to establish a reputation concerning hepatitis B control and thereby re-build a connection with the WHO,\textsuperscript{18} Taiwan had better continue using the plasma vaccine rather than switch to the new vaccine, which would mean a new beginning.

Finally, Minister Lee decided a policy of protecting Lifeguard’s plasma vaccine:

(1) The DOH should soon begin the procedure of purchasing Lifeguard’s plasma vaccine. (2) Since our hepatitis B control program runs very well, we should introduce it to other countries in order to establish an international reputation and thereby try to re-build a connection with the WHO. (3) The DOH should seriously examine the license application of foreign recombinant DNA vaccine. The foreign pharmaceutical companies should do a complete safety test and clinical trial of the new vaccine in Taiwan. Furthermore, the new vaccine should meet the vaccination schedule of our mass vaccination program.\textsuperscript{19}

\textsuperscript{17}Ibid.

\textsuperscript{18}After Taiwan left the United Nations in 1971, Taiwan was excluded from all UN’s organizations, including the WHO.

\textsuperscript{19}Ibid.
The conclusions of the meeting set an informal barrier to the importation of the foreign recombinant DNA vaccines. Since the DOH as yet lacked a standard to examine the recombinant DNA vaccines, the foreign pharmaceutical companies had to wait for the completion of the standard. The timing of the completion would be arbitrary. Besides, the content of the standard might be negotiable in order to favor Lifeguard’s recombinant DNA vaccine and place the foreign vaccines under a disadvantage. Although foreign recombinant DNA vaccines had begun clinical trials in Taiwan, their subjects were non-carrier mothers’ infants rather than high-risk infants, as mentioned above. It meant that they would have no necessary data regarding the efficacy of the new vaccines on Taiwanese high-risk infants. Therefore, the DOH might have reasons to exclude the new vaccines from the mass vaccination program. Moreover, both the recombinant DNA vaccines of Merck and SK/RIT were originally designed as a three-dose schedule. They would have to adjust themselves to the four-dose schedule in order to participate in the mass vaccination program. It was not easy for the foreign pharmaceutical companies to break through any of these informal barriers. But they would fully use the AIDS issue as a "potential crisis" of the plasma vaccine to put pressure on the DOH. The following sections detail how these informal barriers protected Lifeguard’s plasma vaccine.

Negotiating the Vaccine License Standard

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Although Lifeguard was the product of the NSC’s biotechnology program, the DOH asked Lifeguard to follow the WHO’s standard of producing hepatitis B plasma vaccine. Since the hepatitis B plasma vaccine was the first vaccine made by human serum, the WHO set up a very strict standard for the production of this vaccine. The WHO asked for five consecutive chimpanzee tests and then a clinical trial (Peng CT, 1984). This rigid standard conflicted with the NSC’s interests in marketing Lifeguard’s vaccine as soon as possible.

In August 1985, according to the schedule of the NSC, Lifeguard at first planned to apply for its plasma vaccine license on March 27, 1986, and hoped to get the license from the DOH in June 1986.\textsuperscript{20} This schedule was made under a supposition that the Lifeguard vaccine was identified with the Pasteur vaccine; therefore, the Lifeguard vaccine could get the license after one batch of the vaccine passed the chimpanzee test rather than five consecutive tests. But the DOH disagreed. The Bureau of Pharmaceutical Affairs of the DOH asserted:

The quality of hepatitis B vaccine might change because of the change of manufacturing location, operators, and instruments. Although the technology of the Lifeguard vaccine came from Pasteur, whose vaccine has passed 200 chimpanzee tests, nothing can guarantee the quality of

\textsuperscript{20}The STAG document Hsingchengyüan kanyen fangchih kuwen weivüanhui kanyen fangchih chihua hsieh’iaohui huivı chilu (The Minutes of the Hepatitis B Control Program Coordinated Meeting), August 26, 1985.
the Lifeguard vaccine. There will be nothing good for consumers if the DOH licenses Lifeguard’s vaccine when it has only passed one chimpanzee test.\textsuperscript{21}

Therefore, following the WHO’s guidelines, the DOH required Lifeguard’s vaccine to pass five consecutive chimpanzee tests and then a clinical trial. Besides, the DOH asked Lifeguard to add an AIDS test to every chimpanzee test.\textsuperscript{22} On the other hand, the NSC and the DCB argued for Lifeguard. On September 26, 1985, Chang Tien-hung of the DCB asserted in a DOH meeting:

Lifeguard is a government-controlled company rather than a regular private one. The schedule of Lifeguard’s production is directed by the hepatitis B control program. Therefore, Lifeguard plans to market its vaccine by August 1986 in order to meet the requirement of the mass vaccination program. In addition, the Pasteur vaccine has proven safe in more than 20 countries and on more than 1.2 million people worldwide. Pasteur would send its operators to Lifeguard to guarantee the technology transfer and would be responsible for any vaccine problems. Every batch of the Lifeguard vaccine would pass a

\textsuperscript{21}The DOH document \textit{Yentao paosheng chihvao kufen yuhsien kungszu B-hsing kanyen hsüehchiang yimiao heihsinghsing anchüan shihyen yenchiv chihua huiyi chily}(The Minutes of Examining the Chimpanzee Test Project of the Lifeguard Hepatitis B Plasma Vaccine Meeting), August 26, 1985.

\textsuperscript{22}Ibid.
chimpanzee test.23 Therefore, the NSC and the DCB asked the DOH to agree that the Lifeguard vaccine was identified with the Pasteur vaccine and only required to pass one chimpanzee test rather than five consecutive chimpanzee tests and a clinical trial. Otherwise, Lifeguard would have a big financial loss due to a one year delay.

But the DOH still insisted that the safety of vaccine was the "absolute requirement." Hsu Tzu-chiu, Director of the DOH, supporting the position of the Bureau of the Pharmaceutical Affairs, said:

The DOH has the responsibility to protect public health. Therefore, the first priority is the safety of the vaccine rather than the interests of any company. No political pressure can compromise the DOH's standard.24

The meeting concluded by upholding the requirements of five batches of the vaccine passing the chimpanzee tests and a clinical trial for license.25 The NSC could not bend the insistence of the DOH; consequently, the NSC turned to the STAG under the charge of Minister Lee Kuo-ting.

On October 26, 1985, under the arrangement of the STAG, the Hepatitis

23The DOH document Kanyen fangchih weiyüanhuí 75 nientu ti 1 tz’u huivy chułu(The Minutes of the First Meeting of the Hepatitis Control Committee in FY 1986), September 26, 1985.

24Ibid.

25Ibid.

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Advisory Committee of the Executive Yuan held a "special meeting" to design a clinical trial plan for the Lifeguard vaccine at Rockefeller University, New York. The participants of the meeting\textsuperscript{26} reached a compromise retaining the chimpanzee tests, but simplifying the clinical trial in order to minimize Lifeguard's possible financial loss. Dr. Krugman designed the simplified clinical trial as the following:

After the Lifeguard vaccine passes the first chimpanzee test, the DOH gives the Lifeguard vaccine a temporary license for a clinical trial. The clinical trial aims to compare the Lifeguard vaccine and the Pasteur vaccine on 100 preschool children for three months. The DOH would license the Lifeguard vaccine after the five chimpanzee tests and the clinical trial.\textsuperscript{27}

The aim of this simplified clinical trial was that if the Lifeguard vaccine was as good as the Pasteur vaccine, it could waive the long-term efficacy follow-up.\textsuperscript{28} Compared to the two clinical trials in 1981—a three-year clinical trial after five batches of vaccine had passed the chimpanzee tests—the Krugman’s simplified clinical trial saved

\textsuperscript{26}The Participants of the meeting included Wang Chi-wu and Tien Wei-cheng of the NSC, Hsu Tzu-chiu and Shih Yao-tang of the DOH, Dr. Bennett, and Dr. Krugman.

\textsuperscript{27}The STAG document Hsingchengyüan kanyen fangchih weiyüanhui t'epieh huiyi (The Minutes of the Special Meeting of the Hepatitis Advisory Committee), October 26, 1985.

\textsuperscript{28}The NSC document B-hsing kanyen yimiao shihyian chihua (The Proposal of the Hepatitis B Vaccine Clinical Trial Project by Veterans General Hospital), in 75.11.7. (75) Tai-Hui-Chu-Sheng Tzu No. 146, November 7, 1986.
a lot of time and money for Lifeguard.

**Interpretative Flexibility of Statistical Data**

On April 8, 1987, Lifeguard reported to the DOH that one chimpanzee of the fourth test had abnormalities of liver function, but the unusual particles on the liver cells were not hepatitis virus. Dr. B. Y. Cockrell and Dr. E. Muchmore of the LEMSIP Center of the New York University endorsed the report that the abnormalities of liver function came from pre-existing conditions rather than from Lifeguard’s plasma vaccine. Lifeguard suggested, therefore, that this safety test could be passed.\(^{29}\) But the Hepatitis Control Committee of the DOH did not accept Lifeguard’s assertions. The committee asked the LEMSIP Center of the New York University to provide more details of the test result.\(^{30}\)

Meanwhile, on April 9, 1987, Lifeguard sent the DOH the result of the

\(^{29}\)Lifeguard document 76.4.8. (76) Pao-Pin-Fa-Tzu No. 022 to the DOH, April 8, 1987.

\(^{30}\)The DOH document Kanyen fangchih weiyüanhui 76 nientu ti 3 tz'u huiyì chilyu(The Minutes of the Third Meeting of the Hepatitis Control Committee in FY 1987), April 28, 1987.
clinical trial comparing the Lifeguard vaccine and the Pasteur vaccine.\textsuperscript{31} The report said that both of the vaccines could produce good anti-HBs response. After the third dose, the anti-HBs response rate of the Lifeguard vaccine (93.9\%) was better than that of the Pasteur vaccine (88.0\%), but the difference was not statistically significant. However, regarding the geometric mean titer (GMT) of anti-HBs, the Pasteur vaccine was better than the Lifeguard vaccine (948.4 mIU/ml v.s. 437.5 mIU/ml) (p < 0.05). The report believed that the GMT difference came from the sex unbalance of the subjects in two groups. To compare two groups by sex, the difference was not statistically significant either in the anti-HBs response rate or in the GMT of anti-HBs. Therefore, the report asserted that both the Lifeguard vaccine and the Pasteur vaccine had good immunogenicity.\textsuperscript{32}

In the Hepatitis Control Committee of the DOH, three anonymous reviewers accepted Lifeguard's report. But one anonymous reviewer had strong reservations. The reviewer criticized the trial, saying "the sample size is too small to inspect the real difference between the two vaccines." The reviewer continued that "the anti-HBs response between two groups may be different, but the statistical methods cannot inspect the difference because the sample size is too small." The reviewer also cited a

\textsuperscript{31}The Lifeguard document 76.4.9. (76) Pao-Pin-Fa-Tzu No. 026, April 9, 1987, to the DOH. The directors of the clinical trial were Lo Kuang-juei and his colleagues of Veterans General Hospital.

\textsuperscript{32}The female children in the Lifeguard group were more than the Pasteur group (59.2\% v.s. 30.0\%, p < 0.01).
statement of Stuart J. Pocock:

There is the danger that potentially inferior drugs are being approved for marketing because adequate evidence of therapeutic equivalence cannot be obtained through the current tendency to unduly small trials.\textsuperscript{33}

Besides, the reviewer said, "the GMT variation of anti-HBs response was abnormally big among the subjects (from zero to 34648 mIU/ml)." The reviewer added, "the GMT difference of anti-HBs between two groups becomes statistically insignificant because the sample size becomes smaller when divided by sex rather than because the sex factor is adjusted."\textsuperscript{34}

In the Hepatitis Control Committee meeting on April 28, 1987, most of the members who were clinicians supported Lifeguard’s report. On the contrary, the only statistician, Dr. Chen chin-ying, and the only public health researcher, Wang Jung-te, had the same reservations as the reviewer who did not accept Lifeguard’s report. As mentioned above, the aim of this simplified clinical trial was that if the Lifeguard wanted to waive the long-term efficacy follow-up, its vaccine should be \textit{as good as} the Pasteur’s vaccine. However, the chairman of the committee, Dr. Sung Juei-low,


\textsuperscript{34}The DOH document \textit{Kanyen fangchih weiyuancih 76 nientu ti 3 tz’u huiyichiulu} (The Minutes of the Third Meeting of the Hepatitis Control Committee in FY 1987), April 28, 1987.
shifted the problem domain. He asserted:

The committee had better regard the aim of the clinical trial as deciding whether the two vaccines are good enough rather than judging whether they are the same or not. If the anti-HBs titer of the Lifeguard vaccine exceeds certain criterion, the committee can consider to accept it.35

Finally, Sung Juei-low concluded that "compared to the results of previous efficacy studies, the Lifeguard vaccine has good immunogenicity."36 No committee members mentioned the original standard of this simplified clinical trial.

In this meeting, most of the members who were clinicians showed little concern about the opinions of the statistician and the public health researcher. In order to understand this phenomenon, we need to examine the power structure of the Hepatitis Control Committee of the DOH first. In the 1980s, the committee was effectively dominated by clinicians. Although the name of the second task group of the committee was "Clinical Medicine and Epidemiology," there was no member who studied epidemiology until the March of 1984.37 Statisticians did not enter the

35Ibid.

36Ibid.

37Wang Jung-te, who studied public health, was invited into the committee on March 1, 1984. See the DOH document Kanyen fangchih yüanhui 73 nientu ti 3 tz’u huiyi chiwu(The Minutes of the Third Meeting of the Hepatitis Control Committee in the FY 1984), March 1, 1984.
committee until late 1984 when the DOH planned to launch a big project regarding low-dose usage of the plasma vaccine.\textsuperscript{38} Even when the epidemiologists and statisticians entered the committee, they did not have much influence in the decision-making of the committee, because the dominant clinicians usually cared little for statistics.\textsuperscript{39} Because epidemiologists and statisticians were a minority in the power structure of the committee, how to decide the sample size in an epidemic project and how to interpret statistical data became flexible. In other words, this interpretive flexibility of statistical data shaped the knowledge production in the committee.

\textbf{The New Criticism Over Lifeguard’s Vaccine}

The domination of clinicians in the Hepatitis Control Committee of the DOH counterbalanced the Lifeguard plasma vaccine’s disadvantages of statistical requirements, such as those concerning sample size and whether or not the difference of the data was statistically significant. In this situation, the committee just waited for the detailed report of the fourth chimpanzee test from the United States. But a group

\textsuperscript{38}The DOH document Yenchiu B-hsing kanyen hsiaochilian yenchiu chih yangpenshu chi ts’anyü tanwei huiyi chilu(The Minutes of Discussing the Low-Dose Usage of the Hepatitis B Vaccine Research Project Meeting), November 8, 1984.

\textsuperscript{39}Interview with one anonymous interviewee at Taipei in May 1993. Interview with another one at Taipei in October 1993. Both of them served in the Hepatitis Control Committee of the DOH before.
of professors at National Yang-Ming Medical College created a new controversy over the Lifeguard plasma vaccine.

On May 8, 1987, ten professors of National Yang-Ming Medical College\textsuperscript{40} appealed in public to the government regarding the problems of Lifeguard’s hepatitis B vaccines. They questioned the safety of the plasma vaccine:

Although the first generation vaccine has been used for many years and has good clinical effect, many foreign pharmaceutical companies are developing the second generation vaccine because the first generation vaccine is made by carriers’ plasma. It is impossible to guarantee that all known or unknown viruses would be excluded in the process of purifying HBsAg from the plasma. A serious consideration remains in the fact that many hemophilia patients were infected by AIDS because the patients used plasma products.\textsuperscript{41}

Therefore, they suggested that the second generation vaccine made by recombinant DNA technology would be much safer than the first generation vaccine. In addition, they questioned the process of licensing Lifeguard’s vaccine:

\textsuperscript{40}They included Dr. Wu Yen-hua, Dr. Wei Yao-hui, Dr. Dr. Feng Chi-ming, Dr. Chen Fen-fang, Dr. Yeh Hsiao-Fan, and Dr. Tsai Ying-chieh of the Institute of Biochemistry, Dr. Wu Jung-tsai and Dr. Chang Nan-chi of the Institute of Microbiology and Immunology, Dr. Chien Chia-Yun of the Institute of Neurology, and Dr. Wang Ying-chih of the Institute of Medical Engineering.

Compared to the long-term safety tests and clinical trials in advanced countries, it seems careless that the Lifeguard vaccine only took one year from producing products to applying for a license. Besides, the safety tests were only conducted on several chimpanzees and the clinical trial was only conducted on fifty children. Furthermore, it is said that one chimpanzee was infected by a certain virus (the information presented above came from newspapers), but the details remain unknown.\textsuperscript{42}

Therefore, they appealed to the government for revising vaccine policy and carefully examining Lifeguard’s vaccine:

(1) Open the market for the second generation vaccine in order to let the public have an alternative; (2) The safety of the Lifeguard vaccine should be examined carefully by experts, and the list of these experts made public; (3) The first priority of the DOH policy should be public health rather than the interests of the domestic companies.\textsuperscript{43}

The ten professors raised the AIDS issue of the plasma vaccine, although no report yet revealed any case of AIDS infection from the hepatitis B plasma vaccine. In other words, the ten professors showed little confidence in Lifeguard’s plasma vaccine. But it is interesting to note that their information came from newspapers,

\textsuperscript{42}Ibid.

\textsuperscript{43}Ibid.
according to their own statements. We need to examine what kind of media images the newspapers shaped regarding licensing Lifeguard’s vaccine.

Media Images of the License Examination

One important media image of the license examination was that there might be certain political pressure that had favored the Lifeguard vaccine in the license examination. On April 17, 1987, Lienho pao reported that the Lifeguard vaccine was applying for the DOH’s license since "its quality was very similar to Pasteur’s vaccine." The press continued:

Every bureau of the DOH was making efforts to let Lifeguard’s vaccine get the license by May 1. ... In order to let it get the license as soon as possible, the DOH would only examine the result of the first two doses, although the full schedule of the vaccine is four doses. ... Usually the Bureau of Pharmaceutical Affairs [of the DOH] has its own autonomy. But it is unusual that the Lifeguard vaccine could presuppose the day of getting the license.44

On April 28, Lienho pao reported that the Hepatitis Control Committee of the

44Lienho pao, April 17, 1987. On April 27, there was another similar report on Lienho pao.
DOH held a meeting behind closed doors to examine the Lifeguard vaccine. The press continued:

The DOH said that the meeting was not open because the content of the meeting was highly professional. Besides, the related information of the meeting would not be made public because "few people would understand it." … The DOH denied any charge of giving Lifeguard any privilege. In addition, Chungyang jih pao reported that four legislators requested the government not to license the Lifeguard vaccine until the completion of the fourth dose in the clinical trial in order to secure the health of citizens.

On April 29, several newspapers reported that the Hepatitis Control Committee of the DOH passed the Lifeguard vaccine, according to the announcement of chairman of the committee Dr. Sung Juei-low. The press said that the committee

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45 When Shih Chun-jen was Director General of the DOH, the general meetings of the DOH were usually open to journalists. But in a sensitive situation, journalists were not allowed to sit at a meeting. Interview with Mr. Chen Chien-yu at National Taiwan University on November 18, 1993.


47 Chungyang jih pao, April 28, 1987. The four legislators included Huang Ming-ho, Hung Wen-tung, Pan Chih-cheng, and Chang Shih-liang. Both Huang and Hung were doctors. Also see Lifayüan kungpao(The Communique of the Legislative Yuan), Vol.76, No.34, p.59.
was satisfied with the safety and immunogenicity of the Lifeguard’s vaccine. 48

Lienho pao continued:

Although there was a certain minor question about the result of the chimpanzee test, the committee did not consider it important. The committee has asked Lifeguard to get the detailed report of the test from the United States. ... Although some committee members questioned the legitimacy of the clinical trial regarding the small sample size and the three-month term, the conclusion of the meeting was positive to the clinical trial. 49

However, on May 1, Lienho pao pointed out that some committee members had reservations about licensing Lifeguard’s vaccine. The press said:

After seeing newspaper reports, some committee members felt strange about why Dr. Sung Juei-low announced in public that the committee passed the Lifeguard vaccine, which in fact was very different from the conclusion of the meeting. One committee member said, "the meeting concluded by examining the application again after receiving the detailed report of the chimpanzee test from the United States, rather


than passing the vaccine."50

In addition, Lienho pao reported some questionable points of Lifeguard’s vaccine, such as lower GMT and the abnormal liver function of the fourth-test chimpanzee. On May 2, there were more detailed reports about the questions of the fourth chimpanzee test.51 Meanwhile, Minsheng pao reported, "Director General of the DOH Shih Chun-jen announced that the DOH would not consider the importation of foreign plasma vaccines because Lifeguard could produce it." The press continued:

Regarding the importation of the recombinant DNA vaccine, the DOH would consider this issue only after its clinical trial finishes. Upon the presupposition of safety and efficacy, Shih Chun-jen said, the DOH would give priority to the domestic plasma vaccine rather than to the foreign recombinant DNA vaccines if the price of the domestic plasma vaccine was reasonable.52

One important image coming from these newspaper reports was that the Lifeguard vaccine might receive its license by taking advantage of certain political privilege. A series of press reports helped shape this media image which likely influenced the confidence of the readers who were concerned over the safety of the vaccine. The press’s reporting of the April 28 closed door meeting might raise

50Lienho pao, May 1, 1987.
suspicious. Even more significant, the press revealed that some committee members disagreed with Dr. Sung Juei-low over whether the vaccine had indeed passed. In addition, the press reported more details about the questions of the fourth chimpanzee test. Finally, the DOH announced that the Lifeguard plasma vaccine had higher priority over foreign plasma vaccines and foreign recombinant DNA vaccines. Therefore, these reports contributed to the image that the Lifeguard vaccine might get the DOH’s license because of certain political privileges rather than its safety, efficacy, and price. In other words, whether it was safe or not remained questionable.

Resolving the Controversy

Government agencies and government scientists played an important role in resolving the controversy. The government did not respond to the criticism of the ten professors in public at first. Rather, Minister Lee Kuo-ting asked Dr. Sung Juei-low to discuss with the president of National Yang-Ming Medical College Yu Chun about how to stop the criticism. But on May 14, 1987, the ten professors wrote a letter

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53 The STAG document Chih Lee chengwuweiyuan han (A Letter to Minister Lee Kuo-ting from a Group of Professors of National Yang-Ming Medical College), April 14, 1987. On April 15, Lee Kuo-ting said on a comment to the letter that “this letter was issued after Dr. Sung reached president Yu.”

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to Minister Lee.\textsuperscript{54} In this letter, besides the same content of the criticism on May 8, they added,

According the report of the press, one third of 100,000 infants who received HBIG at National Taiwan University two years ago were found to have antibodies to AIDS;\textsuperscript{55} that is, the HBIG was made from the serum of the hepatitis patients who also were infected by AIDS. Although the infants were proved safe after a two-year follow-up, this event shows that the raw material of plasma products might come from the serum of AIDS patients. But no one can guarantee that the purifying process of the plasma vaccine will exclude the AIDS virus.\textsuperscript{56}

On the same day, the ten professors again made public their appeal on \textit{Minsheng}

\textsuperscript{54}In this letter, the professors also said that their information came from newspapers reports.

\textsuperscript{55}They might refer to the May 9, 1987 report of \textit{Minsheng pao}. In fact, on November 21, 1985, \textit{Chungkuo shih pao} had reported this HBIG event. Besides, the Hepatitis Control Committee of the DOH discussed this HBIG event in a meeting on December 12, 1985. See the DOH document \textit{Kanyen fangchih weiyüanhui ti 2 tsu 75 nientu ti 2 tz’u huivy}(The Minutes of the Second Meeting of the Second Task Group of the Hepatitis Control Committee in FY 1986), December 12, 1985. It is interesting to note that on November 21, 1985, \textit{Chungkuo shih pao} reported that "the DOH informally gagged researchers who were involved in the follow-up of the HBIG event."

\textsuperscript{56}The STAG document \textit{Chih Lee chengwuweiyüan han}(A Letter to Minister Lee Kuo-ting from a Group of Professors of National Yang-Ming Medical College), April 14, 1987.
pao, especially because the government did not respond to their May 8 appeal.\textsuperscript{57} In the May 14 appeal, they emphasized, "many professors and graduate students at National Yang-Ming Medical College did not have confidence in the plasma vaccine because of getting hepatitis B was better than getting AIDS." They asked the DOH again to open the domestic market for the foreign recombinant DNA hepatitis B vaccine in order to let the Taiwanese people have an alternative.\textsuperscript{58}

The appeal of the critics put pressure on the government and Lifeguard. For example, Lifeguard went to Pei-An Junior High School to promote hepatitis B vaccination before this event happened. Among the 1307 students and teachers tested, there were 760 people who needed to be vaccinated due to the test reports on April 17, 1987. But on May 9, when Lifeguard went to the school to vaccinate the students and teachers, only 222 persons accepted the vaccine. Most of the reasons why they rejected the vaccine were the same: they were influenced by the appeal of the ten professors on May 8.\textsuperscript{59}

On May 15, 1987, Lifeguard and the DCB went to National Yang-Ming Medical College to communicate with the ten professors. But Lifeguard and the DCB

\textsuperscript{57}Interview with one of the professors at Taipei in November 1993.


\textsuperscript{59}The STAG document Chang Tien-hung chihhan Lee Kuo-ting chengwuweiyuan(The Report of Chang Tien-hung of the DCB to Minister Lee Kuo-ting), May 15, 1987. Besides, many readers called Lienho pao to ask where they could buy the recombinant DNA vaccine at that time. Interview with Mr. Chen Chien-yu, a journalist at Lienho pao, at Taipei on November 18, 1993.
had a difficult time persuading some of them to accept Lifeguard’ vaccine because the professors insisted that the material coming from recombinant DNA technology was safer than plasma products. Besides, the professors insisted that even if the Lifeguard plasma vaccine was safe, the DOH could not control the importation of the recombinant DNA vaccine. Finally, with the help of College President Yu Chun as a coordinator, they compromised by agreeing not to speak against the Lifeguard plasma vaccine in newspapers anymore; additionally, they would communicate with Dr. Sung Juei-low to get a "professional explanation" regarding the questions of vaccines.⁶⁰

Meanwhile, the Director of the Bureau of Pharmaceutical Affairs of the DOH Huang Weng-Foung argued against the appeal of importing the recombinant DNA vaccine. He argued that:

Although the recombinant DNA vaccine may avoid the problem of serum contamination, it is too early to assert that the vaccine is safe. In addition, although the vaccine has had good results regarding safety and efficacy from some clinical trials, the time of clinical usage is too short to make sure that it would have no unknown problems. Besides, there are some problems regarding whether the dosage, the vaccinating

schedule, and the price of different recombinant DNA vaccines can be compatible with the hepatitis B control program.\textsuperscript{61}

Therefore, he concluded, "since the recombinant DNA vaccine needs further clinical observations to make sure of its long-term safety, the DOH would not consider it for the time being."\textsuperscript{62} In his argument, the safety of the Lifeguard plasma vaccine was not the issue. Rather, the safety of the recombinant DNA vaccine—the most important point that supported the appeal of the critics—became problematic.

But some Taiwanese dealers of foreign pharmaceutical companies raised objections to Huang Weng-Foung's arguments. One dealer said, "since the recombinant DNA vaccine has been licensed by the U.S. FDA and other countries, its safety is beyond all question." Besides, another dealer guaranteed that "the price of the recombinant DNA vaccine will be cheaper than the price of the plasma vaccine." According to the problem of the schedule and dosage of vaccination, one expert said that "it was easy to arrange."\textsuperscript{63}

Inside the STAG, both Chen Ding-shinn and Chang Tien-hung wrote their comments on the ten professors' appeal to Minister Lee Kuo-ting. Both of them supported Lifeguard's plasma vaccine and criticized the ten professors, saying that none of them were hepatitis B experts. Chen Ding-shinn suggested that the


\textsuperscript{62}Ibid.

government enforce health education regarding hepatitis B control and improve communication with the critics and other concerned people to avoid misunderstanding. But at the same time, the ten professors reasserted, this time in public, that only the Hepatitis Control Committee of the DOH had authority to review the safety of the vaccine. They planned meeting Dr. Sung Juei-low in order to have a further understanding about the safety of the Lifeguard’s vaccine. After Chen Ding-shinn and Chang Tien-hung reported their comments, Minister Lee himself decided to meet the ten professors on June 4, 1987. After this meeting, the ten professors ceased their public criticism of the plasma vaccine.

More Education


One of the ten professors says that he has not accepted the plasma vaccine. He stopped his criticism because of Minister Lee Kuo-ting’s earnest exhortation. Minister Lee asked them to cooperate with the government to promote the hepatitis B control program and the policy of developing biotechnology. Interview with an anonymous professor at Taipei in November 1993. Another professor said that he was convinced of the quality of Lifeguard’s vaccine after he saw the production process of the vaccine at Lifeguard. Interview with him at Taipei in November 1993.
Even though a sheep was lost, it was still not too late to mend the fence.

After the meeting on June 4, 1987, the STAG made more efforts at hepatitis education because "many people still [did] not understand hepatitis B vaccine."\(^{67}\) The STAG asked a doctor of the Veterans General Hospital to write a pamphlet entitled Ta ko wen (Questions and Answers Regarding Hepatitis B Control) and send it to the DOH. This pamphlet began with the terms, "first generation vaccine" and "second generation vaccine," emphasizing the misleading quality of these names, since some people might perceive the second one as better than the first one. Their more typical names were the "plasma vaccine" and the "recombinant DNA vaccine."\(^{68}\) Then the pamphlet emphasized that the recombinant DNA vaccine was not better than the plasma vaccine in safety, efficacy, and price. In addition, millions of people throughout the world had used the plasma vaccine with good effects. In contrast, the pamphlet added that the recombinant DNA vaccine had had little clinical experience as yet. The DOH then put the pamphlet into its booklet Kuots’an hsüehchiang B-hsing kanyen yimiao hochun tengchi shuoming (The Explanation of

\(^{67}\)The STAG document 76.7.7 (76) Ko-Chi-Fa-Tzu No. 366, July 7, 1987.

\(^{68}\)In the first draft of the pamphlet (in Chinese), one statement said that "the recombinant DNA vaccine aims to let people be free from the fear of getting AIDS from the plasma vaccine." In the final version of the pamphlet, this statement disappeared; otherwise, readers might think that those who received the plasma vaccine would take a risk of being infected by AIDS virus.
Licensing the Lifeguard Hepatitis B Plasma Vaccine).69

Besides, the DCB and Lifeguard invited a foreign authority, Dr. Petricianni, whose major was biological products and served in the WHO before, to give a talk regarding AIDS and the safety of the plasma products at National Taiwan University. He emphasized that the plasma vaccine would be free from AIDS if it was processed by the WHO standard. Since the plasma vaccine had been used for a long time, it was safer than the recombinant DNA vaccine which had had little clinical experience.70 Under the guarantee and the education of the foreign authority, the voices of the critics over the safety of the plasma vaccine vanished in public discourse.

In the 1987 controversy, we saw that the flexibility and the negotiability of the license examination depended upon the power structure of the Hepatitis Control Committee. In addition, political operations of the government agencies and government scientists played an important role in licensing Lifeguard vaccine and resolving the controversy. As soon as the controversy was resolved, the safety of the plasma vaccine was reestablished and Lifeguard’s plasma vaccine finally got the DOH’s license.


The Third Controversy Over the Plasma Vaccine

In 1987, the Lifeguard’s plasma vaccine entered the market, and by 1991, there was no case reported of anyone infected by the AIDS virus from the vaccine. But then the AIDS issue as a potential crisis of the plasma vaccine was raised again in 1991. This time, the DPP politicians used the AIDS issue as a tool for political leverage. The change of political context and politicians’ interests reshaped the scientific status of Lifeguard’ plasma vaccine.

Emergence of the 1991 Controversy

On April 25, 1991, Taiwan provincial assemblyman Chang Wen-ying, a DPP member, questioned Commissioner of the Taiwan Provincial Department of Health(TPDOH) Lee Chun-jen over whether or not interchangeably receiving different hepatitis B vaccines was safe.⁷¹ Lee Chun-jen replied:

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⁷¹The press reported that Chang Wen-ying brought her twin children to receive the second dose of the hepatitis B vaccine. A nurse asked her to choose the first generation vaccine or the second generation. The nurse told Chang Wen-ying that the first generation vaccine was free but had higher possibility of side-effects. In
The first generation vaccine is made from carrier plasma. Contamination is possible in the process of production and transportation. Besides, there is no absolute guarantee regarding the process of purifying plasma. In contrast, the second generation vaccine made by recombinant DNA technology solved those problems. Therefore, the second generation was better and safer than the first generation.\textsuperscript{72}

In addition, a TPDOH official Huang Yi-tsun said, "theoretically, the two vaccines can be interchangeably used, according to the current reports." Therefore, some DPP assemblymen asked the TPDOH to switch to the second generation.\textsuperscript{73}

The DOH rebutted, saying that the only difference between two vaccines was price rather than safety or efficacy. Director of the Bureau of Pharmaceutical Affairs Hsiao Mei-ling said, "if the second generation vaccine is cheaper than the Lifeguard vaccine, the DOH would consider the second generation vaccine." She emphasized the importance of staying with the same vaccine:

The first generation vaccine is safe according to the experience of the contrast, the second generation was safer but cost NT$ 300 (US$ 11) per dose, which was imported. Chang Wen-ying said that many clinics suggested parents choose the second generation vaccine for their children. See Lienho pao, April 26, 1991; Taiwan jih pao, April 26, 1991.

\textsuperscript{72}Lienho pao, April 26, 1991; Tzuyu shih pao, April 26, 1991; Taiwan jih pao, April 26, 1991.

\textsuperscript{73}Ibid.
past decade. In contrast, the safety and efficacy of the second generation vaccine needs to wait for further observations since it has been on the market for less than two years. However, no reports tell the difference about safety and efficacy between the two vaccines. The research regarding the interchangeability of the two vaccines has not finished yet. The DOH’s assertion about the uncertainty of the vaccinal interchangeability became the DOH’s main argument in this controversy.

On May 2, 1991, Chang Wen-ying raised two issues to attack Lifeguard’s vaccine: the AIDS issue and the issue of the KMT-owned enterprise’s interest. She asked the TPDOH to replace "the first generation vaccine with the second generation because of safety considerations." She asserted:

74The unfinished research here was the DOH’s project which was done by Dr. Lee Ching-yun of National Taiwan University.

75Chungkuo wan pao, April 26, 1991; Lienho pao April 26 & 27 1991; Chienkuo jih pao, April 27, 1991; Chingnien jih pao, April 27, 1991; Chungyang jih pao, April 27, 1991; Tzuyu jih pao, April 27, 1991. According the safety of the interchangeability, however, Dr. Lo Kuang-juei and Dr. Lee Shou-tung of Veterans General Hospital said that the two vaccines were good enough and the interchangeability between these two vaccines was without question according to their research. See Lienho pao, April 27, 1991; Chungyang jih pao, April 27, 1991. The result of Lo Kuang-juei and Lee Shou-tung’s research was published on Vaccine, see Chan Cho-yu(1991). But their positive statements regarding the interchangeability of different vaccines soon disappeared in newspapers.
The first generation vaccine might contain the AIDS virus with a probability of 1/10,000,000. On the contrary, the second generation vaccine is free from this problem. … The most important inside story is that Lifeguard is a KMT-owned company, thereby the KMT government wants to protect Lifeguard’s monopolized business. … The interchangeability of the two vaccines was beyond question. Since the DOH wanted to protect Lifeguard’s market, it insisted on waiting for the result of the research regarding the interchangeability of the vaccines.  

But the TPDOH did not positively respond to Chang Wen-ying’s assertions. On the one hand, Commissioner Lee Chun-jen resigned at that time; that is, Chang Wen-ying lost the subject of her attack. On the other hand, the TPDOH asked the DOH to reply to Chang Wen-ying’s questions.  

Chang Wen-ying waited for another chance to attack Lifeguard one month later when new Commissioner of the TPDOH Lin Koshao accepted office.

On June 18, 1991, DPP assemblymen Chang Wen-ying and Lin Chung-nan

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77 The DOH did not agree with Chang Wen-ying’s assertion. See Taiwan shengyihui kungpao (The Communique of Taiwan Provincial Assembly), Vol.69, No.1, p.27; the DOH document 80.6.18. Wei-Shu-Fang-Tzu No.944830, June, 18, 1991.
threatened to cancel the FY 1992 budget of the hepatitis B vaccination program if the TPDOH did not switch to the second generation vaccine. Chang Wen-ying still insisted that the first generation vaccine posed a potential crisis of AIDS infection. She emphasized that "choosing the appropriate vaccine was a humanitarian problem rather than a political problem." The new Commissioner Lin Ko-shao immediately promised to persuade the DOH to switch to the second generation vaccine.\footnote{Lienho pao, June 19, 1991 and June 20, 1991; Taiwan shinsheng pao, June 19, 1991.} Why did Commissioner Lin Ko-shao not support the policy of the DOH when he just accepted office? We need to understand the great political change during the mid-1980s in Taiwan first.

**The Political Change Since the mid-1980s**

From the mid-1980s, Taiwan’s political structure gradually changed. In 1986, the first opposition party, Democratic Progressive Party(DPP), formed in Taiwan. In 1987, martial law ended. Liberalization became the trend after the mid-1980s. In the domain of science policy, the political power of the STAG declined after Minister Lee Kuo-ting retired in 1988.

As mentioned in chapters one and three, the KMT government successfully
dominated Taiwan from the 1950s to the mid-1980s. But from the mid-1980s, Taiwan’s political context changed as the KMT government gradually lost its political supremacy. Hsiao Hsin-huang(1989) and Wang Jenn-hwan(1993, 1989) indicated several events which showed the liberalization of Taiwanese political context from the mid-1980s. First, after the mid-1980s, when the opposition parties could get 20%-30% of the vote in some important elections, it meant that the KMT government could not fully control politics anymore. Second, increasing social movements, which emerged after 1983, might directly or indirectly shake the authority of the KMT government. When various popular groups emerged because the existing legal system did not protect their rights, it indicated that the government authority was declining. Third, in the 1980s, a "investment strike" continued. The investment rate declined from 25.2% in 1982 to 16.3% in 1986, but the saving rate remained circa 30%. In other words, the private enterprises preferred saving to investment. This phenomenon indicated that the enterprises did not have confidence in the KMT hegemony as before.

In September 1986, Democratic Progressive Party(DPP), the first "real" opposition party in Taiwan, was formed in defiance of martial law and forced the

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79 These social movements included consumers’ movements, anti-pollution movements, environmental movements, feminists’ movements, students’ movements, natives’ movements, labors’ movements, peasants’ movements, teacher human rights movements, etc.
KMT government to admit its legitimacy. In July 1987, the KMT government proclaimed that the period under martial law had ended. Wang Jenn-hwan (1993) describes the change of Taiwan's political structure: many new parties and new newspapers emerged; basic human rights gradually became issues; more social movements and more opposite movements arose. After President Chiang Ching-kuo died in 1988, the KMT party fell into a severe power struggle. New President Lee Teng-hui, a Taiwan-born economist, had a difficult time coordinating different interests within the KMT party. When reformers compromised with the conservatives, the KMT government had no clear policies to meet the requirements of the social movements and opposition movements. The KMT government became a "bewildered state" from 1987 to 1990 until a powerful military ruler Hao Po-tsun became the Premier in 1990 (Wang JH, 1993).

"Military Interfering in Politics"

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During the period when martial law was in force, from 1949 to 1987, no new party was permitted. Although there was the Youth China Party and the Socialist Democratic Party, they hardly had an active role in Taiwan's politics. In fact, they were pro-government and received financial supports from the KMT government. Opposition candidates did stand for elections as independent candidates. The DPP made an initially poor showing in the restricted 1986 election. But in December 1989—the first election in which opposition parties were allowed to campaign openly—the DPP succeeded in capturing 21 of the 101 seats in the Legislative Yuan and 16 of the 77 seats in the Taiwan Provincial Assembly. Besides, the DPP gained control in 7 of 21 counties and cities (EIU, 1993:5).
In May 1990, when President Lee Teng-hui appointed Hao Po-tsun, a powerful military-ruler, to be Premier, many voices from opposition parties, social movements, and scholars argued against the appointment, expressing a fear over whether or not Hao Po-tsun would turn back the clock. They protested against the "military interfering in politics." The protesters worried that Hao Po-tsun would obstruct political reform because the military was a conservative power supporting the conservative power within the KMT government (Wang JH, 1993; EIU, 1991).

In May 1991, faced with protests against the "military interfering in politics," the Governor of the Taiwan Provincial Government, Lien Chan, appointed former Administrator of the Military Medicine Administration, Lin Ko-shao, as Commissioner of the TPDOH. Soon 42 DPP assemblymen and KMT assemblymen of a total 76 assemblymen opposed the appointment "in order not to let military intervene in the civil service system." The pressure of the boycott would significantly influence the decision of the TPDOH regarding the choice of the hepatitis B vaccine.

81 Hao was an ex-general from the mainland, a graduate of Chiang Kai-shek’s military academy and later Chiang’s aide in chief. Before he was appointed as Premier, he was the Minister of Defense.

On June 18, 1991, when Lin Ko-shao went to the Taiwan Provincial Assembly for the first time since he accepted office, DPP members Chang Wen-ying and Lin Chung-nan asked him to switch to the second generation hepatitis B vaccine; otherwise, the total budget of the TPDOH would be cancelled. Chang Wen-ying had asserted that the use of the second generation was based upon a humanitarian consideration. Lin Ko-shao promised to negotiate with the DOH.\textsuperscript{83}

On the second day, when more DPP assemblymen asked Lin Ko-shao for the same request, he agreed with them immediately. Soon many DPP assemblymen, who had previously boycotted Lin Ko-shao, now praised him in public.\textsuperscript{84} Regarding his decision, Lin Ko-shao said, "since the Assembly would cancel the vaccine budget if we do not switch to the second generation vaccine, we must follow the direction of the Assembly." He continued, "assemblymen are bosses and the Commissioner of the TPDOH is an employee; that is, the employee should follow bosses."\textsuperscript{85} In other words, Lin Ko-shao's decision regarding switching the vaccine was strongly influenced by the boycott pressure of so many DPP assemblymen. Therefore, the plasma vaccine suddenly became unsafe in the discourse of the Taiwan Provincial Assembly because of the political pressure within a special political context.

\textsuperscript{83}Lienho pao, June 19, 1991; Taiwan shinsheng pao, June 19, 1991.

\textsuperscript{84}Lienho pao, June 20, 1991; Taiwan shinsheng pao, June 20, 1991.

\textsuperscript{85}Lienho wan pao, June 21, 1991.
Ad Hoc Research

The DOH continued to insist on using Lifeguard’s plasma vaccine. On June 19, 1991, when Commissioner Lin Ko-shao promised to switch to the recombinant DNA vaccine starting from January 1, 1992, the DOH soon proclaimed that it would keep using the plasma vaccine until a three-year research project regarding the safety and efficacy of the interchangeability between different vaccines was finished. Director General of the DOH Chang Po-ya asked, "without the guarantee of the coming research result, who can take the responsibility if anything happens to vaccinated babies due to the interchange of different vaccines?" She emphasized, "experts rather than representatives decide how to choose vaccines upon the considerations of safety, efficacy, and finance." Furthermore, the Deputy Director General of the DOH Shih Yao-tang said, "the policy of using the domestic plasma vaccine aims to promote the domestic biotechnological industry rather than to protect


87 Ibid.

88 Director General of the DOH Chang Po-ya was Commissioner of the TPDOH Lin Ko-shao’s cousin. She was one of the two Cabinet members who were not KMT members.

89 Lienho pao, June 20, 1991.

Lifeguard, since it is dangerous for Taiwan without her own vaccine industry." 91 Moreover, Deputy-Director of the Bureau of Communicable Disease Control of the DOH Hsu Hsu-mei argued, "since the price of the second generation vaccine is much higher than that of the first generation, there is no reason to choose the expensive vaccine when the safety and efficacy of the first generation vaccine were excellent." 92 

Meanwhile, no scientists argued in public against the plasma vaccine as the critics had done in the first two controversies. In contrast, many researchers who spoke in public supported the plasma vaccine. For example, Dr. Chen Ding-shinn of National Taiwan University and Dr. Lee Shou-tung of Veterans General Hospital criticized Commissioner Lin Ko-shao's decision and asserted "let science be science; let politics be politics." 93 In addition, two doctors, Wang Ying-ming and Shih Shou-chuan, also appealed that the vaccine policy should be decided scientifically rather than politically. 94 

The DOH insisted that any further vaccine policy decision-making should wait for the result of the three-year vaccinal interchangeability research. Was there not any research that discussed the safety and efficacy of the interchangeability of

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91Taiwan shinsheng pao, June 22, 1991.


different vaccines? In fact, *The Lancet* (1988) had reported that the plasma vaccine and the recombinant DNA vaccine could be used interchangeably during the course of vaccination. Besides, on April 26, 1988, the Hepatitis Control Committee of the DOH discussed a case concerning a child who had been vaccinated abroad who wanted to finish his vaccination course in Taiwan. The committee concluded by continuing his vaccination course following Taiwan’s schedule. In addition, on May 16, 1988, *Chungkuo shih pao* reported:

> Some concerned people asked the Hepatitis Control Committee of the DOH whether or not interchanging the plasma vaccine and the recombinant DNA vaccine would cause any trouble. After discussing the issue, the committee endorsed the safety of the vaccinal interchangeability.

In other words, the committee showed no worry about the interchangeability of different vaccines.

In July 1988, the DOH officials expected licensing the recombinant DNA vaccines by the end of the year. At this point, the Hepatitis Control Committee of the DOH decided upon the policy of keeping the same brand name during the vaccination

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95 The DOH document *Kanyen fangchih weiyüanhui 77 nientu ti 3 tz’u huivy chilu* (The Minutes of The Third Meeting of the Hepatitis Control Committee in FY 1988), April 26, 1988; *77.5.16. Wei-Shu-Fang-Tzu No. 728959*, May 16, 1988.

schedule because "there was no research approval of the vaccinal interchangeability."97 Besides, the DOH decided to keep using Lifeguard's plasma vaccine on newborn babies in the hepatitis B control program, but would open the rest of the market to the recombinant DNA vaccines.98

In September 1988, Lifeguard asked the Executive Yuan and the DOH to protect its domestic market because it had been established by the government's policy. Lifeguard argued:

If Lifeguard dies of the DOH's open-market policy, no one would invest in high-tech industry anymore. The government had better protect domestic vaccine industries as Japan and the United States do.99

The Executive Yuan agreed to protect Lifeguard. It directed the DOH "to protect the young high-tech pharmaceutical industry."100 But the DOH had a difficult time

97The DOH document Kanyen fangchih wei-yūanhui 78 nientu ti 1 tz’u hsiao tsu huiyi(The Minutes of the First Division Meeting of the Hepatitis Control Committee in FY 1989), July 26, 1988; 77.9.7. Wei-Shu-Fang-Tzu No.754228, September 7, 1988.


100The Executive Yuan document to the DOH 77.10.4. Tai-(77)-Wei-Tzu No. 27090, October 4, 1988.
denying the license application of the recombinant DNA vaccines when Taiwan was undergoing a trend of political and economic liberalization. Also, many legislators repeatedly asked the DOH to open the vaccine market for the recombinant DNA vaccines concerning Lifeguard that had failed in providing vaccines in time on several occasions during 1987 and 1988. The DOH developed some strategies to protect Lifeguard and avoid the criticism of legislators.

As mentioned above, the STAG held a meeting on March 20, 1987 to set informal barriers for the importation of the recombinant DNA vaccine. One strategy of the barriers was to exclude the HBeAg positive mothers' infants, who had been involved in the mass vaccination program beginning in 1984, from the clinical trials of the recombinant DNA vaccines. On December 12, 1988, when the DOH examined the license application of the new vaccines, the DOH asked for the efficacy data on high-risk infants, "since the most important subjects of the mass vaccination program were newborns." Another strategy of the barriers was to ask the three-dose-course recombinant DNA vaccines to have a four-dose course "in order to comply

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101See the statements of legislators on Lifayüan kungpao(The Communique of the Legislative Yuan): Huang Cheng-yi et al. on May 30, 1987; Pan Chih-cheng et al. on November 6, 1987; Hung Wen-tung on November 27, 1987; Chiu Lien-hui on December 15, 1987; Hung Wen-tung on March 25, 1988; Hung Wen-tung on April 5, 1988; Hsu-chang Ai-lien on April 6, 1988; Hung Wen-tung on April 6, 1988.

102The DOH document Shenvi HB-VAX II chi Engerix-B linch'uang ch'uehjen shihyen chihua ti 2 tz'u hsiaotsu huiyi(The Minutes of Examining the Clinical Trials of HB-VAX II and Engerix-B Meeting), December 12, 1988; 78.1.6. Wei-Shu-Fang-Tzu No. 771768, January 6, 1989.
with the schedule of the hepatitis B control program.\textsuperscript{103}

A new strategy of the DOH to protect Lifeguard was to emphasize the necessity of approving the safety and the efficacy of the vaccinal interchangeability. Before the research was finished, the DOH insisted on keeping the same vaccine in the vaccination course. The DOH reported to the Executive Yuan that:

(1) The DOH would keep using Lifeguard's plasma vaccine in the hepatitis B control program from FY 1990 to FY 1992, and would open the rest of the domestic market to the recombinant DNA vaccines. (2) During this period, the DOH would study the interchangeability of different vaccines. (3) If the price of the recombinant DNA vaccine falls below Lifeguard's price, the DOH would consider to switch.\textsuperscript{104}

In other words, the DOH gave Lifeguard a three-year partial protection until FY 1992.

Although the DOH insisted on keeping the same vaccine in the whole course, there were different opinions within the Hepatitis Control Committee of the DOH regarding the research necessity of the vaccinal interchangeability. In a meeting on February 5, 1990, Dr. Lee Ching-yun of National Taiwan University, who had

\textsuperscript{103}Ibid.

\textsuperscript{104}The DOH document 77.12.21. Wei-Shu-Yao-Tzu No. 763983 to the Executive Yuan, December 21, 1988.

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finished a clinical trial of a recombinant DNA vaccine supported by Merck in 1989, questioned the research necessity of the vaccinal interchangeability:

The vaccine is progressive. Why does the DOH want to do the research of the vaccinal interchangeability? What does the DOH worry about? The United States switched the vaccine without doing this kind of research.\textsuperscript{105} Deputy Director of the Bureau of Communicable Disease Control Hsu Hsu-mei replied that "now it is a sensitive time because the vaccine policy is concerned over whether or not to support domestic pharmaceutical industries." She added, "the Hepatitis Advisory Committee of the Executive Yuan advised doing this research." Lee Ching-yun rebutted, "the research only has a \textit{political value} rather than a scientific value."[emphasis added] In addition, Lee Shou-tung pointed out, "there are two papers on \textit{The Lancet} regarding the interchangeability of different vaccines which have positive results." But the conclusion of the meeting was that "the vaccinal interchangeability research is necessary."\textsuperscript{106} It was interesting that Lee Ching-yun

\textsuperscript{105}The DOH document Put’ung ch’angpai chi B-hsing kanyen hunho shihyung chih mianyi hsiaokuo yenchiu yenchiu fanchen yent’aohui huivi chilu(The Minutes of Discussing Meeting Regarding the Efficacy Study of Interchangeably Using Different Vaccines), February 5, 1990.

\textsuperscript{106}In addition, Dr. Chen Ding-shinn also said that the vaccinal interchangeability research had no scientific value. See "The Hepatitis B Control Program in the Past, Now, and for the Future," by Chen Ding-shinn, \textit{Lienho pao}, September 9 & 10, 1989. Although Chen Ding-shinn said in public that people had better keep using the same vaccine in their vaccination course, he told a journalist many times that to use
accepted the request of the committee to do this research.

*Ad hoc* research characterized this project. It did not mainly aim to solve any scientific problem. The director of the research even pointed out that its function was political. It was a measure used to protect Lifeguard's plasma vaccine for three years. Therefore, the time of announcing the research results became politically sensitive. In June 1991, Dr. Lee Ching-yun said:

the preliminary results of the research regarding the vaccinal interchangeability seemed positive. But the conclusion cannot be published until the end of the research schedule, because now the circumstance is too sensitive.107

The DOH recognized that the plasma vaccine would be replaced by the recombinant DNA vaccine in the near future.108 No matter what the result of the research would be, the DOH had prepared to open the vaccine market to the recombinant DNA vaccine in mid-1992.109 In other words, the vaccinal different vaccines interchangeably was safe. Interview with an anonymous journalist at Taipei in November 1993.


108The DOH suggested Lifeguard consider importing the unpacked recombinant DNA vaccine to pack in Taiwan. See the DOH document 77.12.21. Wej-Shu-Yao-Tzu No. 763983, December 21, 1988. Lifeguard contracted with Merck about this business in January 1989, presented as the followed.

interchangeability research aimed to protect Lifeguard for three years.

Meanwhile, Lifeguard also had prepared for switching to the recombinant DNA vaccine business. Lifeguard showed no interest in waiting for the DCB’s recombinant DNA vaccine because its development was slow. In January 1989, in order to keep the domestic market after the recombinant DNA vaccine entered Taiwan, Lifeguard contracted Merck’s unpacked recombinant DNA vaccine to pack it into doses in Taiwan. In addition, Lifeguard tried to get the DOH’s license of Merck’s recombinant DNA vaccine in March 1992, three months before Lee Ching-yun’s interchangeability research was finished. That is, when Lee Ching-yun’s research finished, Lifeguard would have prepared the recombinant DNA vaccine to replace its plasma vaccine, thereby keeping its Taiwan’s market.

However, in mid-1991, the DPP assemblymen Chang Wen-ying and her colleagues used the AIDS issue to attack Lifeguard’s plasma vaccine. Besides, on June 19, 1991, Commissioner Lin Ko-shao was forced by the assemblymen to buy the recombinant DNA vaccine starting from January 1992. Since the three-year partial protection had been the DOH’s policy, the DOH made its efforts to argue against Chang Wen-ying’s assertion, as mentioned above.

\[110\] Interview with Mr. Lai Pen-tui at Lifeguard, Taipei, on May 3, 1993. Also see the Lifeguard document The Report to Shareholders, June, 1992.
Diminishing the Power of the Taiwan Provincial Government

After Commissioner Lin Ko-shao announced the use of the recombinant DNA vaccine from January 1, 1992, Director General of the DOH Chang Po-ya insisted that the mass vaccination program should use the plasma vaccine before the research of the vaccinal interchangeability was finished in the mid-1992; otherwise, the DOH would not subsidize one-third of the budget for the hepatitis B vaccine. Later, on July 10, 1991, Lin Ko-shao negotiated with the DOH and reached a compromise in which the mass vaccination program would use the recombinant DNA vaccine beginning in July 1992. On the same day, Director General Chang Po-ya stated that Premier Hao Po-tsun had agreed to use the plasma vaccine in FY 1992. Furthermore, she asserted:

The government had better incorporate Lifeguard into state-owned enterprises; otherwise, some politicians will attack the DOH for protecting the KMT-owned enterprise. The DOH likes to promote domestic biotechnological industries because Taiwan should have her own vaccine industry. I do not need to do anything good for the KMT-owned enterprise because I am not a KMT member. ... Besides, it is unreasonable to say that Lifeguard is a KMT-owned company since

KMT only holds a small part of Lifeguard’s shares.\textsuperscript{112}

In the discourse of the DPP assemblymen’s criticisms and Chang Po-ya’s assertions regarding Lifeguard’s vaccine, the term "KMT-owned enterprise" implied that the KMT government might choose Lifeguard’s vaccine because of political considerations rather than safety and efficacy. In other words, the DPP assemblymen used the "KMT-owned enterprise" issue to undermine the credibility of Lifeguard’s vaccine.

On July 11, 1991, under great pressure from some KMT assemblymen, Commissioner Lin Ko-shao changed his mind and announced again that the TPDOH would begin using the second generation vaccine from January 1, 1992.\textsuperscript{113} Lin Ko-shao explained that the Executive Yuan had directed the use of the second generation vaccine from the July of 1992, but KMT assemblymen Liu Chuan-chung and his colleagues insisted that Lin Ko-shao should keep his original promise to use the second generation vaccine from January 1, 1992.\textsuperscript{114} There was only a six-month gap between January and July. But this time the KMT assemblymen, rather than DPP members, insisted on using the recombinant DNA vaccine from January 1, 1992 rather than to support the KMT government’s policy. We need to look into the


\textsuperscript{114} Ibid.
political context of that time in order to understand why the KMT assemblymen were on the DPP members' side in this controversy over the vaccine safety.

From 1990, unrest characterized the Taiwan Provincial Assembly. Many assemblymen worried that the power of the Taiwan Provincial Government would be weakened or even emptied, which would mean that the power of the assemblymen would decrease very much. Two issues in their discourse indicated their worry. One was how to adjust the administrative districts and the other was centralization.

From the late 1980s, under the trend of political liberalization and greater democracy, more and more opinions favored the direct election of the Governor of the Taiwan Provincial Government, the Mayor of the Taipei City Government, and the Mayor of the Kaohsiung City Government.\(^{115}\) The issue of direct elections raised, in turn, a corollary issue concerning administrative district boundaries. Beginning in 1949, after the KMT government left mainland China, their administrative area was limited to Taiwan Province, Taipei City, Kaohsiung City, and two small groups of islands, Quemoy and Matsu(Figure 5-1).\(^{116}\) The administrative district of Taiwan Province entailed about 90% of the land and 70% of the population. If the Governor of the Taiwan Provincial Government was directly elected, his or her popular support might be greater than that of the President, who

\(^{115}\) They were assigned by the central government.

\(^{116}\) These two cities were municipalities under the direct jurisdiction of the Executive Yuan.
was elected by the representatives of the National Assembly. Administrative district boundaries would influence the political power structure. Therefore, the issue of adjusting Taiwan’s administrative districts emerged. One proposal was "One Province and Several Municipalities," which aimed to widen the districts of Taipei City and Kaohsiung City, or even add one more municipality, such as Taichung City. Another assertion was "Several Provinces and Several Municipalities." In other words, these proposals aimed to weaken the power of the Taiwan Provincial Government.\footnote{See assemblymen’s statements on Taiwan shengyihui kungpao(The Communique of the Taiwan Provincial Assembly): Liu Shou-cheng on October 16, 1990; Chang-Tsai Mei on October 16, 1990; Liu Chin-Te on March 26, 1991; Yu Jen-ho on April 1, 1991; Chou Hsi-man on April 3, 1991; Chang Chao-lang on April 16, 1991; Liu Shou-cheng on June 18, 1991.}

The other issue was centralization. After the KMT government moved to Taiwan in 1949, one method the central government used to control local governments involved finance. Many local taxes had to be sent to the central government, then the central government assigned a subsidy to the local governments. Therefore, the Taiwan Provincial Government and many other local governments were poor and depended on the central government.

In 1991, the KMT government planned to centralize the budget of all local police departments. Furthermore, the KMT government planned to incorporate many properties of Taiwan Provincial Government, such as the Taiwan Water Company, Taiwan Tobacco & Wine Monopoly Bureau, international harbors, forestry affairs,
labor insurance, farmer insurance, and others into the direct control of the central government. The decrease of the political power of Taiwan Provincial Government implied the decrease of the political power of the assemblymen. Therefore, they not only argued against centralization, but also asked the officials of the Taiwan Provincial Government to be responsible to the Governor and the Taiwan Provincial Assembly rather than to the central government.\footnote{See the assemblymen’s statements on Taiwan shengyihui kungpao (The Communique of the Taiwan Provincial Assembly): Yu Jen-ho on April 1, 1991; Chiu Ching-chun on April 2, 1991; Liu Shou-cheng et al. on May 28, 1991; Huang Yu-jiau on July 11, 1991; Lien Chin-fu on July 12, 1991; Fu Wen-cheng on July 15, 1991; Cheng Chin-te on July 15, 1991; Lin Chung-nan on July 15, 1991; Hsieh Chun-hui on July 16, 1991; Yu Ling-ya on July 16, 1991; Cheng Chao-lang on July 17, 1991; Chen Ming-wen on July 22, 1991.}

Resolving the Controversy

The 1991 vaccine controversy coincided with the unrest in the Taiwan Provincial Assembly, arising from the assemblymen who worried that their power might be diminished by the central government. After Commissioner Lin Ko-shao agreed with the DOH to use the recombinant DNA vaccine from July 1992, some KMT assemblymen, rather than DPP members, criticized Lin Ko-shao, saying that he was only loyal to the DOH rather than to the Governor and the Assembly. KMT
assemblyman Chen Chin-hsiang asserted that the Taiwan Provincial Government should make its own decision regarding vaccine policy rather than be directed by the central government. KMT assemblyman Liu Chuan-chung criticized Lin Ko-shao, stating that if Lin Ko-shao was only responsible to the DOH rather than to the Taiwan Provincial Assembly, he was ignoring the Taiwan Provincial Government. When KMT assemblyman Cheng Chen-hsiung put more pressure upon Lin Ko-shao to keep his word concerning switching to the new vaccine, this pressure involving Lin Ko-shao's loyalty to the Assembly. Lin Ko-shao agreed to use the recombinant DNA vaccine from January 1, 1992 as the assemblymen requested.  

Finally, Lin Ko-shao proposed a compromise in which the TPDOH would provide the two vaccines from the January 1, 1992, to let the general people have an alternative. The DOH and the Taiwan Provincial Assembly finally accepted his proposal.  

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120 Taiwan shinsheng pao, July 19, 1991; Chungkuo shih pao, July 19, 1991. DPP assemblywoman Chang Wen-ying still criticized the DOH on three matters; for emptying the power of the Taiwan Provincial Government, that the plasma vaccine had a potential crisis of getting AIDS, and that Lifeguard was KMT party's company. See Taiwan shengyihui kungpao(The Communique of the Taiwan Provincial Assembly), Vol.68, No.28, pp.4050-4059(in Chinese). Also see Chungkuo shih pao, August 4, 1991.  
121 In 1989, the TPDOH used 928,576 doses of the plasma vaccine on babies in Taiwan Province(DOH, 1989:307). But in fact, the TPDOH only bought 40,000 doses recombinant DNA vaccine in 1992. See Taiwan shinsheng pao, December 7, 1992.
born in November, 1992, although the plasma vaccine was still as good as the recombinant DNA vaccine.\textsuperscript{122} Furthermore, although Dr. Lee Ching-yun’s three-year research showed positive results regarding the vaccinal interchangeability, the DOH still asked the general public to use the same vaccine during their vaccination course. The DOH’s explanation was that the interchangeability research was not long enough.\textsuperscript{123} But the other possible reason might be that the DOH still had lots of plasma vaccines in stock.\textsuperscript{124}

The political operations of the government agencies and politicians resolved the controversy. Raising the AIDS issue, the assemblymen insisted on switching to the recombinant DNA vaccine based upon their different political considerations. The DOH’s policy considerations shaped its "knowledge" regarding the interchangeability of different vaccines. The scientific evidence solely did not resolve the controversy. Rather, when the DOH, the TPDOH, and the Taiwan Provincial Assembly established a compromise about the schedule of beginning the use of the recombinant DNA vaccine, the controversy was resolved and the safety of the plasma vaccine was reestablished again.

\textsuperscript{122}Minsheng pao, October 30, 1992.

\textsuperscript{123}Ibid.

\textsuperscript{124}Meanwhile, the DOH still had about four hundred thousand doses of plasma vaccine in stock. See Minsheng pao, October 30, 1992; Chungkuo shih pao, October 30, 1992; Chungshih wan pao, November 7, 1992. The DOH used the plasma vaccine until November 1993. See Minsheng pao, September 27, 1993.
Conclusion

The emergence of the 1987/1991 controversies displayed the socially contingent characteristics of the plasma vaccine safety. In Taiwan, the safety of the plasma vaccine was established after the 1981 controversy was resolved, as discussed in chapter three. But its status did as a scientifically credible vaccine not necessarily remain, even though it had an excellent record. During the 1987 controversy, the AIDS issue downgraded the credibility of the plasma vaccine. But as soon as the critics' voices disappeared from public discourse, the plasma vaccine was accepted as safe again, and widely used in Taiwan. However, in 1991, DPP politicians used the AIDS issue to challenge the credibility of the plasma vaccine yet again, even though no AIDS case had been linked to the plasma vaccine. In other words, the excellent record of the plasma vaccine did not guarantee its scientific status.

Politicians, government agencies, and government scientists all participated in the scientific knowledge formation regarding the vaccine safety. The DOH's policy considerations produced an ad hoc research project--the study of interchangeability of different vaccines--to protect Lifeguard's vaccine. The DOH's policy shaped the knowledge regarding whether or not interchangeably receiving different vaccines was
safe and efficacious. The change of the DOH’s policy implied the change of the
knowledge.

Political interests of the assemblymen and political context shaped the
development of the 1991 controversy, which in turn reshaped the concepts of the
plasma vaccine safety. In the 1991 controversy, both KMT and DPP assemblymen
were on the same side arguing against Lifeguard’s plasma vaccine. Some DPP
assemblymen criticized the vaccine in order to attack the KMT government.
Worrying that the centralization policy of the KMT government would weaken their
political power, some KMT assemblymen asked the TPDOH to switch to the
recombinant DNA vaccine. Regardless of the assemblymen’s political considerations,
their creation of a big controversy and forcing of the TPDOH to switch the vaccine,
downgraded the scientific status of the plasma vaccine.

The political operations of government agencies and politicians, rather than
scientific knowledge solely, resolved the controversies. In 1987, the STAG under the
charge of Minister Lee Kuo-ting still played an important role in resolving the
controversy. In 1991, the compromise among the DOH, the TPDOH, and the Taiwan
Provincial Assembly resolved the controversy. After Minister Lee Kuo-ting retired in
1988, the power of the STAG declined. The STAG even disappeared in the 1991
controversy. That is, no strong political power could coordinate different opinions
anymore. The government scientists, who welcomed the participation of politicians
before, now could not but say "let science be science; let politics be politics."
Chapter Six

Conclusion

The process of scientific knowledge formation is the main concerns of the sociology of scientific knowledge. The dynamic of scientific development is an important topic for science policy studies. This dissertation contributes to sociology of scientific knowledge and science policy studies by examining the political dimensions of scientific practice. Specifically, it provides a valuable understanding about how scientific knowledge was formed and how various factors shaped scientific activities. The history of the Taiwanese hepatitis B control program from 1980 to 1993 displays a rich picture regarding the political dimensions of scientific practice in Taiwan.

This dissertation discusses the political dimensions of the hepatitis B control program from two perspectives: the social contingencies of scientific knowledge and the role of government in scientific practice. From the social contingencies of scientific knowledge, this research shows that on the basis of different concerns or political interests, various participants, rather than scientists solely, interactively shaped and reshaped the content of scientific knowledge regarding hepatitis B
control. From examining the role of government in the hepatitis B control program, this research demonstrates how the KMT government as a funder, designer, regulator, and researcher significantly participated in scientific practice.

**Social Contingencies of Scientific Knowledge**

The socially contingent characteristics of scientific knowledge displayed how possible political operations could shape scientific knowledge formation. When numerous participants could bring various issues and strategies into scientific practice to argue for their concerns, the dynamic of scientific practice might not be directed solely by traditional "scientific rationality." When the credibility of scientific knowledge or experts was downgraded in controversies, this scientific knowledge and these experts had a difficult time serving as the arbitrators of the controversies. When government science policy shaped certain scientific knowledge, the change of the policy in turn changed the knowledge.

*Various Participants*
In the history of the hepatitis B control program, we see that numerous participants, such as government officials, industries, mass media, concerned general people, and scientists, all together shaped and reshaped certain scientific knowledge regarding hepatitis B control. That is, scientific knowledge was not necessarily produced by some elite scientists solely. When various groups brought different issues and different strategies for their concerns into scientific practice, the dynamics of scientific knowledge production may change.

In the 1981 controversy, the safety of the vaccine was not decided by some elite scientists. Rather, bringing in different legal, ethical, racial, and technical issues, various participants, including government officials, journalists, legal advisors, newspaper readers, scientists, and other concerned people, together shaped the scientific status of the vaccine safety. The critics used some strategies, such as creating a sustained controversy, citing medical workers' uncertain or negative assertions, recalling the "bad history" of the U.S. FDA concerning licensing vaccine, to downgrade the credibility of the authority and the "scientific knowledge" that the supporters cited. Therefore, the issues and strategies of numerous participants prevented scientific knowledge from being the sole arbitrator of the controversy.

In the 1987 controversy, the reports of the press helped create an image in which the process of licensing Lifeguard's vaccine seemed questionable. In addition, the rhetorical arguments of the recombinant DNA vaccine supporters tried to undermine the scientific status of the plasma vaccine. Government officials,
scientists, pharmaceutical companies, and the newspapers together reshaped the safety of the plasma vaccine.

In the 1991 controversy over the safety of Lifeguard plasma vaccine, DPP assemblymen challenged the safety of the vaccine for their political interests. They showed little confidence in Lifeguard's vaccine, saying that the DOH chose Lifeguard's plasma vaccine because Lifeguard was a KMT-owned enterprise rather than because the vaccine was safe. Meanwhile, the change of political context from the late 1980s in Taiwan significantly influenced the political concerns of some KMT assemblymen, thereby they also questioned the vaccine rather than supported the vaccine policy of the KMT government. In order to partly protect Lifeguard, the DOH officials and government scientists made efforts to argue for the Lifeguard plasma vaccine. Therefore, the interaction of various participants' rhetorical arguments, strategies, political concerns, and economic interests, reshaped the scientific status of the plasma vaccine.

**Resolving Controversies**

Social factors and scientific knowledge simultaneously resolved the controversies when participants were satisfied with both technical feasibility and political acceptability. In the three controversies, bringing different issues and using
different strategies, numerous participants shaped different dynamics of scientific practice. In 1981, the critics were concerned with the legal and ethical legitimacy of the clinical trial and the long-term safety of the vaccine on Taiwanese children. In 1987, the AIDS issue became the main point in the controversy, even though no reported AIDS case had resulted from the plasma vaccine. In 1991, political interests of the DPP and KMT assemblymen and the usage of the AIDS issue shaped the controversy.

Since various participants in different political contexts shaped different dynamics of scientific practice, the ways of resolving the controversies were different. Political operations played an important role in resolving the controversies. The March 1981 meeting of Veterans General Hospital, the March 1981 meeting of the STAG, and the efforts of Yang Ming Medical College President Yu Chun and Minister Lee Kuo-ting in 1987, all helped silence the critics. In 1981, the critics’ voices vanished in the public domain after the Control Yuan released its report. In 1987, the critics’ voice disappeared from the public discourse after the persuasion of Minister Lee Kuo-ting. In 1991, the criticism over the plasma vaccine faded away after the political compromise regarding the schedule of providing the recombinant DNA vaccine was reached among participants.

In the controversies, although the political operations significantly shaped the resolution process, cognitive arguments still played an important role. For example, the report of the Control Yuan cited many scientific papers to support its final
conclusion. Besides, participants often cited "scientific knowledge" to argue against each other. But scientific knowledge was not the sole arbitrator of the controversies; otherwise, political operations would have played little role in resolving the controversies. That is not to say that scientific knowledge totally lost a certain degree of authority in the controversies. Instead, participants usually cited "scientific knowledge" which favored their concerns; that is, "scientific knowledge" became a possible tool for any participant. In 1981, when supporters cited the endorsement of the U.S. FDA for the vaccine, some critics tried to undermine the credibility of the FDA. When supporters cited the positive report of the plasma vaccine clinical trial on American homosexual men, a critic questioned the credibility of the paper. In 1987 and 1991, when some scientists or politicians used the AIDS issue to challenge the plasma vaccine, government scientists raised the excellent record of the vaccine to argue for safety of the vaccine. These cases showed that when the participants simultaneously held contradictory "scientific knowledge" to argue against each other, the credibility of "scientific knowledge" was downgraded, which in turn prevented scientific knowledge from being the sole arbitrator of the controversies.

When the controversies were resolved, it did not necessarily mean that all participants reach a consensus accepting the safety of the plasma vaccine. For example, in 1981, Dr. Liaw Yun-fang accepted the report of the Control Yuan about the clinical trial on Taiwanese children, because the risk of having a uncertain vaccine might be no worse than the existing risk of HBeAg carrier mothers’ infants.
In 1991, after the safety of the plasma vaccine was no longer an issue in public domain, Assemblywoman Chang Wen-ying still insisted that receiving the vaccine had a risk of AIDS infection. Therefore, the resolution of the controversies meant that no voice criticized the safety of the vaccine in public rather than that every participant accepted the safety of the vaccine.

After the controversies were resolved, the safety of the plasma vaccine was established in public discourse. Even though no serious injury or reported AIDS case resulted from the plasma vaccine, the vaccine was questioned again and again. The AIDS issue, the competition of the recombinant DNA vaccine, or the political interests of some politicians were all possible factors that helped various critics challenge the plasma vaccine. The excellent record of the plasma vaccine could not guarantee its scientific status. The repeated challenges that the plasma vaccine faced presented the social contingencies of scientific knowledge.

Science Policy Shaping Scientific Knowledge

Besides the controversies themselves, how government policies shaped and reshaped scientific knowledge regarding hepatitis B control revealed the social contingencies of scientific knowledge which in turn denoted the political dimensions of scientific practice. When the DOH designed a policy regarding hepatitis B control,
the policy implied certain "correct knowledge." The change of the DOH’s policy meant the change of its "correct knowledge." Various politicians and government leaders, social pressures and social problems all influenced the direction of the DOH’s policy, which in turn changed the content of the DOH’s "correct knowledge."

In 1980, the DOH insisted on shelving Beasley’s clinical trial project until the U.S. FDA licensed the plasma vaccine. But as soon as the government leaders endorsed the clinical trial, the DOH accepted the vaccine and approved the clinical trial. In addition, in order to promote the hepatitis B control program, government scientists emphasized the severity of hepatitis B, warning that carriers would likely develop cirrhosis or hepatocellular carcinoma in the future. But in the 1980s, no direct evidence proved this "correct knowledge." However, when many carriers were discriminated against in the military, work place, school, and within their own families, the DOH changed its "correct knowledge" and began saying that hepatitis B was not so terrible and the possibility of developing cirrhosis or hepatoma from asymptomatic carriers was very low. In other words, the severity of the hepatitis B vanished.

In order to improve dietetic hygiene, which in turn would control hepatitis A, by hitching a ride on the hepatitis B control program, the DOH made efforts to convince Taiwanese people of certain "correct knowledge" involving saliva as one way of transmitting the hepatitis B virus. Thereby, the DOH suggested Taiwanese people change their dining manner to "Chinese food, Western style." Later, in order
to respond to the pressure of many legislators, the DOH began promoting disposable utensils. But when millions of polystyrene utensils created a big environmental problem and many carriers were discriminated against in restaurants or family dining tables, the DOH finally revised its "correct knowledge" and confessed that using disposable utensils aimed to control hepatitis A rather than hepatitis B.

From the cases of the controversies over the safety of the plasma vaccine and how the DOH’s policies shaped the content of scientific knowledge regarding hepatitis B control, we understand the social contingencies of scientific knowledge. In this contingent characteristic, we see how political operations shaped the scientific knowledge formation. It is this contingent characteristic that provided a space for government participating in scientific practice.

The Role of Government in Scientific Practice

Studying how government participates in scientific practice provides a valuable perspective for characterizing some political dimensions of scientific practice. Government may design science policies to direct scientific development, set up guidelines to regulate scientific research, provide funding to promote scientific
studies, and do scientific research itself through government scientists. The history of the hepatitis B control program displayed how the KMT government significantly influenced the scientific knowledge formation regarding hepatitis B control.

**Government’s Science Policy**

Government science policy means government intending to achieve certain goals by its strategies regarding scientific development and its allocation and mobilization of resources. In other words, science policy is the government’s blueprint of developing science. Since many research projects rely upon government funding, especially in a Third World country like Taiwan, whether or not a research field was involved in a science policy would significantly influence the development of this field.

In the 1970s, although some of Taiwan’s hepatitis B researchers repeatedly appealed to the KMT government for paying attention to hepatitis B research, the government showed no concerns about hepatitis B control. Therefore, compared to American hepatitis B researchers in Taiwan, Taiwan’s researchers were poorly funded, which in turn limited their research. However, after the government leaders endorsed the hepatitis B control program, which later became one of the eight strategic areas of science and technology, the government funding for the hepatitis B
research significantly increased.

Political considerations and economic interests helped shape the government’s science policy. In the late 1970s, diplomatic frustrations and economic depression threatened the regime of the KMT government. The government chose to advance the economy, by upgrading industries and diversifying into new product lines, in order to use economic relations to replace traditional forms of international political relations. The NSC chose to launch biotechnology by developing the recombinant DNA hepatitis B vaccine as the first step. Since the domestic market provided a chance of survival for the new technology, the NSC supported the hepatitis B control program.

Since Taiwan’s pharmaceutical companies were almost all small-scale and hardly R&D oriented, the NSC established Lifeguard to transfer Pasteur’s plasma vaccine technology, hoping to promote R&D-oriented bioindustries. In other words, Lifeguard was a product of the government’s policy. However, in the 1991 controversy, the DPP assemblymen criticized the Lifeguard vaccine, saying that the KMT government used Lifeguard’s vaccine because Lifeguard was a KMT-owned enterprise, rather than because the vaccine was safe and efficacious. That is, this criticism tried to downgrade the scientific status of the vaccine.

The government’s policy influenced the development of certain research. When the recombinant DNA vaccine became a competitor of the plasma vaccine, the DOH discouraged the clinical trial of foreign recombinant DNA vaccine in Taiwan. Compared to the warm support for the clinical trial of the plasma vaccine in 1981,
the clinical trial of the recombinant DNA vaccine was not welcomed in the mid-1980s. Besides, after partial protection for Lifeguard's vaccine became the DOH's policy, the DOH designed an ad hoc research program—the study of the vaccinal interchangeability—to respond to the challenges of the recombinant DNA vaccine supporters. In other words, the government's policy directed or discouraged certain research.

**Government Officials in Scientific Practice**

Besides designing science policy to direct scientific development, government officials directly participated in resolving the controversies in order to establish the safety of the plasma vaccine. In March 1981, the STAG under the charge of Minister Lee Kuo-ting held a meeting in order to silence the critics. Meanwhile, the DOH repeatedly argued for the vaccine and the clinical trial. Later, the investigation and the report of the Control Yuan helped critics and supporters reach a compromise, and thereby resolved the controversy. In 1987, Minister Lee Kuo-ting helped in resolving the second controversy by winning over some of the critics. In 1991, since the Executive Yuan directed the DOH to protect high-tech bioindustry, the DOH not only designed the ad hoc research program to respond to the critics' challenges, but also actively argued for the Lifeguard's plasma vaccine. Finally, the compromise among

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the DOH, the TPDOH, and Taiwan Provincial Assembly resolved the controversy.

In addition, the DOH helped promote scientific knowledge regarding hepatitis B control. Hundreds of health stations held short-term training courses for medical workers and school teachers, home visits for pregnant women, discussion meetings and question-answer contests with prizes for community people. Besides, the DOH asked all state-owned hospitals to modify their practice by using disposable needles and syringes. In other words, no matter whether medical workers of state-owned hospitals accepted the "correct knowledge" that HBV was transmitted via blood, they should shift to new medical practice based upon the "correct knowledge."

Furthermore, in November 1981, Yi-Lan Provincial Hospital announced that all their liver patients would use disposable utensils in order to "cut the routes of HBV infection." Later, the Department of Health of Taiwan Province ordered every provincial hospital to sterilize liver patients' utensils. These decisions changed the medical practice in the hospital too, no matter whether or not their medical workers thought that HBV was transmitted by saliva. But when the medical workers changed their medical practice, the "correct knowledge" became part of their life.

Later, in August 1982, Premier Sun ordered the DOH to request food hawkers to use disposable utensils. In May 1983, the DOH ordered all the cafeterias and restaurants to do as such if they had no running water. That is, the political decisions shaped the DOH's policy, which in turn enforced the status of the "correct knowledge" that HBV was transmitted via saliva and contaminated utensils.
From the history illustrated above, government officials played an important role in promoting the hepatitis B control program. They did not only make efforts to convince the general people of certain "correct knowledge," but were also actively involved in resolving the controversies. No one accused government officials in public of being outsiders intervening in scientific practice regarding hepatitis B control. Government scientists helped government officials become significant participants by giving them a certain degree of interpretative authority in scientific affairs.

Government Scientists

Studying the activities of government scientists is important since more and more public policy issues involve complex scientific and technological information, and government scientists can offer the necessary information for the government in the process of policy decision-making or to argue for government’s policy. In other words, government scientists may intensify government officials’ capacity in the context of political negotiation.

In the controversies, government scientists argued for the DOH’s policy. As mentioned above, in 1980, the Hepatitis Control Committee of the DOH did not accept the plasma vaccine. As soon as the government leaders endorsed the clinical
trial, the Hepatitis Control Committee approved it and then argued for the vaccine. In 1986, the Hepatitis Control Committee modified the standard of licensing vaccine in order to minimize Lifeguard’s financial loss. Later, in 1987, most of the members of the committee showed no concerns about the statistical disadvantage of the Lifeguard’s vaccine clinical trial in order to pass the license examination. In 1991, when partial protection for Lifeguard’s plasma vaccine became the DOH’s policy, the Hepatitis Control Committee not only argued against the recombinant DNA vaccine, but also designed an ad hoc research program to respond to critics’ challenges.

Besides arguing for government’s policy, government scientists produced certain "correct knowledge" in order to promote the hepatitis B control program. As mentioned above, they emphasized the severity of hepatitis B, saying that carriers would likely develop cirrhosis or hepatocellular carcinoma in the future. In addition, they suggested Taiwanese people change their dining manner to "Chinese food, Western style" and use disposable utensils. But when the DOH’s policy changed in order to respond to some social problems, government scientists changed the content of the "correct knowledge."

When the controversies were resolved and the safety of the plasma vaccine was established, there was no guarantee that Taiwanese people would automatically accept the vaccine. Government scientists made efforts to convince various groups of "correct knowledge" regarding hepatitis B control. They edited and examined the educational materials, such as booklets, pamphlets, and videos regarding hepatitis B
control. They addressed some community meetings and short-term training courses for medical workers or school teachers. They wrote papers regarding hepatitis B control on popular medical magazines and newspapers. Their efforts helped government officials promote the hepatitis B control program, especially the mass vaccination program.

From the historical cases illustrated above, we see how the government actively participated in scientific practice regarding hepatitis B control. The government designed science policy to promote hepatitis B control. Government officials were involved in resolving the controversies. Government scientists produced certain "correct knowledge" to support the government's policy. The DOH's policy implied certain "correct knowledge." The change of the policy meant the change of the "correct knowledge." In other words, the participation of the government significantly shaped the dynamic of scientific knowledge formation regarding hepatitis B control in Taiwan.

Further Research

This dissertation is a preliminary step in understanding the political
dimensions of scientific practice in Taiwan. There are more noteworthy topics waiting for further research. One topic concerns how government scientists may influence the development of two competing research schools. Since many research projects rely upon government funding, the design of science policies may significantly influence the development of certain research fields. Therefore, if two research schools compete with each other, and if the government scientists take part in making science policy, will they design the government science policy to benefit their own research school and disadvantage the competitors’ research school? If this is the case, government scientist studies would contribute to the philosophy of science regarding how two research schools compete.

The other topic concerns informal power structure within science policy decision-making. This dissertation has shown that the informal power structure among the Hepatitis Control Committee shaped the interpretative flexibility of statistical data when they examined Lifeguard’s vaccine license application. This dissertation also has pointed out that the power of the STAG in the hepatitis B control program declined very much after Minister Lee Kuo-ting resigned. Since the STAG still exists and is overseen by a Minister Without Portfolio, why does its coordinated power decline? Without a coordinated mechanism, what will be the dynamic of scientific development in Taiwan? Studying the informal power structure of science policy decision-making will contribute to answering these questions.

Another topic pertains to the relation between science and technology, which
in turn influences science policy design and allocation of limited R&D budget. This dissertation has denoted that when the NSC designed the strategy of promoting genetic engineering research, it adopted the idea of the assembly-line model of the science-technology relationship. In this model, the beginning operation was basic science; applied science, invention, development, engineering, and innovation followed. According to this strategy, the action was divided into three levels: up-stream, mid-stream, and down-stream. But how was this assembly-line operated? What was the result of this strategy? Since private enterprises--the down-stream--need to compete in the market, can they wait for the uncertain results from the up-stream? In addition, should the research direction of the up-stream--the academic research, in the NSC's design--be directed by the interests of the down-stream? If all research in an assembly-line model program should be directed by one specific goal, who should be the designer?

Finally, since science policy may influence the direction of scientific development, who has to be involved in the decision-making process? What will be an acceptable process of policy decision-making? Should science policy be decided by government leaders who are informed by some scientists? Should science policy be decided by government officials who get some advice from their familiar scientists? These questions still wait for studies in Taiwan.
Table 4-1. Ten Leading Causes of Death, Taiwan Area, 1980  
(from Health Statistics II, Vital Statistics, the Department of Health, 1979, p.21)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Cause of Death</th>
<th>No. of Death</th>
<th>Death Rate*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All causes of Death</td>
<td>81,014</td>
<td>468.09</td>
</tr>
<tr>
<td>1.</td>
<td>Cerebrovascular</td>
<td>13,069</td>
<td>75.51</td>
</tr>
<tr>
<td>2.</td>
<td>Malignant neoplasms</td>
<td>12,215</td>
<td>70.58</td>
</tr>
<tr>
<td>3.</td>
<td>Accidents</td>
<td>11,146</td>
<td>64.40</td>
</tr>
<tr>
<td>4.</td>
<td>Heart Disease</td>
<td>7,034</td>
<td>40.64</td>
</tr>
<tr>
<td>5.</td>
<td>Pneumonia</td>
<td>3,256</td>
<td>18.18</td>
</tr>
<tr>
<td>6.</td>
<td>Hypertensive disease</td>
<td>3,091</td>
<td>17.86</td>
</tr>
<tr>
<td>7.</td>
<td>Cirrhosis and chronic liver disease</td>
<td>2,947</td>
<td>17.03</td>
</tr>
<tr>
<td>8.</td>
<td>Bronchitis, emphysema and asthma</td>
<td>2,673</td>
<td>15.44</td>
</tr>
<tr>
<td>9.</td>
<td>Tuberculosis</td>
<td>2,669</td>
<td>15.42</td>
</tr>
<tr>
<td>10.</td>
<td>Suicide</td>
<td>1,715</td>
<td>9.91</td>
</tr>
<tr>
<td></td>
<td>All liver diseases**</td>
<td>5,304</td>
<td>30.66</td>
</tr>
</tbody>
</table>

* Death rate per 100,000 population  
** All liver diseases include chronic liver diseases, cirrhosis, malignant neoplasm of liver and intrahepatic bile ducts, specified as primary.  
*** Mid-year population 17,307,514
Table 4.2 Deaths by Cause and HBsAg Status on Recruitment (from Beasley et al., 1981b:1131)

<table>
<thead>
<tr>
<th>HBsAg Status on recruitment</th>
<th>Cause of death</th>
<th>Population at risk</th>
<th>PHC incidence*</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHC</td>
<td>Cirrhosis</td>
<td>Other</td>
<td></td>
</tr>
<tr>
<td>HBsAg-positive</td>
<td>40</td>
<td>17</td>
<td>3,454</td>
</tr>
<tr>
<td>HBsAg-negative</td>
<td>1</td>
<td>2</td>
<td>19,253</td>
</tr>
<tr>
<td>Total</td>
<td>41</td>
<td>19</td>
<td>22,707</td>
</tr>
</tbody>
</table>

* Incidence of death from PHC per 100,000 during the time of the study.
Table 4-3 HBsAg Carrier Rates and Age-Adjusted Mortality Rates per 100,000 from Liver Cancer in China (Liver cancer rate data from Li J. et al., 1979:40; HBsAg data from Beasley et al., 1982c:554)

<table>
<thead>
<tr>
<th>Province</th>
<th>Liver cancer rate</th>
<th>HBsAg rate</th>
<th>(1)/(2)</th>
<th>(3)/(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male(1)</td>
<td>Female</td>
<td>= (3)</td>
<td></td>
</tr>
<tr>
<td>Whole country</td>
<td>14.52</td>
<td>5.61</td>
<td>15.2</td>
<td>0.96(4)</td>
</tr>
<tr>
<td>Guangxi</td>
<td>26.55</td>
<td>6.63</td>
<td>16.9</td>
<td>1.57</td>
</tr>
<tr>
<td>Fujian</td>
<td>26.04</td>
<td>9.11</td>
<td>17.9</td>
<td>1.45</td>
</tr>
<tr>
<td>Jiangsu</td>
<td>23.81</td>
<td>8.82</td>
<td>9.7</td>
<td>2.45</td>
</tr>
<tr>
<td>Zhejiang</td>
<td>22.11</td>
<td>8.14</td>
<td>12.8</td>
<td>1.73</td>
</tr>
<tr>
<td>Guangdong</td>
<td>16.99</td>
<td>4.94</td>
<td>16.7</td>
<td>1.02</td>
</tr>
<tr>
<td>Jiangxi</td>
<td>14.22</td>
<td>5.05</td>
<td>19.8</td>
<td>0.72</td>
</tr>
<tr>
<td>Hunan</td>
<td>12.78</td>
<td>4.77</td>
<td>17.8</td>
<td>0.72</td>
</tr>
<tr>
<td>Hebei</td>
<td>12.47</td>
<td>5.17</td>
<td>10.5</td>
<td>1.19</td>
</tr>
<tr>
<td>Anhui</td>
<td>12.36</td>
<td>5.06</td>
<td>12.8</td>
<td>0.97</td>
</tr>
<tr>
<td>Hubei</td>
<td>12.29</td>
<td>4.92</td>
<td>17.6</td>
<td>0.70</td>
</tr>
<tr>
<td>Sichuan</td>
<td>11.73</td>
<td>4.89</td>
<td>16.2</td>
<td>0.72</td>
</tr>
<tr>
<td>Shandong</td>
<td>11.57</td>
<td>4.24</td>
<td>9.3</td>
<td>1.24</td>
</tr>
<tr>
<td>Shannxi</td>
<td>11.47</td>
<td>6.41</td>
<td>4.9</td>
<td>2.34</td>
</tr>
<tr>
<td>Henan</td>
<td>11.39</td>
<td>5.12</td>
<td>11.5</td>
<td>0.99</td>
</tr>
<tr>
<td>Nei Mongol</td>
<td>9.61</td>
<td>5.12</td>
<td>14.8</td>
<td>0.65</td>
</tr>
<tr>
<td>Shanxi</td>
<td>9.47</td>
<td>5.27</td>
<td>4.9</td>
<td>1.93</td>
</tr>
<tr>
<td>Guixhou</td>
<td>6.62</td>
<td>2.75</td>
<td>15.1</td>
<td>0.44</td>
</tr>
<tr>
<td>Yunnan</td>
<td>6.15</td>
<td>2.85</td>
<td>10.1</td>
<td>0.61</td>
</tr>
</tbody>
</table>
Table 4-4 Death by Cause, Previous History of Cirrhosis, and HBsAg Status (from Beasley et al., 1981:1131)

<table>
<thead>
<tr>
<th>Status on Recruitment</th>
<th>Cause of death</th>
<th>Population at risk</th>
<th>PHC incidence *</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PHC</td>
<td>Cirrhosis</td>
<td>Other</td>
</tr>
<tr>
<td>Previous cirrhosis:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HBsAg-positive</td>
<td>5</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>HBsAg-negative</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>No cirrhosis:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HBsAg-positive</td>
<td>35</td>
<td>10</td>
<td>48</td>
</tr>
<tr>
<td>HBsAg-negative</td>
<td>1</td>
<td>2</td>
<td>199</td>
</tr>
<tr>
<td>Total</td>
<td>41</td>
<td>19</td>
<td>247</td>
</tr>
</tbody>
</table>

*Incidence of death from PHC per 100,000 during the time of the study.
Figure 1-1. The Organization of the Central Government
Figure 4-1. Schematic map of the geographic distribution of HBsAg and primary hepatocellular carcinoma (from Szmuness, 1978).
Figure 4-2. Map of the age-adjusted death rates of hepatoma in Taiwan by areas (1971-1980). ■ Significantly higher than Taiwan area, 19.7-30.4/100,000. □ Not significant, 18.0-19.6/100,000. □ Significantly lower than Taiwan area, 11.4-16.6/100,000.
Figure 4-3. HBsAg prevalence in China by province of origin (from Bealsey et al., 1982c:554)
Figure 4-4. Liver cancer mortality (male), 1973-1975, by county, geometric scale (from Li J. et al., 1979:39).
Figure 4-5. Liver cancer mortality (female), 1973-1975, by county, geometric scale (from Li J. et al., 1979:43).
Figure 4-6. The Administrative Structure of the Hepatitis B Control Program in Taiwan
Figure 4-7. The health organization network regarding hepatitis B control in Taiwan (from the DOH, 1993:9).
Figure 4-8. The student class-schedule bookmark regarding hepatitis B control, the Department of Health.
Figure 4-9. A expert address regarding hepatitis control at Shui-Lin Junior High School, Yun-Lin County, on January 8, 1993. Photography provided by Yun-Lin County Health Bureau.
Figure 4-10. A poster exhibition regarding hepatitis B control at Chin-Tung Village, Yun-Lin County, April 23, 1993. Photography provided by Yun-Lin County Health Bureau.
Figure 4-11. A question-answer contest with prizes at Ta-Pi Elementary School, Ta-Pi Village, Yun-Lin County, December 17, 1982. Photography provided by Yun-Lin County Health Bureau.
Figure 4-12. A composition contest and a calligraphy contest at Tung-Hsing Elementary School, Lun-Pei Village, Yun-Lin County. Photography provided by Yun-Lin County Health Bureau.
Figure 4-13. A wall poster contest at Tung-Hsing Elementary School, Lun-Pei Village, Yun-Lin County. Photography provided by Yun-Lin County Health Bureau.
Figure 4-14. The negative image of the sanitation of food hawkers in Taiwan's mass media. *Taiwan Hsin Wen Daily News*, August 24, 1982.
Figure 4-15. A discussion meeting regarding hepatitis B control at Chih-Tung Village, Yun-Lin County, April 23, 1993. Photography provided by Yun-Lin County Health Bureau.
Figure 4-16. A question-answer contest with prizes at Hsi-Lo Town, Yun-Lin County, January 28, 1993. Photography provided by Yun-Lin County Health Bureau.
Figure 4-17. Taiwan Province's assemblyman Hung Chentsong asked the Department of Health of Taiwan Province to prohibit carriers from kissing their lovers. Min Sheng News, March 18, 1983.
Figure 5-1. Map of Taiwan's Administrative Areas
Appendix 1. The Chinese Titles of the Taiwanese Newspapers

Chingnien jih pao: Youth Daily News
Chingnien chanshih pao: Young Soldier News
Chungyang jih pao: Central Daily News
Chunghua jih pao: China Daily News
Chungkuo shih pao: China Times
Chung shih wan pao: China Times Express
Chingchi jih pao: Economic Daily News
Lienho pao: United Daily News
Lienho wan pao: United Evening Express
Minsheng pao: Min Sheng News
Ta cheng pao: The Great News
Taiwan jih pao: Taiwan Daily News
Taiwan shih pao: Taiwan Times
Taiwan shinsheng pao: Taiwan Shin Sheng Daily News
Taiwan shinwen pao: Taiwan Shin Wen News
Tzuli wan pao: The Independence Evening Post
Tzuli tsao pao: The Independence Morning Post
Tzuyu jih pao: Liberty Daily News
Tzuyu shih pao: Liberty Times
(A) Science and Technology Advisory Group


1986.11.14. The Statement by Dr. Ivan L. Bennett, Jr. at the Interim STAG Meeting.


1987.7.7. 76.7.7 (76) Ko-Chi-Fa-Tzu No. 366, July 7, 1987.


1990.7.23. Hsingchengyüan kanyen fangchih kuwen weiyüanhui ti 8 tz’u huivy chilu(The Minutes of the Eighth Meeting of the Hepatitis Advisory Committee of the

(B) The Department of Health


1981.2.19. P'eihao B-hsing kanyen fangchih chihua futao kuots'an suchiao chusha chich'ai chih ch'anchih niting shihyung fangkan huiyi(The Minutes of Improving the Quality of Domestic Disposable Syringes Meeting), February 19, 1981.

1981.5.7. Hsingchengyuan weishengshu kanyen fangchih Ti 1 tsu ti 2 tz'u tsotanhui(The Minutes of the Second Meeting of the First Division of the Hepatitis Control Committee), May 7, 1981.

1981.5.23. Yent'ao suchiao chihshe ch'ich'ai ch'üanmian t'uikuan chih kohsingshing chi chüanhshüeh chunghsin shuhsüeh chienyen fangfa kaichin shihyi yi chiach'iang kanyen fangchih kungtso hsieht'iaohui(The Minutes of Promoting Disposable Needles and Syringes Meeting), May 23, 1981.

1981.5.27. B-hsing kanyen fangchih weisheng chiaoyü chiaoeh'ai shengch'a huiyi(The Minutes of Health Education Materials for Hepatitis B Control Examining Meeting), May 27, 1981.
1981.6. **Yüfang yi(B)-hsing kanyen** (Preventing Hepatitis B), a DOH leaflet, June 1981.

1981.6.18. **Hsingchengyuan weishengshu kanyen fangchih Ti 1 tsu ti 3 tz’u tsotanhui** (The Minutes of the Third Meeting of the First Task Group of the Hepatitis Control Committee), June 18, 1981.


1981.9.7. **Yent’ao t’uihsing chiach’iang B-hsing kanyen fangchih chihua yuksuan shihiy shihiy huiyi** (The Minutes of Promoting Intensive Hepatitis B Control Plan Meeting), September 7, 1981.

1981.11.5. **70.11.5. Wei-Shu-Fang-Tzu No. 347824**, November 5, 1981.

1982.3.25. **Yent’ao ch’engli kanyen hunanche tzuhsün chunghsin hsiangkuan shihiy huiyi chilu** (The Minutes of Establishing Hepatitis Patient Information Center Meeting), March 25, 1982.


1982.8.11. **Feng hsongchengyuanchang chihshih chiach’iang kuting t’anfan weisheng kuanli huiyi** (The Minutes of Licensed Hawker Health Control Meeting), August, 11, 1982.


1983.2.24. Kanyen fanchih weiyüanhui 72 nientu ti 3 tz’u huiyi chilu(The Minutes of the Third Meeting of the Hepatitis Control Committee in FY 1983), February 24, 1983.

1983.4.4. Yiyü kanping huanche tenglupiao t’ienhsieh shihyi huiyi chilu(The Minutes of Discussing the Hepatitis Patient Registration Form Meeting), April 4, 1983.

1983.4.9. 72.4.9. Wei-Shu-Huan-Tzu No. 422387, April 9, 1983.


1983.6.4. 72.6.4. Wei-Shu-Kung-Kuan-Tzu No. 423419, June 4, 1983.


1984.2.20. 73.2.20 Wei-Shu-Fang-Tzu No. 460963, February 20, 1984

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1984.3.1. Kanyen fangchih yüanhuí 73 nientu ti 3 tz’u huiyi chihu (The Minutes of the Third Meeting of the Hepatitis Control Committee in the FY 1984), March 1, 1984.

1984.5.7. Weishengshu kanyen fangchih weiyünhuí 73 nientu ti 4 tz’u huiyi (The Minutes of the Fourth Meeting of the Hepatitis Control Committee in FY 1984), May 17, 1984.


1984.6.27. 73.6.27. Wei-Shu-Fang-Tzu No.478221, June 27, 1984.


1986. 75 nientu B-hsing kanyen weisheng chiaoyü shihshih chihua chinsing

1986.3.5. 75.3.5. Wei-Shu-Fang-Tzu No. 582601, March 5, 1986.

1986.4.24. Kanyen fangchih weiyüanhui ti 3 tsu 75 nientu ti 3 tz’u huivy chilu (The Minutes of the Third Meeting of the Third Task Group of the Hepatitis Control Committee in FY 1986), April 24, 1986.


1987.7.1. Kuots’an hsüehchiang B-hsing kanyen yimiao hochun tengchi shuoming (The Explanation of Licensing the Lifeguard Hepatitis B Plasma Vaccine).


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(C) National Science Council


1986.11.7. 75.11.7. (75) Tai-Hui-Chu-Sheng Tzu No. 146, November 7, 1986.

(D) The Veterans General Hospital

1981.3.9. B-hsing kanyen yimiao huiyi chilu(The Minutes of the Discussion Meeting About the Hepatitis B Vaccine), March 9, 1981.

(E) The Control Yuan

1981.6.5. 70.6.5. 70-Chien-Tai-Yuan-Tiao-Tzu No.1769, June 5, 1981.


(F) The Executive Yuan


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1988.10.4. 77.10.4. Tai-(77)-Wei-Tzu No. 27090, October 4, 1988.

(G) The Legislative Yuan

Lifayüan kungpao(The Communique of the Legislative Yuan).

(H) Taipei City Government


(I) Kaohsiung City Government


(J) Taiwan Provincial Government

(K) Yilan Hsien Government


(L) Taoyuan Hsien Government


(M) The Ministry of Education


(N) The Research, Development and Evaluation Commission


(O) Yünlin Hsien Government


(P) The Environmental Protection Administration

(Q) Taiwan Provincial Assembly

Taiwan shengyihui kungpao(The Communique of Taiwan Provincial Assembly).
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Articles in Refereed Journals


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TEACHING PRESENTATIONS:

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Guest speaker on "The Politics of the Hepatitis B Vaccine Trial Project," at
Dr. Daiwie Fu’s graduate class "The Taiwanese Intellectual History," Fall Semester, 1993.

Guest speaker on "Paradigm and Revolution," at Dr. Chyuan-yuan Wu’s graduate class "Research Methodology of Social Sciences," Fall Semester 1993.