Proceedings

Rockingham Poultry Serviceman's Organization

POULTRY HEALTH SEMINAR

Roanoke-Salem, Virginia
Sheraton Motor Inn
September 14 - 15, 1977

sponsored by

Cooperative Extension Service
Virginia Polytechnic Institute and State University

in cooperation with the

Rockingham Poultry Serviceman's Organization

and

Virginia Department of Agriculture and Commerce

PROGRAM

SHERATON MOTOR INN

WEDNESDAY, September 14, 1977

7:30 - 8:30 Registration

Morning Session - Chairman, Boyd Dove

8:45 Welcome - Winston Turner

9:00 Where Are We Going? - Jerry Gass

9:45 Social Stress of Poultry - Paul Siegel

10:15 Break

10:30 Broiler Respiratory Diseases - Richard Long

11:15 Control Feeding of Broilers - Bob Wagstaff

12:00 Lunch

Afternoon Session - Chairman, Larry Moran

1:30 Current Brooding Practices for Poultry - Floyd Reese

2:15 Managing Broiler Breeders - James Smith

3:00 Break

3:15 Turkey Diseases - Kenny Page

4:00 Baby Chick Quality as Related to Breeders and Hatchers - Don Davis

5:00 Break

Evening Session - Chairman, Winston Turner

6:30 Program - Mr. Cullen Johnson - "Freedom or Security"

THURSDAY, September 15, 1977

Morning Session - Chairman, Winston Turner

8:45	Gumboro - John Rosenberger
9:30	Viral Arthritis - Norman Olson
10:15	Break
10:30	Mycoplasma Infections - Kenny Page
11:15	Coping with Mycotoxins - Roger Wyatt
12:00	Discussion
12:30	Adjourn

This program has been planned by the Rockingham Poultry Servicemen's Organization.

Winston Turner - President
Boyd Dove - Vice President
Larry Moran - Secretary-Treasurer

PROGRAM COMMITTEE

Richard Eaton	Holly Farms
Bruce Grover	American Cyanamid
Bob Johnson	Rocco
Suresh Singh	Rockingham
Leroy Thompson	Heatwole
Walker Thompson	Wampler
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CONTENTS

The Outlook on Aflatoxin

Roger D. Wyatt
Poultry Science Department
University of Georgia

Indications are that due to a drought year, the prevalence of various insects and a moderately wet harvest season, the corn in Georgia and other states as well may contain higher than normal levels and a higher incidence of the mycotoxin, aflatoxin. In view of this probability extreme care should be exercised to minimize the chances of feeding contaminated feed to poultry and if it is determined that the feed is contaminated other steps should be taken to minimize the economic losses due to aflatoxin. The following represents a summary of certain practices that have been proven in "field" tests to be successful in helping in this problem area.

1. Corn: (A) After corn is harvested, it should be dried to 14-15% moisture as soon as possible. The mold that produces aflatoxin is found almost everywhere in nature, including corn, and moist corn offers an excellent environment for the mold to grow and produce aflatoxin. In the absence of moisture the growth of the mold is eliminated and no more aflatoxin will be produced.

   (B) Corn quality can be related to aflatoxin contamination. Generally speaking, corn with a high percentage of broken kernels, "off-colored" kernels, visible insect damage and/or obvious mold growth should be avoided. The chances of corn with one or more of the above signs could contain aflatoxin. The "Black-Light Test" is helpful in evaluating corn for quality. However, it should be remembered that this test only works with corn, the kernels to be examined must be broken open or halved, the percentage of kernels showing the characteristic bright greenish yellow fluorescence bears no relation to the level of aflatoxin that may be present, some corn showing no fluorescence may contain aflatoxin, and the actual level of aflatoxin present must be determined by chemical assay.

2. Feed: (A) Feed manufactured from aflatoxin free corn can still become contaminated upon storage. Once again, care should be taken to eliminate all sources of moisture from feed storage containers. For example, seal the hatches on feed and grain storage containers. Make sure the hatch "seats" properly. Caulk the seams of feed bins to eliminate rain water from running in.

(B) Keep on the farm feed storage time to a minimum.

3. "Clean up": A rigorous clean up procedure and conscientious feed sanitation program is essential in minimizing mycotoxin problems.

(A) Remove dried, caked, moldy feed. Caked feed in a feed handling system tends to "seed" all feed passing over this material. As long as this material is allowed to stay in the system, contamination with mold spores from the caked material to the good feed will result. This can be termed the "vicious cycle" and it is this cycle that the poultryman should try to break. It is recommended that when possible all material adhering to the inside of a feed container (i.e. bins, bulk trucks, augar ways, etc.) be removed with a scraper.

(B) After removal, if possible spray the area with a disinfectant solution (commercial household bleach and water in a ratio of 1:4 is usually sufficient, and is readily available and inexpensive). Caution must be excerised however to allow the container to dry completely after cleaning and disinfection. Remember that removal of caked feed from your feed handling systems removes a potential source of mold spores, mycotoxins and moisture.

4. Birds: If a probability exists of feeding aflatoxin to poultry, several steps can be taken to lessen the effects.

(A) Increase the protein, energy and vitamin level of the ration.

(B) Use a broad spectrum antibiotic at treatment levels for the recommended time, especially if mortality increases.

(C) Feed suspect feed to somewhat older birds if possible (broilers older than 3 weeks). However, do not feed aflatoxin to broiler breeder females.

(D) Avoid all stresses especially heat stress. Keep the birds as cool as possible. Broilers reared in an environment with a slightly lower than normal temperature will be more resistant to aflatoxin.

(E) Necropsy birds routinely to determine the impact of feeding suspect feed. Discontinue feeding suspect feed if findings indicate internal lesions.

For further information please call 542-1351 or 542-1325
9/77

SOCIAL STRESS OF CHICKENS

Paul B. Siegel
Poultry Science Department
Virginia Polytechnic Institute and State University
Blacksburg, VA

Poultry production continues to become more intensive as we move into this last quarter of the 20*th* century. Although this intensification has had a dramatic influence on the efficiency of production, criticisms of these very production methods are becoming increasingly vogue. In some cases the differences of opinion are real, in others they are semantic. The semantic problem may be illustrated by examining terms used by the advocates and the critics (*Slide 1*). I believe that we can agree that although the meanings of terms will differ based on the views and the backgrounds of the individuals involved, this can be resolved when reasonable people wish to do so. When basic philosophies become polarized, however, the solutions require hard facts not opinions or rationalizations. Presently there is a shortage of facts. This may compound the problem because one thing is for certain -- namely, the problems will not go away.

Slide 1 - Some current terms used in talking about poultry

animal liberation, crowding, stress, environment, hungry people, phenotypic plasticity, anthropomorphism, animal welfare, free enterprise, strife, modern agriculture, intensive farming, population density, organic farming, animal machines, genetic diversity, caging.

Presented to The Rockingham Poultry Servicemen's Organization, September 14, 1977, Salem, Va.

There is ample evidence that although there may be a lack of data to either support or refute criticisms of poultry production and the welfare of poultry maintained in commercial flocks, this has not precluded certain nations from developing and others from discussing the need for guidelines relating to the care and welfare of poultry. It may be argued that it is presumptuous to develop guidelines from a meager scientific base -- this, however, is not a satisfactory reply. Information is needed on how husbandry influences the welfare of poultry. When such is not available, then the judgements will be made from the meager data that are available.

My presentation today will involve an interfacing of social behavior, the stress syndrome and production aspects of poultry. Although not all items will be new, my goal is to present an overview to provide you with insights about the subject. Many of my thoughts on this topic have been nutured by discussions with colleagues in the Poultry Department at Virginia Tech, our graduate students, and Dr. W. B. Gross of the Department of Veterinary Science.

A BRIEF HISTORY

Many changes in husbandry have occurred in the several thousand years since the chicken was first domesticated. Chickens no longer fend for themselves in the barnyard, but are maintained in insulated fan-ventilated houses and fed a nutritionally balanced diet. Incubation behavior and parent-offspring relationships were replaced by mechanical incubation and artificial brooding. Past changes in husbandry have been, and future changes must be, within the biological adaptability of the fowl. Although experience indicates that there is considerable phenotypic plasticity in chickens, in my opinion the critical item in the future era of poultry will be their ability to adapt to a wide range of environments.

Higher bird densities increase the probabilities of social interactions among flockmates. This, as Craig and his colleagues in Kansas have shown, does not necessarily increase the frequency of agonistic interactions. To understand this requires knowledge of social organization and integration of the group.

SOCIAL ORGANIZATION & INTEGRATION OF THE GROUP

Probably everyone in this room is concerned with poultry behavior because it involves the commerce of the bird with its environment. The environment, in this context, is practically all encompassing because it involves both internal and external factors including man. Any discussion of the social environment of an animal immediately raises the question of the meaning of social. I like Carpenter's definition where social behavior refers to the reciprocal interactions of two or more individuals and the resulting modifications of an individual's action. This definition is quite germane to most forms of poultry production because, under current husbandry, chickens are maintained at higher population densities than ever before. The effects of this may or may not be serious. An individual learns the characteristics of its environment and becomes familiar with them.

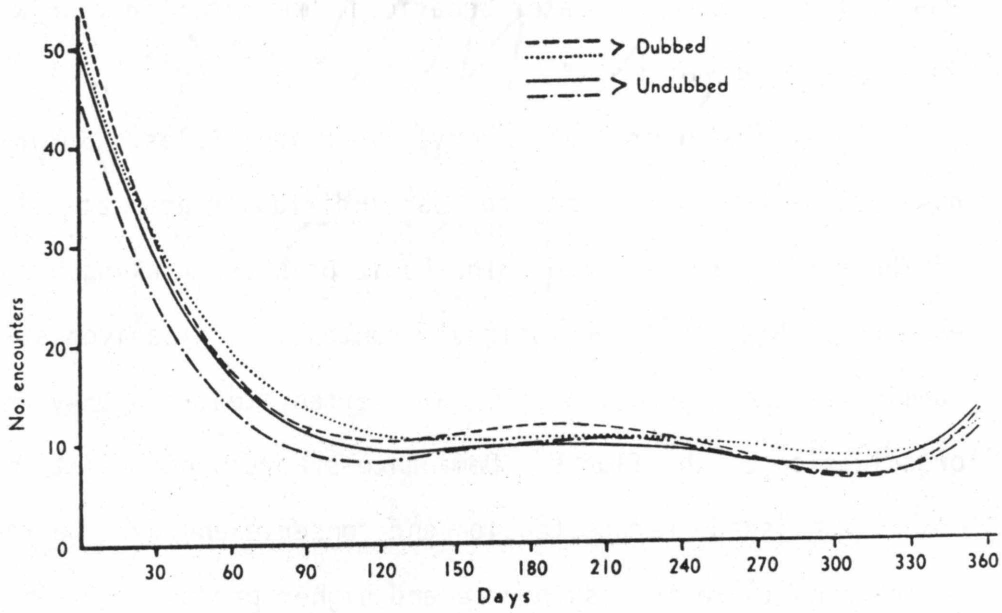
The "model" of the long term surroundings that forms is more firmly established among older animals, hence their mechanisms for reflecting change will reveal a greater behavioral modification than would occur in younger individuals.

The social organization serves important roles. Surprisingly, however, it is not uncommon to hear individuals advocate elimination of the social organization. The logic of such thinking breaks down when considered in an evolutionary context. Aggressiveness and submissiveness are common among all vertebrates, and they enable the organization of the flocks. Dominance-subordinance relationships, once established, reduce tension and conserve energy. We know that in chickens there is less strife and higher productivity in organized flocks than in those kept in the process of becoming organized. The role of social organization is summarized in Slide 2 and examples of how social encounters are reduced over time are shown in Slides 3 and 4.

Slide 2: Social organization

1. *Types:* Hierarchical and territorial
2. *Role:* Selective mechanism and minimize non-adaptive energy expenditures
3. *Involves:* Sensory modalities, recognition and memory
4. *How:* By making the behavior between individuals regular and predictable.

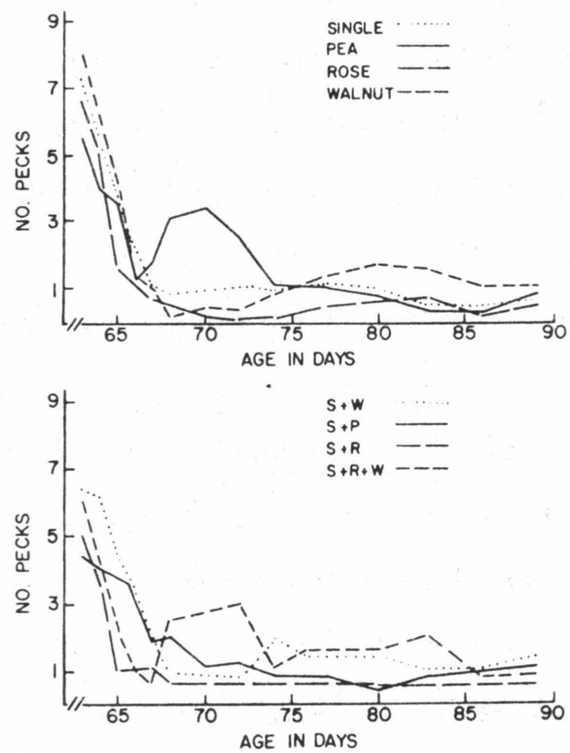
Slide 3: Frequency of encounters within flocks of 85 dubbed and undubbed Leghorn pullets for the 360-day period from the time of assembledge at 157 days of age (mean number of encounters per pen per 25 min of observation).



SPATIAL RELATIONSHIPS AND POPULATION DENSITY

High social rank, can offer several advantages (depending on the husbandry) including greater access to feeding and watering areas. This observation that high social rank could be a biological advantage has been confirmed and expanded upon many times in the last 40 years. To us the interesting aspect in chickens is not that there is a social hierarchy, but rather what items may cause social stratification in flocks. That is why do some groups of individuals rank higher in the peck-order than others.

Slide 4: Frequency of pecks within flocking treatments for the 28-day period from the time of assembledge at 62 days of age (mean number of encounters per pen per 20 min of observation).



What tack then can one take to study this? The head and its appendages become logical starting points for serious investigation because they are the primary recognition factors, and recognition is important in the memory involved in maintaining a stable peck-order. Comb size is positively associated with social position. That is, when dubbed and undubbed birds are intermingled in the same flock, the undubbed individuals will be in the higher social positions. It is not uncommon to observe several comb phenotypes among males in broiler breeder flocks and in commercial broiler flocks. Single comb birds have the social advantage in broiler flocks and comb type is also associated with mating efficiency.

If you observe a flock of chickens you will note that the subordinate birds keep their heads lower than their dominant neighbors. This posture enables the subordinate individual to communicate its submission to the dominant individual. Relaxation of this submissive posture may be a stimulus for an aggressive act by the despot. The submissive posture is consistent with the hypothesis that there is a minimum distance at which animals do not approach each other. The implications of this hypothesis as population densities are increased are important. Using photographs of flocks, McBride and coworkers in Australia showed that hens do not arrange themselves at random under intensive housing. The spacing of heads is more regular than under random spacing. This may be attributed to visual interactions with neighboring flockmates. They suggested that the presence of a chicken's head constitutes a social force that has a measurable effect on the behavior of its neighbors. The pattern was strongest in the case of the nearest neighbor and negligible with the third nearest neighbor. When head distances were held constant the more directly an individual faced its subordinate, the more the latter turned its head.

The implications of this are interesting because they suggest that the space directly in front of an animal has special properties, and that the social hierarchy provides a priority system in controlling these spaces. When we consider these areas or spaces as portable territories, then we can see how an animal may expand its area in high density situations such as in multiple bird cages by using the aisle space. This, in turn, may provide insights into various types of cannibalism.

The social hierarchy of flocks provides a flexible system because it allows priorities associated with peck-rights to be applied to a range of competitive situations. Increases in population density caused by a reduction of space allowances per bird force individuals to intrude into each other's space. This may result in a development of social strife which may become a stressor. Therefore, husbandry must be such that it minimizes social strife that may be caused by the elimination of surplus space.

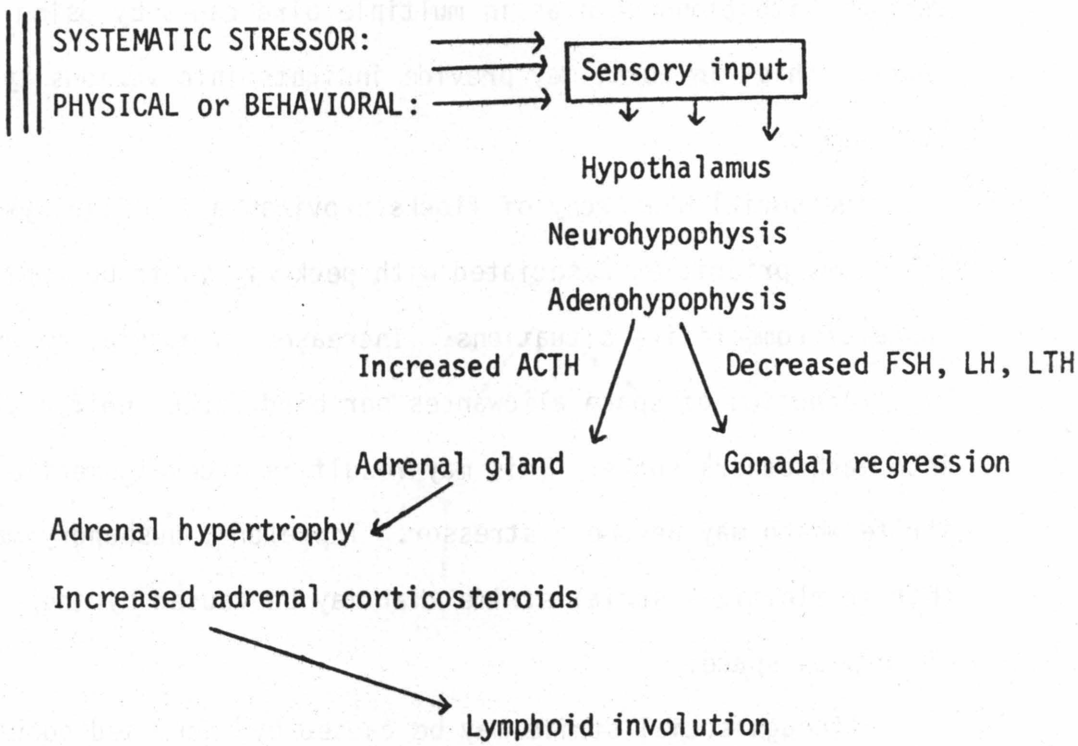
Although social strife may be caused by increased population density, the question concerning us today is whether or not the change is within the adaptive ability of the individual and the population? Therefore, it becomes important to differentiate between density and crowding (Slide 5), and to understand the stress syndrome so elegantly described by Selye (Slide 6).

Slide 5: Density and crowding

Density is the number of individuals per unit area or unit space. It is a physical measurement.

Crowding is a product of density, contact, communication and activity. It implies a pressure, a force, and a psychological reaction. It may occur at widely different densities and result in social strife.

Slide 6: Schematic diagram of stress response



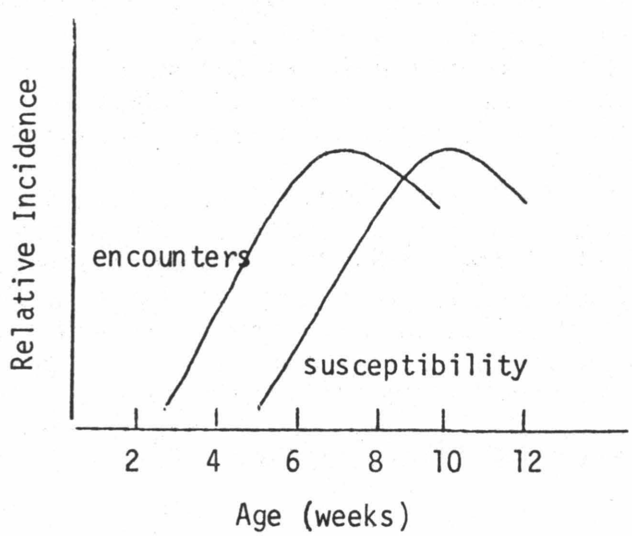
A systematic evaluation of these models requires a multidisciplinary approach. We, at Virginia Tech, have been fortunate over the years to have a close interfacing of programs involving the behavior, genetics, physiology and diseases of poultry. The procedure used to create social strife is to rotate individuals among flocks for two weeks in order to prevent the establishment of a stable social hierarchy. Plasma corticosterone levels of such chickens are higher than those of controls maintained in stable groups - thus we have created a social stress. Utilizing this procedure, Dr. Gross showed that high social strife increased resistance to *Escherichia coli* and *Staphylococcus aureus* infection and decreased resistance to Newcastle Disease virus. From this and other experiments we have suggested a model for Air Sac Disease (Slide 7).

Slide 7: Model for Air Sac Disease

(Mycoplasma and/or virus) + social strife
↓
Lymphoid reaction
↓
Susceptability to inhaled E. coli
↓
Aerosaculitus, bacteremia, pericarditus, death

To evaluate what occurs under field conditions we measured the frequency of agonistic social encounters and Air Sac susceptibility in broilers. As shown in Slide 8, the curves are parallel and follow the assumptions shown in the model.

Slide 8: Relative incidence of encounters and air sac disease



We have lines of White Rocks that have undergone many generations of selection for high and low body weight that are also known to differ for other traits including plasma corticosterone. The high weight line has low plasma corticosterone levels while the low weight line has high plasma corticosterone levels. When we placed adult males from these lines in a low stress environment i.e., transfer from all male flocks to cages with wire partitions mortality from *Staphylococcus aureus* was 3% for the low weight (high plasma corticosterone) line and 45% for the high weight (low plasma corticosterone) line. Specific lines of White Leghorns were then selected for high and low plasma corticosterone based on levels observed from the rotating of birds among flocks. Separation into distinct high and low corticosterone lines was rapid, and several genotype-environment interaction experiments involving chickens from these lines in high and low social strife situations have been conducted by various individuals at Virginia Tech.

Dr. Gross observed that birds from the high plasma corticosterone line had greater mortality and lesions from Mareks Disease than those from the low corticosterone line regardless of the social environment. Also, regardless of line, chickens maintained under high social strife had greater mortality and lesions from Mareks Disease than those maintained under low social strife. Most interesting, however, was that the birds from the high plasma corticosterone line under high social strife exhibited the greatest mortality and lesions (71%) while the low line under low strife exhibited the least (7%).

In contrast, the pattern observed with *Eimeria necatrix* was the opposite as that noted for Mareks Disease. Lesions were more severe and body weight gains less for the low plasma corticosterone line under low social strife than for the high line under high stress. The implications of such genotype-environment interactions are important to poultry production. They imply that there is an optimum amount of social strife that is best for the organism. Too little or too much is undesirable, and the optimum may differ depending on the genetic background of the stock.

The concerned raise questions and frequently the answers are educated guesses that are not independent of the biases discussed at the beginning of this paper. Other times there are answers. For example, the question frequently arises as to whether or not moving birds is a stress. At 62 days of age we assembled 16 flocks of 6 birds each from a large flock and measured plasma corticosterone levels on the day of flocking plus at 7 and 28 days after flocking. The results are shown in Slide 9.

Slide 9: Plasma corticosterone levels at 0, 7 and 28 days after flockings.

Days after flocking	Plasma corticosterone ng/ml
0	3.42[a]
7	4.72[b]
28	4.00[a]

The value at 7 days was significantly higher than those at 0 and 28 days.

Certain inferences suggested from these data are that vaccinations should be performed before chickens may be stressed by factors such as moving and debeaking. Also, medication should be administrated during and after stress occurs. The integration of such husbandry procedures can complement the chickens defenses more than the arbitrary procedures that are frequently used in poultry production.

SUMMARY

The challange to the poultry producer and serviceman is to develop the husbandry situation whereby there is the optimum amount of stress to stimulate the behavioral response that has the greatest biological advantage to the bird.

CONTROLLED FEEDING OF BROILERS

Robert K. Wagstaff
Executive Vice-President
Golden Pride, Inc.
Berlin, Maryland

The controlled feeding of broilers in commercial broiler production had its beginning in various company growout operations in the Southeast several years ago. The first of such reports has not been documented. Choretime Equipment Company, however, has long recognized this practice as they have used control feeding as an aid in the selling of their feeding equipment.

Upon hearing of this practice Golden Pride began research to determine its value about three years ago and made an original report at the 1976 Maryland Nutrition Conference.

The controlled feeding system as used in Golden Pride is based on a 6 hour cycle, keeping birds on feed for 4 hours and then removing feed for 2 hours. This cycle repeats 4 times each day. Other cycles are beneficial as shown in Table 1. Birds were fed on either a 4,6, or 8 hour cycle. Both improved weight and better feed conversion were obtained. The 6 hour cycle was chosen as the cycle of choice because it was felt that this cycle could best be adopted in the growout operation. The 4 hour cycle was too short for three-week old birds to eat all the feed in the feeder pans in three hours. The 8 hour cycle was not chosen because it was felt that seasonal effects would be more severe with this system. We also had the challenge of convincing broiler growers that it was "good" to let broilers be without feed for a period of time.

I believe that we were among the first people to recognize that controlled feeding was energy dependent, that is, feeds higher in energy show more benefit when controlled feeding is used. Table 2 shows the results of the first experiment run on energy. Note that improved weight and better feed conversions were obtained on energy levels in excess of 1,500 calories of Metabolizable Energy per pound.

A repeat experiment using a three feed system also confirms that improved broiler performance occurs when the energy level is in excess of 1,500 calories (Table 3). We have continually noted that both improved weight and better feed conversions occur when feed containing at least 1,500 calories are fed.

Table 4 shows a summary of the results of work reported by McCartney and Brown of the University of Georgia. The several experiments show that feeding 15 minutes per hour or 15 minutes per two hours improves weight and feed conversion. Experiment 4 being the exception. Birds were also examined for changes in the digestive system and it was found that birds on controlled feeding had larger crop and proventriculus weights when fed on the 15 minute feeding every 2 hours. They found in one experiment that when feeding time is restricted to 15 minutes every 4 hours the weight of the total digestive tract, crop and proventriculus, gizzard and intestines as a percentage of body weight is significantly larger. It was concluded that the crop and proventriculus are the parts of the digestive system that are primarily affected by controlled feeding.

A most recent report by Conard and Kuenzel from the University of Maryland also shows that controlled feeding is energy dependent. Diets containing 1,470 calories did not show improvement while diets containing 1,570 calories showed improvement. Table 5 gives a summary of the results when birds were given either 3,4, or 5 meals in a 16 hour lighted cycle. The best regime was 5 meals per 16 hours, however, all treatments were improved over the full feed treatment. Body composition measurements showed that controlled feeding did not change percent fat or protein, but did increase body moisture content. These findings are very interesting and need confirmation. Why should moisture content increase under feed restriction?

Controlled feeding works. The practice has been adopted by Golden Pride as part of its growout operations. Table 6 gives a summary of the field results since its adoption in 1975. During the first half of 1977, the difference between controlled feeding and the regular production has decreased. This may be due in part to the severe weather conditions of early 1977. A recent report by Thomason in Poultry Digest recommended that one must not use controlled feeding during the last 48 hours before slaughter if you are to avoid feed contamination in the processing plant. We have not found this to be so. As long as the regular feeding regime is not interrupted, birds may be kept on controlled feeding right up to the regular time for feed removal. A more critical factor is to plan feed deliveries so that the birds never run out of feed during the 24 hour period before processing.

Summary:

Controlled feeding of broilers has been shown to be beneficial to performance when feed contains at least 1,500 M E calories per pound. Controlled feeding appears to increase the digestive tract capacity, primarily the crop and proventriculus. Body composition experiments show that percentage fat and protein are not altered but percentage moisture increases. These body compositon findings need further confirmation. Feed contamination in the processing plant can be avoided when controlled feeding is used by not interrupting the feeding regime within the last 24 hours before slaughter.

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Table 1

Research Farm Experiment: Effect of
Various Feed Control Times on Broiler Performance

Time on Feed	Time off Feed	Weight	Feed Conversion
Full Feed		3.91	1.90
3 hrs.	1 hr.	3.99	1.88
4 hrs.	2 hrs.	4.03	1.87
5.5 hrs.	2.5 hrs.	4.05	1.87

Age: 55 days, 9/18/75

Feed: Starter 1495, Finisher 1540

Lighting: 24 hrs. on

Golden Pride

Table 2
Research Farm Experiment: Effect of Various Energy Levels on Broiler Performance on Full or Controlled Feeding

Energy Level		Weight		Feed Conversion	
Starter	Finisher	Full Feed	Controlled	Full Feed	Controlled
1450	1470	3.38	3.33	1.88	1.87
1490	1510	3.50	3.50	1.80	1.80
1530	1550	3.48	3.50 (+)	1.77	1.75 (-)
1570	1590	3.51	3.57 (+)	1.73	1.70 (-)

Age: 47 days, 11/25/75

Feeding time: 4 hrs. on, 2 hrs. off

Lighting: 24 hrs. on

Golden Pride

Table 3

Research Farm Experiment: Effect of Various Energy Levels on Broiler Performance on Full or Controlled Feeding Using Three Feeds

Energy Level			Weight		Feed Conversion	
Start	Grow	Finish	Full Feed	Controlled	Full Feed	Controlled
1450	1470	1480	4.22	4.22	1.97	1.95
1490	1510	1520	4.25	4.23	1.93	1.94
1530	1550	1560	4.23	4.29 (+)	1.93	1.89 (-)
1570	1590	1600	4.23	4.31 (+)	1.90	1.86 (-)

Age: 54 days, 2/17/76

Feeding time: 4 hrs. on, 2 hrs. off

Lighting: 24 hrs. on

Golden Pride

Table 4
Un. of Georgia Research: Effect of Feeding Time on Body Weight and Feed Conversion

Experiment	Weight			Feed Conversion		
	Full Feed	15/hr.	15/2 hr.	Full Feed	15/hr.	15/2 hr.
1	4.40	4.55	-	2.21	2.12	-
2	4.54	4.52	4.55	2.11	2.09	2.07
3	4.68	-	4.84	2.26	-	2.20
4	4.70	-	4.40	2.18	-	2.17

From: McCartney & Brown,
Poult Sci. 713, 1977

Table 5

Un. of Maryland Research: Effect of Meal Feeding on Broiler Performance and Body Composition

Meals	Wt.	Feed Conv.	% Fat	% Moisture	% DFFW	% Ash
3	4.04	2.02	15.1	60.7	21.4	2.7
4	4.22	1.97	13.7	62.5	20.8	2.9
5	4.41	1.96	14.1	62.7	20.3	2.9
Full feed	4.19	2.16	15.3	60.8	21.0	2.8

DFFW - Dry fat-free weight; is a close estimate of the true protein content of the carcass

Diet: 1570 K cal/pound.

Lighting: 16 hrs. light, 8 hrs. dark

Meals: 1.5 hrs. feed

From: Conard and Kuenzel, 1977

Table 6

Field Experience of Golden Pride Poultry
Comparison Between Broiler Performance of Farms
Using Controlled Feeding vs. Regular Program

Period	Regular Production		Controlled Feeding		Difference	
	Weight	Feed Conv.	Weight	Feed Conv.	Weight	Feed Conv.
9/75 - 12/75	3.95	1.98	4.00	1.94	+.05	-.04
1/76 - 12/76	3.95	1.95	4.02	1.93	+.07	-.02
1/77 - 6/77	3.91	1.97	3.95	1.95	+.04	-.02

Feeding time: 4 hrs. on, 2 hrs. off

Lighting: 24 hrs. on

Golden Pride

Viral Arthritis "Leg Problems"

Norman O. Olson, D.V.M.
West Virginia University
Morgantown

Leg problems in chickens are divided into five classifications as follows: I. Infections, II. Skeletal abnormalities, III. Nutrition, Iv. Genetic and V. Interaction of toxins, nutrition, genetics, infectious diseases, environment, weight, age, and sex. Subclasses of these factors occur. Significant interactions occur resulting in many causes for lameness.

Infectious agents such as viral arthritis, staphylococcus, mycoplasma, and E. coli are the most important cause of leg problems in the meat type bird. Bacteria or viruses that get into the blood stream frequently get into the joint spaces and cause arthritis.

Viral arthritis is caused by a reovirus. The viruses are very prevalent and present in all or nearly all poultry operations. There are several serotypes and fortunately those that cause viral arthritis are not so common.

When the reovirus gets into the blood stream the virus is also found in the synovial lining of the joints and tendon sheaths resulting in arthritis or tendonitis. If the infection is mild, microscopic lesions only are seen. This is followed by recovery in one to two weeks. In more severe infections clinical lesions are seen in 5 to 7 weeks on older birds.

The clinical signs are seen as lame birds which tend to walk with a stilted gait. The painful joints (especially the hock joint) cause the birds to sit. In some cases the bird in the setting position extends its legs forward in an attempt to relieve the pain. The birds tend to sit If moved, they take a few steps and sit down.

The amount of feed and water consumed is reduced resulting in many small birds. These are generally seen around the feeders and waterers.

About twice as many males show lesions as compared to females. This is apparently related to the size of the bird. The hock joint is most frequently involved and in part is related to activity or injury.

If the lame birds are examined, there is a marked swelling of the shank and the tendon bundle above the hock. The swelling results from an inflammatory process causing an accumulation of fluid and pus cells in the tendon sheaths and lining of the joints. There is an excess straw colored fluid in the hock and the tibio femoral joints. Diagnosis can usually be made on the basis of signs and lesions, especially the bilateral swelling of the shank and the tendon bundle above the hock. The virus can be isolated in embryonating chicken eggs or in primary kidney cells. The agar gel precipitin (AGP) test is frequently used as an aid in diagnosis. Unfortunately the AGP test only detects the reovirus group antigen and may give you misleading results.

Viral arthritis is egg transmitted for a period of one to two weeks following infection. Unfortunately the disease may spread slowly through a flock resulting in a prolonged egg transmission period.

Control: Eradication of the infection does not appear practical. Vaccination of the breeders to provide parental immunity for the first two weeks of life offers some merit. It provides protection during the most susceptible period. This method provided by Dr. L. van der Heide is now being field tested. The importance of the various serotypes in vaccine production and protection has not been established.

Mycoplasma synoviae infrequently causes outbreaks of infectious synovitis in broiler and in broiler breeders. Since eradication programs have been successful, its importance has been greatly diminished.

Staphylococcus infection frequently causes problems. Hatchery sanitation is of value in preventing infection in young birds. Persons handling chicks should not have infected hands. Since the staphylococcus organism is very prevalent on the skin of birds and objects that penetrate the skin may introduce the infection. It has been shown that inoculation into the vein is necessary to experimentally produce staphylococcus arthritis.

Infectious synovitis can be treated with chlortetracycline. Treatment for staphylococcus infection generally is not economical.

Skeletal Abnormalities.

Spondylopathy (back abnormalities) are shown to be related to the genetics of the bird. Selection for back abnormalities can only reach a certain point since severely affected birds cannot breed. Artificial insemination has been used to experimentally increase the incidence of spondylopathy.

Although we see scoliosis, lateral curvature of the back, hyphosis (rounded back) lordosis, downward curvature of the back or rumplessness occur; the most important back abnormality is kinky back, spondylolisthes. Kinky back results from a downward rotation of the 6th thoracic vertebrae. Anatomically the 6th thoracic vetebrae is the weak point in the chicken's back. The cervical and first and 6th thoracic vetebrae are movable. All other vetebrae in the back of a chicken are unmovable. If the 6th thoracic vetebrae is sufficiently rotated, pressure is put on the spinal cord resulting in various degrees of lameness. The affected bird frequently can walk only with the aid of its wings. In other cases the bird becomes paraplegic and is found lying on its side.

Perosis is a term used to describe various degrees of bone or leg abnormalities. When perosis is a problem in broiler flocks there is usually a genetic, nutritional and environmental relationship making diagnosis of the cause difficult.

"Twisted Leg" in broilers is a common ailment. It results from rotation of the tibia or metatarsal bone. The gastrocnemius tendon is usually not slipped off the condyles.

The incidence can be increased to 50% by raising the broilers in batteries. The quality of the protein affects the condition and has been increased by substituting 10% gelatin for other protein. The increased concentration of certain ammino acids in the ration to improve feather quality results in an increase in twisted legs. Prevention can be partially obtained by adding 0.5 to 2% tryptophan to the ration.

Tibial dyschondroplasia is seen as a plug of cartilage replacing normal bone tissue in the tibia or metatarsus. The tibia is enlarged. Lameness may not be present and depends on the severity of the condition. Severely affected birds walk with difficulty. Birds assume a sitting position. Birds 3 to 8 weeks old are usually affected. Tibia dyschondroplasia is a result of an inherited defect which is more pronounced when high chloride rations are fed. Corn soybean rations are better than other combinations in reducing the incidence.

Ruptured gastrocnemius tendons occur more frequently when viral arthritis is a problem. It does occur in the absence of viral arthritis and is related to environmental factors and genetic make up of the bird.

It has been shown that the ruptured tendon has less tensil strength than unruptured tendons in the same flock. The condition is frequently seen when the birds are coming into production and in broiler roaster birds 12 to 14 weeks old.

Nutrition

Present day poultry rations are formulated to contain more than the adequate amounts of minerals and vitamins and provide margins of safety to provide for possible losses during feed processing, transportation, storage and variations in feed composition and environmental conditions. If a deficiency should occur, it is usually due either to the inadvertent omission of a critical ingredient during mixing of the feed or to the destruction of one or more of the vitamins during processing or storage. The fat soluble vitamins A, D and E are most prone to destruction.

Slipped tendons can be caused by low manganese. Levels of 30-60 ppm may be somewhat low for optimum leg health in fast growing birds. Leg abnormalities tend to be higher in low phosphorus rations. Higher calcium rations such as are used for laying hens can cause problems if fed to broilers.

In the field vitamins, Vitamin A, D, choline, nicotinic acid, folic acid, vitamin B_{12} have all been implicated in leg problems.

Rations that contain toxic levels as a result of mold infections especially of corn can result in a high incidence of leg abnormalities.

Genetic Relationship

Strain of the bird and skeletal abnormalities have been implicated.

Interactions

Interaction of toxins, nutrition, genetics, infectious diseases, environment, weight, age, fast growing and sex have been implicated in leg problems. Males are affected in an approximate ratio of 4:1 as compared to females. Part is related to weight, although males and females of the same weight have similar leg problems.

The infectious bursal agent and mycotoxins suppress the immune response. The relationship of these immune suppresents in the development of infectious joint diseases is being investigated.

Mycotoxins and infectious agents affect liver function and interfere with fat soluble vitamins. Infections and mycotoxins resulting in diarrhea will interfere with the absorption of minerals and vitamins.

Raising birds in cages as compared to floor rearing increased leg weakness 11% in males and 3% in females. Stress and activity of the birds have some relationship to leg weakness.

Summary

Significant levels of leg problem in a broiler operation may present a difficult diagnostic problem. There is usually an interaction of disease, nutrition, toxins, genetics and managements practices. Solution of the leg weakness problem requires removal of the cause. Starting with a disease free or immune chick with genetic resistance to leg weakness, providing an adequate toxic free diet and following sound management practices will eliminate many leg problems.

*Presented at the Poultry Health Seminar Sheraton
Motor Inn, Roanoke, Salem, Virginia,
September 14-15, 1977

Baby Chick Quality as Related to Breeders and Hatcheries

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Simmons Industries

Siloam Springs, Arkansas

When using the term "baby chick quality," it would have to be interpreted as meaning health--which is lack of disease. To produce baby chicks without disease requires much effort in avoiding those things which cause disease. This subject can best be explained by the formula:

$$D = \frac{V}{R}$$

D = disease

V = virulence

R = resistance

It becomes obvious that the solution to reducing D is to increase R. R is genetics, environment, nutrition, and infection (immunity). The first letter of each factor spells GENI -- not to be confused with Genie. There is nothing magical about controlling disease. It requires a plan, technology, equipment, people, and lots of "elbow grease."

Hatching hybrid baby chicks in an artificial environment in tremendous volumes with expert precision is a magnificent phenomonen in which anything and everything can go wrong. Our job is to see to it that nothing does go wrong and that all systems remain on GO!

Nothing new is presented in this paper. The presentation was given with pictorial and graphic illustrations of normal embryo development augumented with improper events that can happen on the breeder farm to cause lowering of chick quality. These included gathering, storage, and delivery of hatching eggs supplemented by a discussion of proper and improper procedures and sanitation practices inside the hatchery. Emphasis was placed on vaccinating and debeaking in the hatchery to delivery of baby chicks to the farm. Some discussion was given to transmissible diseases and passive antibodies.

Finally a note to the broiler department; the breeder and hatchery departments are the best "pieces of equipment" you have--treat them kindly.

Gumboro Disease

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The bursa of Fabricius in the chicken is a lymphoepithelial structure located adjacent to the cloaca. In 1962, Dr. A. Cosgrove described a virus induced disease of broiler chickens which affected the bursa of Fabricius. This disease became known as Gumboro disease after the locale in which it was first recognized (Gumboro, Delaware). Bursae from the infected birds were characterized by destruction of the lymphoid elements.

The virus known as the infectious bursal agent or infectious bursal disease virus (IBDV) has been found to cause a general lymphocidal effect in the spleen, cecal tonsils and thymus. However, the primary target organ based on virus replication studies appears to be the bursa of Fabricius.

The disease was of interest for several years primarily because of its clinical manifestations in three week or older birds. Generally, in meat-type birds the disease was characterized by its acuteness, high morbidity rate and relatively low mortality rate. In the lighter breeds the disease is somewhat more severe with mortality sometimes becoming quite high. The lighter breeds are also susceptible for longer periods of time.

The infectious bursal disease virus has received considerable attention during the last three to four years because of its potential for inducing immunosuppression

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Presented at the Rockingham Poultry Servicemen's Organization Poultry Health Seminar, Roanoke, Virginia, September 14-15, 1977.

in susceptible chickens exposed to the virus during the first few weeks of life. Research on the IBDV as an immunosuppressive agent was initiated in our laboratory when we were able to confirm the association of IBDV serologically negative breeders with an increased incidence of gangrenous dermatitis and other infectious diseases in their commercially reared progeny. These studies led to investigations of what effects exposure to the IBDV at one day of age would have on the response to several commonly used vaccines (Newcastle disease, infectious bronchitis and infectious laryngotracheitis). Results from these experiments demonstrated that early (1 day) infection with the IBDV affects the response of young chickens to vaccination. This was shown by a decreased resistance to challenge and lowered antibody levels for birds vaccinated with infectious laryngotracheitis and Newcastle disease vaccines. Birds vaccinated with infectious bronchitis virus after exposure to the IBDV were much more prone to persistent infections than were the non-IBDV exposed birds. In addition, high mortality and decreased weights in the IBDV infected groups demonstrated the damaging effects of early IBDV exposure.

Workers in the United States and other parts of the world are in agreement as to the economic significance of the immunosuppression associated with an early IBDV infection. Researchers in various laboratories are now becoming more concerned with different techniques for protecting birds against the IBDV and its effects.

One method of protecting the young bird is by converting the breeders to an IBDV serologically positive status. Once the breeder is converted, parental antibody can be passed to the progeny thereby protecting them from the immunosuppressive effects that occur with an early IBDV infection. Recent reports have suggested that young birds may also be protected against IBDV infection by vaccinating with an apathogenic strain at one day of age.

Viable and inactivated preparations of pathogenic and apathogenic strains of IBDV have been utilized at the University of Delaware in vaccination and revaccination trials with various aged broiler breeders and their progeny.

Primary immunization of breeders up to at least 66 weeks of age can be effectively accomplished with both viable and nonviable IBDV vaccines if the vaccine is given parentally. Secondary immune responses can be induced in a similar manner. Virus neutralization titers in IBDV passively immune progeny appear to accurately reflect changes in titers observed in the breeders.

Protection against challenge with a pathogenic field strain of IBDV could not be demonstrated two days post-IBDV vaccination of one day old serologically negative chicks with apathogenic strains of IBDV. However, by six days postvaccination, significant protection was noted in approximately eighty percent of the birds challenged. Low levels of maternal IBDV antibody were found to interfere with the development of an active response to day old vaccination.

MANAGING BROILER BREEDERS

Rockingham Poultry Servicemen's Organization
Poultry Health Seminar
September 14, 1977

by
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Diet control of broiler parent stock has become almost "old hat" over the last 10 years in the commercial broiler industry throughout the world... If you're a breeder manager or supervisor, don't become complacent about broiler breeder management because the primary breeders are still adding faster growth genes to their stocks which means you must modify your management practices for maximum breeder performance.

Broilers are growing faster than ever before, which means parent stock are too. This is especially true of very early growth rate if breeders are kept on full feed. For this reason, we have moved feed restriction back to two weeks of age.

The use of a lower protein starter feed will help reduce early growth rate. Use a 17% protein starter ration the first 3 weeks.

Here is a brief summary of breeder pullet management from 2-24 weeks:

Begin sampling body weight at 2 weeks of age by weighing 10 pullets or 10 cockerels at a time. Weigh at least 40 birds to obtain the average weight. Average body weights should determine when feed restriction should be started on each flock of chicks.

Pullet breeders should average the following:

Pullet Age (days)	Total Wt. of 10 Pullets (lbs.)
14	5½
21	7½
28	10
35	12
42	Weigh 1% individually in order to measure flock uniformity (ave.1.40 lbs.)

After 6 weeks of age, weigh a random sample of 1% of the pullets individually every week. As a check on flock uniformity, the following percentages are good guidelines for the percent of pullets that should weigh within 85% and 115% of the average.

Age (wks.)	Flock Uniformity (Percent of Birds Within ± 15% of the Flock Average)
6	90-95
10	85-90
15	80-85
20	85-90

NOTE: If breeders are overweight, uniformity will tend to be better than underweight birds.

After 9 weeks of age, two separate body weight guidelines are recommended depending on hatch date. Pullets hatched from August through January (Northern Hemisphere) will normally come into production at a lower body weight than February through July hatches.

Weights between 4 and 24 weeks are Off-Feed-Day weights. After 24 weeks, body weights are Feed-Day weights.

Change to breeder feed at 22 weeks, but continue every-other-day feeding until 24 weeks of age.

To grow breeders properly, there are three absolute essentials:

1. Accurate feed scales
2. Rapid feed distribution
3. Accurate hand scales for weighing birds each week after 2 weeks of age.

Be careful to avoid piling during the brooding and rearing period. Smothering sometimes results from birds piling at night as the result of being chilled during the growing period. It can be prevented by careful bird management.

The following factors should prevent piling:

1. Begin feed restriction by 3 weeks of age by limiting feed to no more than 10 lbs. per 100 and go to every-other-day feeding when daily feed is consumed within 5 hours.
2. Do not allow house temperature to drop below 60°F. (15°C). A house temperature of 70°F (21°C.) after 5 weeks of age is ideal. The use of brooders, especially at night, to maintain this temperature will save feed and prevent chilling and piling.

3. Pile-ups are most likely to occur on the first cold night without supplemental heat. Pile-ups may occur on the next several nights unless birds are carefully watched, since they tend to pile-up at the onset of darkness once they have been too cold.
4. It is generally advisable to change back to every day feed if piling occurs due to a sudden drop in temperature.
5. During cold weather it is helpful to delay feeding until the afternoon.
6. Watch the flock carefully during vaccination reactions and during any disease outbreak, as birds often need additional heat during these periods.

After 24 weeks of age, return breeders to every-day feeding. From 24 to 32 weeks is a critical period in breeder management. Breeder pullets must be sample weighed every week in order to properly combine body weight gain with rate of production to determine rate of feed increase. A normal flock will increase production 3% per day from 10 to 70% production. Increase in production then normally slows to ½ to 1% per day until 80% is reached. From 80% to peak, production increases of approximately ¼% per day are normal. Usually it is possible to increase feed more rapidly on birds maturing in the spring due to rapid sexual maturity and more slowly on fall breeders.

Normally, peak production should be reached between 31 and 32 weeks of age, but is influenced markedly by both the lighting program and the body weight of the breeder as early as 18 to 20 weeks of age. As a rule of thumb, sexual maturity and peak production are delayed approximately one week if breeders are 0.2 lbs. underweight at 20 weeks of age and is delayed by two weeks if breeders are 0.4 lbs. underweight at 20 weeks of age.

After peak production, continue to weigh breeders at least on a once-a-month basis. After 36 weeks of age, feed level can normally be reduced in 0.20 lb. per 100 per day amounts per week in order to save feed and keep body weights from increasing too rapidly in the breeder house.

Breeder cockerels can be grown successfully with pullets, provided restriction is started by 2½ to 3 weeks of age. Broiler breeder males are capable of growing faster than turkey males, especially to 4 to 5 weeks of age! For maximum breeder flock fertility and hatchability, it is vital that male body weights be carefully controlled early.

Male weight can be more accurately controlled if males are started and grown separately, at least to 10 weeks of age, before being added to the pullet breeders. Some breeder managers grow males successfully separately to 20 weeks of age by providing plenty of floor space and restricting water. Water restriction for males grown separately is often absolutely necessary, since breeder cockerels often consume more than three times the water they need while on feed restriction, which leads directly to wet litter conditions. It is vital to keep litter conditions as dry as possible in order to keep the breeder cockerel's feet and legs in top condition for optimum fertility and hatchability throughout the life of the breeder flock.

Today a sound diet control program for broiler breeder pullets and cockerels means restricting calorie intake to approximately 60% of full feed and to about 48 to 50% of full feed body weight for both pullets and cockerels during the growing period.

There is still plenty of potential for improved management of breeders in order to lower the total feed required to produce a broiler chick. Today, total breeder feed required for the life of the flock should average only 0.80 lbs. per broiler chick. This compares with an estimated average of 1.0 lb. of feed required per broiler chick produced in the US or only 75% of the commercial potential. Top breeder management could save the US broiler industry a total of 300,000 tons of feed/year or more than $36 million per year! What can it save your company?

SLIDES

EARLY MANAGEMENT KEYS

1. 17% Protein Starter.
2. Precision Debeaking of Female and Male.
3. Very Early (2 Week) Weight Control.

BROILER BREEDER MALES (FULL FED TO 28 DAYS)

1977

Protein	28-Day Wt. (lbs.)	% Wt.
20%	1.26	100
17%	0.99	79

UNIFORM BODY WEIGHT

KEYS

1. Early Feed Restriction
2. Rapid Feed Distribution
3. Adequate Feeder Space
4. Accurate Feed Scales
5. Uniform Debeaking

SLIDES(Continued)

REARING PERIOD KEYS

A. Weight Control

B. Uniformity

C. Water Restriction

LAYING PERIOD KEYS

1. Lighting Program - Body Weight
2. Sexual Maturity - 5% 24-25 Weeks
3. Feed for Peak Production
4. Watch Body Weight to Peak
5. Gradually Reduce Feed After 36 Weeks (Approximately 0.2 lb./week)
6. Litter Management

AFTER 48 WEEKS (OLDER BREEDERS)

1. Continue to Reduce Feed - Watch Conversion
2. Litter Condition - Male Foot Condition
3. Stress Hatching Egg Care
4. Seeding - In Young Males - May Help Maintain Hatch
5. Feeding 2 Times/Day - May Improve Fertility

RESEARCH ON BROODING PRACTICES FOR POULTRY

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One method of saving fuel that has received considerable attention is the practice of brooding poultry in a restricted area by enclosing a section of the house with plastic curtains or partitions. This area may be a strip along the side of the house, or a section of the house in the center or at the end. Usually, from one-third to one-half of the total area is used for the brooding phase. Results from this practice in the field have been variable, mainly because of lack of specific information about ventilation required for limited-area brooding, and how much floor space should be allowed for brooding.

Four tests have been completed at South Central Poultry Research Laboratory which were designed to determine how much energy could be saved by limited-area brooding and precision ventilation control in a properly insulated poultry house.

The experiments were conducted in well-insulated [$R=8°F/Btu/(hr)(ft^2)$], windowless, 36-ft-wide by 80-ft-long poultry house of typical configuration. The brooding area was separated from the rest of the house for the first 2 weeks by a partition suspended from the ceiling. A similar partition was used in the center of the house so that one-half of the house could be used for the 2- to 4-week brooding period. In the first test, polyethylene curtains were used as partitions; however, these were difficult to manage and lost excessive heat to the unused part of the house. For the next three tests a folding partition was made of six pieces of rigid-foam insulation board. The construction and operation of the partitions are shown in Figures 1 and 2.

In the first two tests, 15% of the total house area was used for brooding for the first 2 weeks. In the research house, this was a 12-ft by 36-ft area for 3,600 chickens. Four 20,000-Btu/hr LPG brooders, uniformly spaced, were used. Five 8-ft trough waterers, placed between the brooders and at each side of the house, and feeder lids were used to start the chickens. Although this arrangement was satisfactory, observations during the first two tests indicated that the system could be improved by allowing more space for the first 2 weeks and by changing the heating system. Changes made during the next two tests resulted in the house arrangement shown in Figures 3 and 4. For the first 2 weeks, the brooding area was increased to 25% of the total house area, and the 8-ft waterers were decreased from five to four. The LPG brooders were replaced by four 2,000-watt electric brooders which provided 7 Btu/hr of heat per chicken. The insulation in the half of the house used for the first 4 weeks was increased to $R=10°$ F/Btu/(hr)(ft^2) and decreased in the other half to $R=6°F$/Btu/(hr)(ft^2).

At the end of 2 weeks, the birds were released into the half-house area. The normal number of waterers and feeders for the half-house area was used. At the end of 4 weeks, the birds were released into the full house at a stocking rate of 0.8 ft^2/ bird.

Continuous ventilation was provided to limit the carbon dioxide concentration in the growing area to less than 5,000 parts per million and relative humidity to less than 70 percent. When LPG brooders were used, a continuous fresh-air flow rate of 0.06 ft^3/(min)(chicken) during the first week and 0.18 ft^3/(min)(chicken) after the first week was required to obtain these conditions. When electric heaters were used, the fresh air flow rate required was 0.06 ft^3/(min)(chicken) the first week, 0.12 ft^3/(min)(chicken) the second week, and 0.18 ft^3/(min)(chicken) after the second week. With both types of heat, additional ventilation, thermostatically controlled, was provided when temperature in the growing area exceeded 85°F the first week, 80°F the second week, 75°F the third week, and 70°F after the third week. The thermostatic control used for both the auxiliary ventilation and the heaters was of the time-proportioning type developed at South Central Poultry Research Laboratory (1). The controller operates the ventilation fans or the heaters for a percentage of each 5-minute time period as required to maintain the desired temperature in the house.

DEVELOPMENT OF A SOLAR ENERGY SYSTEM FOR BROODING POULTRY

The system for collection and application of solar energy for poultry brooding was developed for the research house, previously described, in which energy conservation research was under way.

The solar energy collection and storage system was designed to supply the heat required to brood and grow broiler chickens in midwinter in Mississippi when used in conjunction with limited-area brooding, adequate insulation, and precise control of ventilation. Research had determined that these energy conservation techniques could reduce fuel requirements from about 90 gallons of LPG to 30 gallons per 1000 chickens, or about 67 percent.

The schematic diagram of the system design is shown in Figure 5. Solar energy is stored in water for use at night. Enough energy storage was provided for one night's use, based on average daily fuel use experience in the house. Two types of solar collectors were used.

Commercially available (PPG Baseline) flat-plate, double-glazed collectors were used to heat water for energy to be stored. Locally designed and built flat-plate collectors for heating air were used to heat ventilation air.

All solar energy was transferred to the chicken brooding and growing area via the continuous ventilation air. The heat stored in the water was transferred to the ventilation air at night through a standard automotive radiator (Figure 5). Water circulation through the radiator was by thermosiphon action. Water was circulated to the solar collectors by an electric-powered pump controlled by a differential thermostat. In addition to the solar energy collected for storage by the water heaters, some of the energy collected by the air heaters was also transferred to storage during midday hours through the radiator. During this time, water circulated by thermosiphon action in opposite direction to the action at night.

The water collectors were protected from freezing by designing the system so the collectors were self-draining when the circulation pump stopped. Sodium chromate was used as an inhibitor to protect the aluminum collector plates from corrosion.

The solar energy system was designed to maintain a continuous air flow rate to the growing area through the full 8-week growth period. All solar energy was introduced through this basic ventilation rate. The normal house ventilation system, thermostatically controlled, was used to provide additional ventilation air as required to control the temperature in the growing area.

RESULTS AND DISCUSSION

Table 1 gives the fuel consumption and temperatures by weeks for the test in 1975-76 with solar assist compared to a test without solar assist conducted in 1974-75. The total consumption for the 8-week test with solar assist was 8.2 gallons of LPG per 1000 chickens, which was 73 percent less than the similar 1974-75 test without solar assist. The outside average temperature for the 8-week period for the solar test was 43°F, which was 7°F colder than for the earlier test; however, inside house temperature was the same for both tests. About one-half of the 8.2 gallons of LPG per 1000 chickens was consumed by the pilot lights on the brooder stoves and would be required regardless of the temperature in the house.

Results of the third test conducted during the first half of the winter of 1976-77 are shown in Table 2. Total energy supplied by solar heat and the electric heaters was equal to 28.27 gallons of LPG per 1000 birds, of which 95.5% was provided by solar energy. Average outside temperature during the 8-week test was 49°F. However, the weather was considerably warmer during the early part of the test and colder toward the end than in the preceding tests.

Results for the fourth test, which was conducted during exceptionally cold weather in the second half of the winter of 1976-66, are shown in Table 3. Weather was especially severe during the first 4 weeks of this test as indicated by the low weekly average temperatures. In this test, energy equal to 36.2 gallons of LPG per 1000 chickens was required to provide adequate temperatures in the house; 75% of this heat was provided by solar energy. The performance of the broiler chickens grown in the last two tests is given in Table 4.

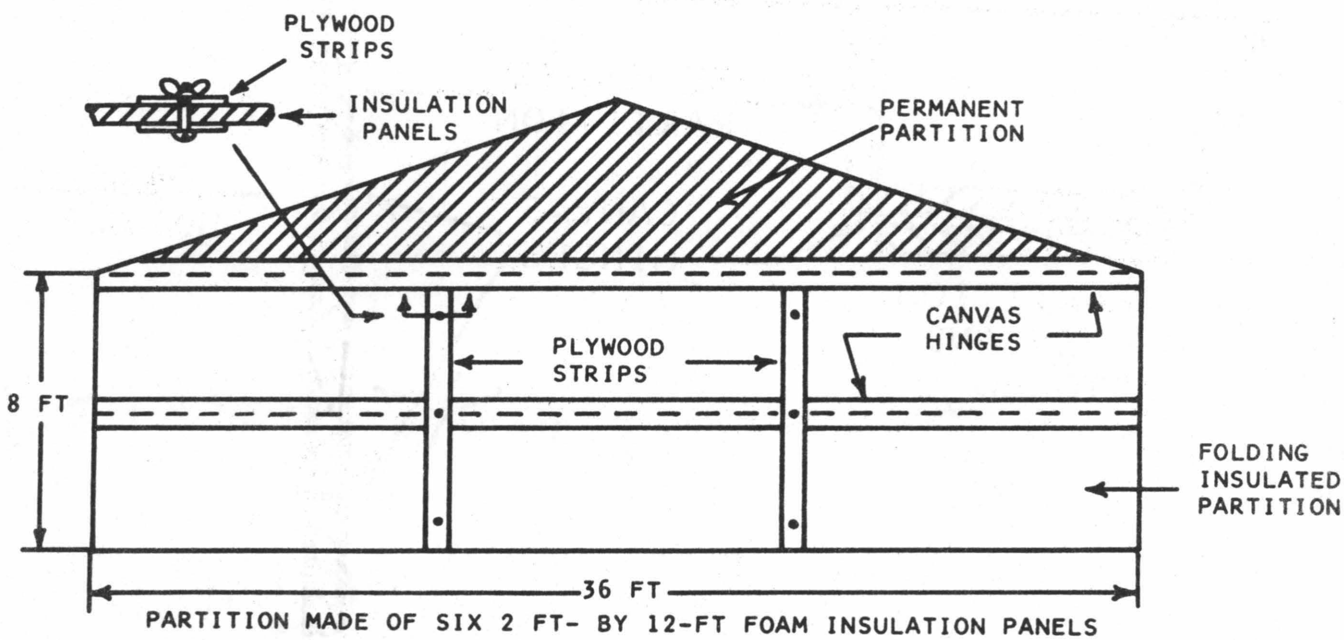

Fig. 1. Construction of the insulated partition used to limit the area used to brood chickens.

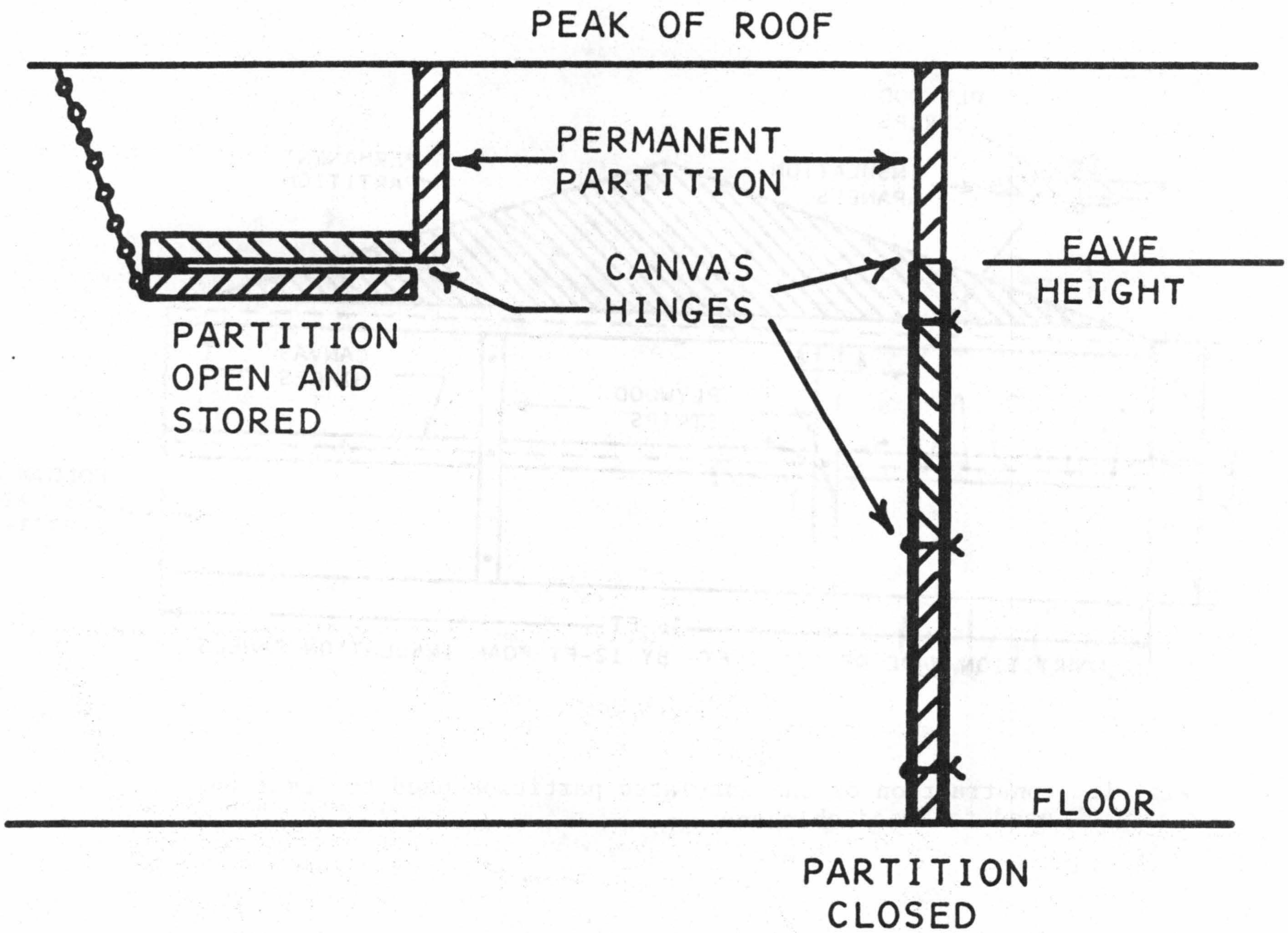

Fig. 2. Cross-section of the insulated partition and how it folds up to release chickens to a larger area.

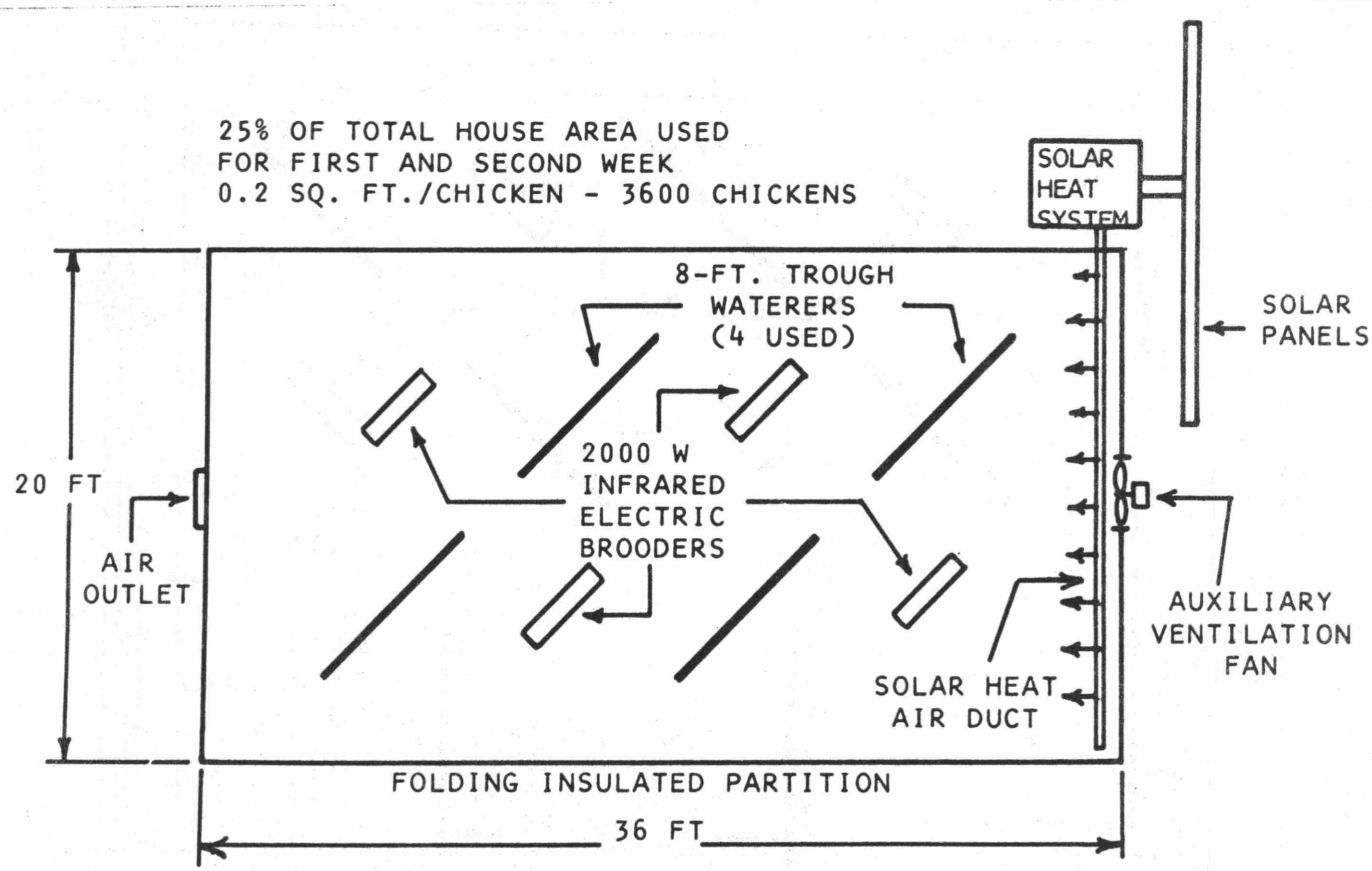

Fig. 3. Arrangement of the 25% area used for brooding chickens for the first two weeks.

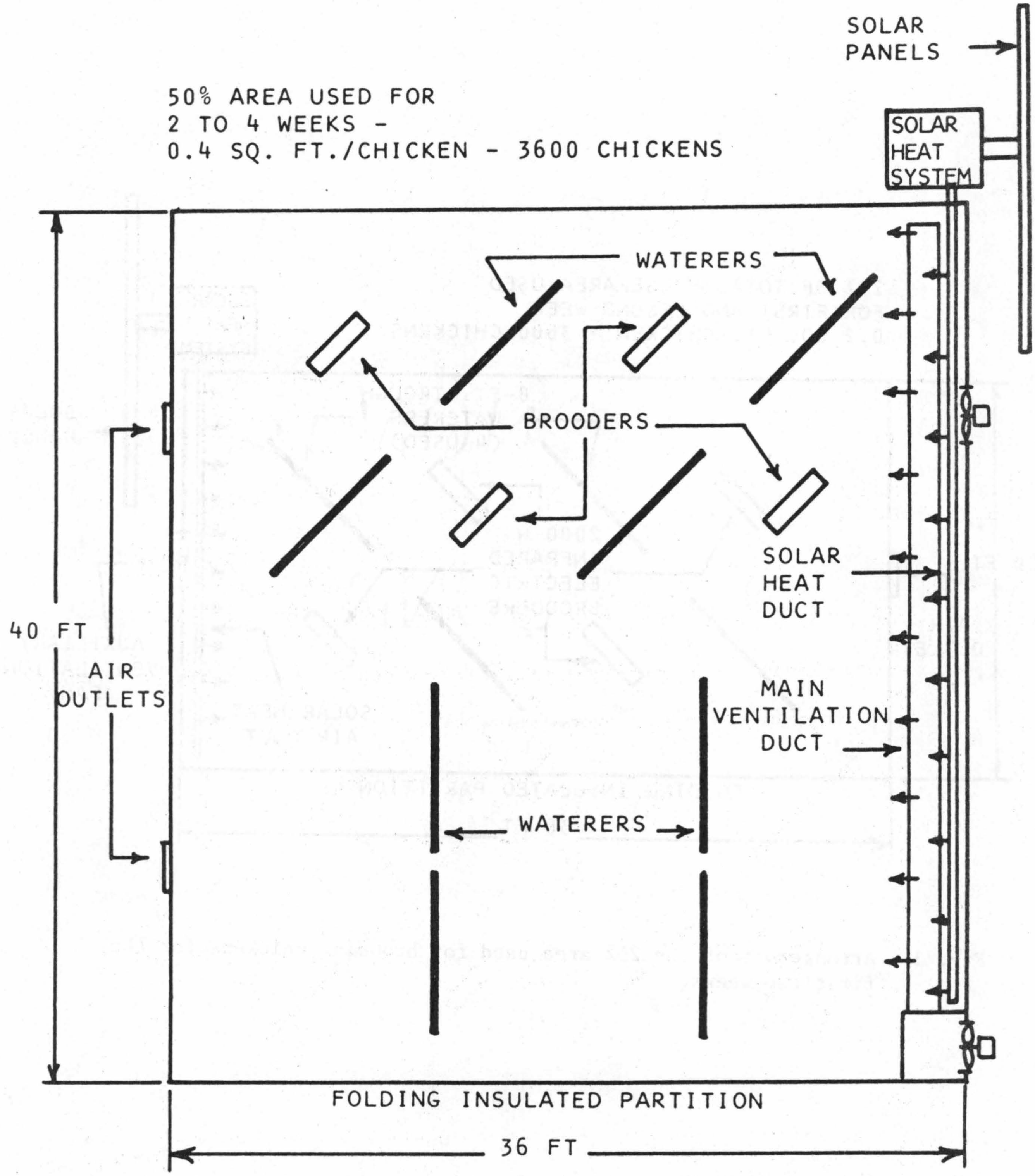

Fig. 4. Arrangement of the half-house area used for the 2- to 4-week growing period.

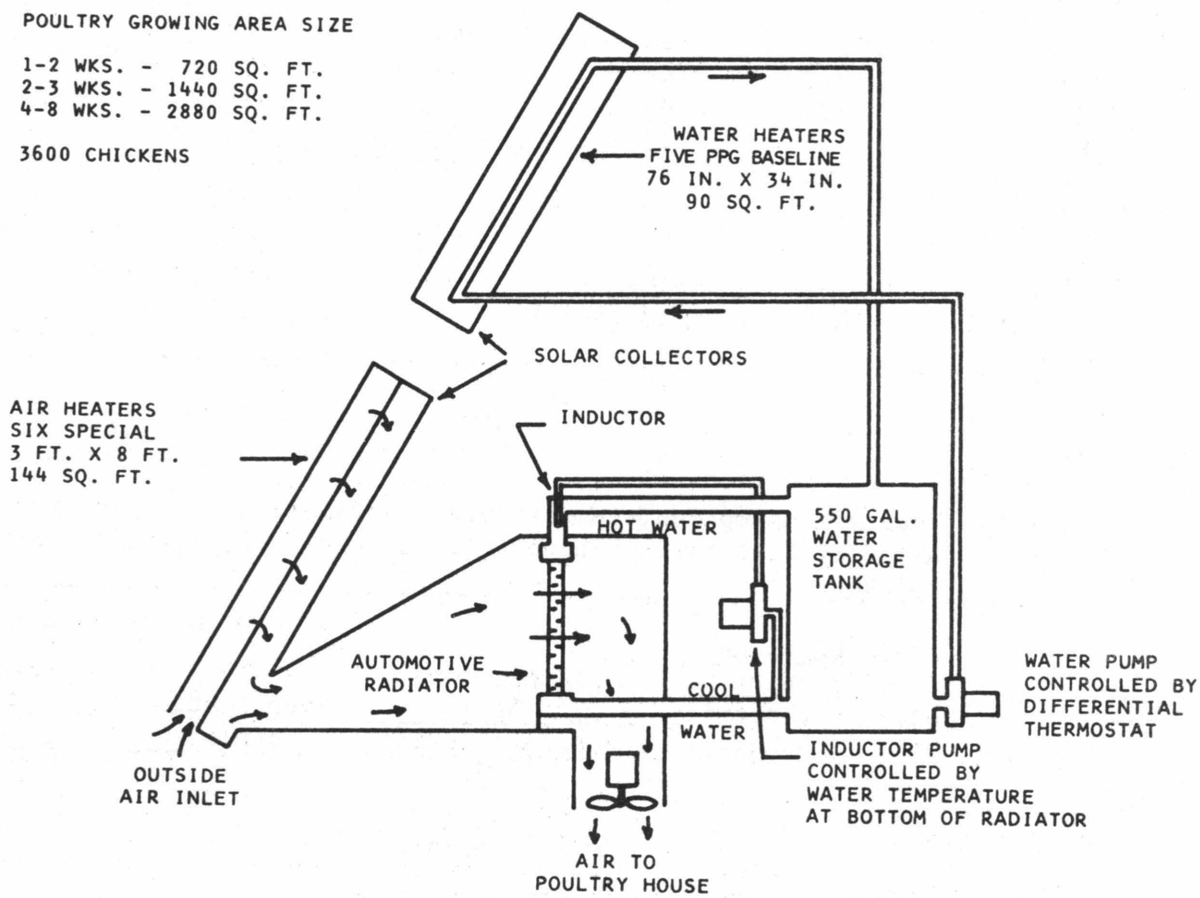

Fig. 5. Schematic diagram of system for collecting and storing solar energy for heating ventilation air for poultry houses.

Table 1. Weekly fuel consumption and outside and house temperature for two broiler brooding and growing tests conducted in Mississippi in winters of 1974-75 and 1975-76

	Without solar			With solar	
	LPG, gal/1000	Temperature, °F			LPG, gal/1000
Week	chickens	Outside	Inside	Outside	chickens
1st	7.2	46	85	51	1.3
2nd	9.2	44	80	53	2.1
3rd	5.8	50	75	34	2.4
4th	2.5	60	70	43	2.4
5th	3.6	41	70	39	-
6th	2.2	56	70	37	-
7th	-	52	70	38	-
8th	-	51	70	48	-
Total	30.5	50 (Avg.)		43 (Avg.)	8.2

Table 2. Energy consumption, temperature, ventilation rate, and relative humidity for test conducted Oct. 11 - Dec. 5, 1976, for broiler chickens

	LPG equivalent gal/1000 chickens		Temperature °F			Inside relative humidity
Week	Solar heat	Electric heat	Outside	Inside	Ventilation cfm/bird	%
1st	3.43	0.25	59.9	85.3	0.06	50
2nd	2.38	0.74	55.7	84.4	0.14	63
3rd	2.79	0.26	48.0	78.6	0.21	64
4th	5.93	0.01	45.9	77.1	0.44	59
5th	1.96	0.01	49.7	73.9	0.38	69
6th	3.77		46.8	72.4	0.72	61
7th	2.50		45.5	72.5	0.89	67
8th	4.23		40.7	71.9	0.68	70
Total	27.0	1.27	49.0			
Total	28.27		Litter moisture at end - 27% (W.B.)			

Table 3. Energy consumption, temperature, and ventilation rate for test conducted Jan. 11 - Feb. 28, 1977, for broiler chickens

Week	LPG equivalent gal/1000 chickens Solar heat	Electric heat	Temperature °F Outside	Inside	Ventilation cfm/bird
1st	3.0	5.1	30.9	82.3	0.06
2nd	3.2	3.0	31.2	80.8	0.11
3rd	4.2	1.1	35.6	76.7	0.22
4th	4.8		38.3	72.9	0.40
5th	3.8		48.6	72.8	0.75
6th	5.0		44.7	72.7	0.89
7th	3.0		55.7	74.6	1.88
Total	27.0	9.2			
Total	36.2		Litter moisture at end - 25% (W.B.)		

Table 4. Body weights and feed conversion for broiler chickens grown in tests under conditions shown in tables 2 and 3

Age, days	Chicken body weight, pounds Test 3 - Oct. - Dec. 1976	Test 4 - Jan. - Mar. 1977
14	0.50	0.51
28	1.36	1.43
42	2.76	2.96
53		3.78
56	4.10	
Feed conversion, lbs. feed/lb. wt.	1.98	1.95

REFERENCES

1. F. N. Reece and F. W. Harwood. Time-proportioning control of livestock structure ventilation, Transactions of ASAE 17, 714 (1974).

BROILER RESPIRATORY DISEASES

By Richard H. Long

A. VIRAL

1. Infectious Bronchitis - probably the leading cause among the viruses.

2. New castle Disease - would be found more frequently if more birds were taken to a lab, especially from birds that are beak-O-vac'ed.

3. Laryngotracheitis - the strain we now have on Delmarva is fairly mild and often difficult to differentiate from bronchitis.

4. Adenoviruses - probably don't cause any problems in broilers without help from other organisms, such as gumboro, mycoplasmas, bronchitis.

5. Viral Arthritis - some researchers have shown that V.A. goes through a respiratory phase, but probably isn't of real importance to broilers.

6. Gumboro virus - because of its effect on the immune system, it can leave a supposedly vaccinated bird open to respiratory virus infection.

B. BACTERIAL

1. E. coli - by far the most common cause of respiratory disease in broilers. Without it, most viruses would do little harm, except newcastle and LT.

2. hemophilis - the organism that causes coryza. Rarely a problem in our area. Quite a problem in California and Florida, mostly in leghorns.

C. MYCOPLASMA

1. galisepticum - more and more flocks are showing up M.G. positive. Don't discount it just because your birds are supposed to be clean.

2. synoviae - can be involved if other factors, such as bronchitis, poor management, and heavy E. coli infection are present.

3. gallinarum - contrary to recent reports, I don't consider it a problem in broilers.

D. ENVIRONMENTAL

1. Weather extremes

a. The winter - the only thing I can say is I hope we never see another one like last winter, although it did force some upgrading of houses.
b. The summer - effect of hot weather on hens probably hurt chick quality as much, if not more than, the winter.

E. GENETICS - the primary breeders gave us what we wanted and now we are paying for it.

1. breeding for weight gains and feed efficiency - at the expense of natural disease resistance. Birds now susceptible to almost all disease conditions.

2. vaccinating primary breeders for MD, VA, IBD - allowed naturally susceptible birds to reach the field

F. MARKET CONDITIONS

1. good markets - we tend to put out too many chicks of questionable quality, set floor eggs, etc. and put chicks in anything with a roof and feeder.

2. bad markets - in an effort to lose less money, we stop using medication, fire all the veterinarians, keep hens too long, etc.

G. MANAGEMENT

1. housing - one more cold winter should eliminate this problem, because we just can't afford cent and a half a pound fuel costs in these old houses.

2. ventilation - probably the most talked about and least understood area of broiler production. Needs to be looked at in breeders too.

3. vaccination - must be coordinated between breeders and broilers. Like insurance, don't use any more than you have to for your local situation.

4. partial house brooding - NOT FOR EVERYONE, some growers just can't manage it. Ventilation, chick source, number of breeder flocks all take on more importance.

5. multiple age farms - I am amazed that some people still do this regularly.

6. chicks from several breeder flocks in one house - must be done occasionally. Should attempt to match flocks with same background (vaccination, disease history, area - all the way back to where the pullets were reared.)

WHO NEEDS TO DO WHAT?

A. PRIMARY BREEDER

1. more natural selection for disease resistance
2. less vaccination for VA, Gumboro, Marek's

B. BROILER BREEDER

1. gear flock size to broiler house size
2. gear vaccination program to broiler vaccination program
3. equip houses for weather extremes
    a. fans
    b. foggers, possibly evaporative coolers
4. resist temptation to set floor eggs

C. HATCHERY

1. remember that sanitation is something to be done every day, not just when you have a problem.
2. egg handling and storage need extra attention during weather extremes
3. Beak-O-Vac machines MUST be cleaned and checked for dosage daily, and should be at least flushed out with clean water 2-3 times a day.
4. Marek's machines MUST be cleaned and checked daily and flushed with water before breaks and at lunch time
5. chick boxes and pads must be kept clean
6. chick handling needs extra attention during weather extremes
    a. extra man on chick bus may be worth the expense

D. GROW OUT

1. DO
   - seriously consider medicated pre-starter
   - watch vaccination program carefully
   - involve a laboratory in respiratory problems
   - work closely with breeder/hatchery people, live haul and processing plant

2. DON'T
   - allow multiple age houses and farms
   - allow a grower to partial house brood unless you know he can handle it
   - try to hide your problems from your neighbors (they may have the answers, or may be the problem)
   - get excited and change all your programs at once

E. LIVE HAUL

1. cooperate with growout on moving sick chickens
2. keep split movements to a minumum

F. PROCESSING PLANT

1. cooperate with growout on processing sick chickens
2. should process sick chickens last
3. should have only two kinds of trim help
   a. beautiful girls
   b. big, ugly, mean men

MYCOPLASMA INFECTION

R. K. Page

Mycoplasma infections vary in significance with different segments of the poultry industry. For that reason mycoplasma infections will be discussed as they apply to the different segments of the poultry industry.

(A) Turkeys

Mycoplasma, with the exception of mycoplasma meleagridis (MM), has been eradicated from the turkey industry. MG or MS breaks in turkeys do occur, however they are very infrequent and usually can be traced to exposure to known MG or MS positive commercial egg birds or broiler breeder hens. MM will elicit an air sacculitis along with skeletal deformities commonly called turkey syndrome 65.

(B) Broiler Breeder Hens

An alarming number of MS and MG breaks have been detected in recent months in broiler breeder hens. Due to improvements in the conditions in which broilers are grown, variations in vaccination programs, and appropriate medication programs, these breaks have not resulted in extensive air sac condemnations. Relaxation of MG and MS monitoring programs have resulted in a number of instances where MS and MG have gone undetected and resulted in extensive air sacculitis problems. In operations where feather sexing is performed, it is absolutely essential to have a good MG and MS monitoring program.

Individual flocks of birds are frequently encountered that do not develop HI antibody titers sufficiently high enough to be called MG or MS positive. These flocks present more of a problem for the laboratory than they do for the company. Condemnations due to air sacculitis seldom ever exceed 1%; however the uncertainty of the mycoplasma status makes one feel uneasy. In situations of this nature, we have found mycoplasma isolations from tracheal swabs to be an effective way of determining the mycoplasma status of these flocks.

Recent information suggests <u>mycoplasma gallinarium</u> or type "B" mycoplasma can elicit a mild air sacculitis when injected into the air sacs of chickens. Although this organism is a potential pathogen, if we get our ventilation programs correct and a properly timed ND-IB vaccination this organism should not cause major air sacculitis problems.

(C) Commercial Egg Birds

MG currently is causing severe problems in the commercial egg industry. Multiple age birds on a laying farm virtually precludes the elimination of mycoplasma from these farms. In these situations controlled exposure to MG is a method of preventing catastrophic drops in egg production. The continuous feeding of low levels of tylosin has also been employed to prevent the production slumps associated with MG infection in laying hens.

Controlled exposure for MG should be discouraged on farms containing single age birds. Controlled studies continue to demonstrate MG free flocks give better performance than MG positive flock.

One of the major concerns of controlled exposure of laying flocks with MG is the spread of the organism to broiler breeder flocks or turkey flocks in the area. Special precautions should be instituted to insure this does not occur.

CURRENT TURKEY DISEASE PROBLEMS

R. K. Page

Turkey disease problems seemingly change every year and do vary a great deal from one geographic area to the next. The problems discussed will reflect the current turkey diseases as they exist in our area.

1 - Coccidiosis

Several coccidiosis problems have been found in recent months. Starting turkey poults on old litter without a coccidiostat has played a role in this problem. Virtually every turkey grower uses a medicated turkey prestarter for the first 18-20 days thus allowing sufficient time for the coccidia to cycle in the bird and cause a disease problem.

2 - Hemorrhagic Enteritis

This disease has gradually developed into a major problem on some farms. When first detected, the mortality is generally very low and tends to increase with each successive grow-out. The HE vaccine has done an excellent job in eliminating this disease.

3 - Fowl Cholera

The CU strain of pasteurella has done an excellent job of eliminating fowl cholera as a major disease problem. Sporadic cases of cholera are occasionally seen and in those flocks chronic mortality problems usually occur. When used correctly the CU vaccine is very effective.

4 - Aspergillosis

The dry, dusty conditions of the summer months have been ideal for aspergillosis. Range reared and confinement grown turkeys have experienced air sacculitis due to invasion of the lungs and air sacs by the aspergillus organism. These organisms are inhaled on dust particles and will produce extensive pneumonic and air sac lesions. Elimination of dust as much as possible will correct this problem.

5 - Hepatic Granulomas

A number of flocks have experienced very high condemnations of livers. Clinically the flocks of birds were in good health and mortality was normal. When these flocks were processed virtually all of the livers were condemned for hepatic granulomas. The pathogenesis of this problem was not determined, however the addition of SQ as a coccidiostat and bacitracin eliminated the problem.

6 - Turkey Respiratory Disease

Respiratory diseases in turkey poults have caused extensive mortality. Usually seen in poults 2-4 weeks of age, the signs consist of extensive upper respiratory involvement with death due to a collapsed trachea or tracheal plugs. The problem tends to reoccur on a farm with mortality exceeding 50% on some occasions. Histological lesions consist of extensive necrosis of the Bursae of Fabricius and other scattered lymphatic tissue.

A variety of viruses have been isolated from clinically affected birds and are currently being evaluated for vaccines.