

**EXERCISE AND TRANQUILIZATION**  
**Their Effects on Blood Constituents of Pigs**

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EFFECTS OF EXERCISE AND TRANQUILIZATION ON BLOOD  
CONSTITUENTS OF PIGS

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It is difficult to obtain blood samples from pigs without exercising and exciting the pig being sampled as well as the other pigs in the group. It has been demonstrated that hemoconcentration occurs in dogs (Khoury et al., 1965), horses (Archer and Clabby, 1965), cats (Izquierdo and Cannon, 1928), and men (Darling and Shea, 1951; Ebert and Stead, 1941; Kaltreides and Meneely, 1940) as a result of exercise.

To quiet both man and animal, tranquilizers have been used in a variety of situations. Increased heart rate and salivary secretions and decreased packed cell volume (PCV) and hemoglobin have been reported for horses, goats, pigs and dogs when given a tranquilizer (Gabel et al., 1964; Jha et al., 1961; Ritchie, 1957; Soliman et al., 1965).

Weanling pigs were used: 1) to determine the effects of exercise on packed cell volume, hemoglobin, plasma protein and heart rate, and 2) to evaluate the usefulness of an oral tranquilizer in quieting pigs for blood sampling as well as its influence upon PCV, hemoglobin, plasma protein and heart rate.

Materials and Methods

Effects of Exercise - Ten weaned Yorkshire barrows averaging 23 kg were randomly assigned to two groups. At 10 a.m. on each of 2 consecutive days blood samples were collected from all pigs (Kornegay, 1967). The pigs of one group which had been placed in a separate pen at the time of the first sampling were then removed individually and forced to run 5 minutes. At the conclusion

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of the exercise blood samples were again collected and at 2 p.m. samples were taken from all pigs of both groups. Pigs were restrained in a small trough and were handled as quickly as possible when taking blood samples. During both days all pigs were fasted for 18 hr. before the first blood samples were taken and during sampling period. On the first day, after the last blood sample was taken, pigs in both groups were placed together and allowed to eat for 2 hr. Water was available at all times. Heart rate was taken with a stethoscope after the pig had been placed in the restraining trough and before the blood sample was taken. Laboratory procedures were as described by Kornegay (1967).

Effect of Tranquilization - In a series of three trials, 42 weaned Yorkshire barrows averaging 20 kg were used to evaluate the tranquilizer triflupromazine hydrochloride\* as an aid in quieting pigs for blood sampling, and to determine the influence of this tranquilizer upon heart rate and blood constituents. In trials 1 and 2, 15 pigs were used in each trial to compare zero, 4.4 and 8.8 mg of triflupromazine per kg of bodyweight. In trial 3, zero and 6.6 mg were compared using 12 pigs. The values obtained from the control pigs (zero) of all three trials were not different; therefore, the data from the three trials were pooled and will be discussed together. Barrows were allotted into groups according to bodyweight and PCV. Treatments were randomly assigned to groups. All pigs were fasted overnight (18 hr.). On the morning of the experiment all groups were given a standard corn-soybean meal diet at the rate of 100 gm per pig with and without tranquilizer. The blood sampling procedures were similar to those described above. The heart rates were taken 2 minutes after the pigs were placed on the restraining trough and before the

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\* Trade name - Vetame, supplied by E. R. Squibb.

blood samples were taken. Blood samples were taken 2 and 5 hr. after the pigs were fed with the exception of the first trial where blood samples were only taken after 2 hr.

The data were subjected to an analysis of variance.

### Results

Effects of Exercise - The mean values for PCV, hemoglobin, plasma protein, and heart rate are shown (Fig. 1). Exercise for 5 minutes caused significant ( $P<.01$ ) increases in PCV, hemoglobin, plasma protein, and heart rate.

Hemoglobin values were greater ( $P<.05$ ) for both control and treatment groups during the morning of the second day. Across all groups, heart rate was greater the second day. The only explanation that can be offered is that the pigs were more excitable on the second day as a result of being handled on the first day.

Effects of Tranquilization - A summary of results of this study is presented in table 1. At 2 hr. after feeding, heart rate was significantly ( $P<.01$ ) greater for the pigs fed the tranquilizer than for the control pigs, but at 5 hr. after the tranquilizer was fed there were no differences due to levels of tranquilizer fed.

PCV, hemoglobin, and plasma protein values of tranquilized pigs did not differ from those of the controls.

The tranquilized pigs seemed to be in a state of stupor compared with the control pigs; some of the tranquilized pigs were chewing on the metal fence and were salivating excessively. Tranquilized pigs shivered more than the controls. The control pigs were more alert than the tranquilized pigs and appeared to struggle more while being restrained but less after being secured on the trough.

It was noted that heart rates of all pigs were very fast immediately after the pigs were placed on the trough, but decreased steadily for the next 1 to 2 minutes. Struggling by the pig was observed to cause an approximate doubling of heart rate. Thus, length of time after restraining a pig (or after struggling) is important when measuring heart rate.

#### Discussion

The observation of positive effects of exercise on PCV, hemoglobin, plasma protein, and heart rate of swine coincides with findings for other species. Darling and Shea (1951) reported increased PCV, serum protein values and pulse rate when athletes and non-athletes were exercised for 2 minutes. Exercise caused increases in PCV, hemoglobin and serum protein values in both normal (Kaltreides and Meneely, 1940) and splenectomized human subjects (Ebert and Stead, 1941). Elevated PCV has been observed in ponies due to exertion and also due to excitation (Archer and Clabby, 1965). Heart rate and PCV were increased in both trained and untrained dogs following short periods of exercise (Archer and Clabby, 1965; Khouri et al., 1965; Rayford et al., 1965).

The observations made in this study and the findings for other species indicate that blood composition and heart rate are affected by exercise, which could be caused by handling the animal. When interpreting hematological data, therefore, considerable allowance must be made for this effect.

The feeding of triflupromazine to pigs produced effects on heart rate and salivary secretion similar to those reported for other species (Benson and Schiele, 1962; Gabel et al., 1964; Jha et al., 1961). Ritchie (1957), using chlorpromazine in pigs, reported an increased heart rate, and found intravenous injections to be more effective than intramuscular injections in changing heart rate.

In this study, the lack of effect of tranquilization on PCV and hemoglobin of pigs is contrary to results reported by Soliman et al. (1965) for dogs. They reported decreased PCV and hemoglobin in dogs given the tranquilizer intramuscularly with the maximum effect 2 hr. after injection. These writers indicated that their findings were similar to those reported by other workers for dogs, rats, horses, buffaloes and cattle. Deberdt (1959) detected no change in PCV and hemoglobin after promazine was administered to man.

The lack of effect on PCV, hemoglobin and plasma protein would suggest that the blood composition is probably not changed when triflupromazine is fed to growing swine at zero, 4.4, 6.6 or 8.8 mg per kg bodyweight. In this study, the use of triflupromazine was of no benefit in quieting pigs for blood-sampling.

#### Summary

The effect of exercise upon packed cell volume (PCV), hemoglobin, plasma protein, and heart rate was studied using 10 pigs averaging 23 kg. PCV, hemoglobin, plasma protein, and heart rate values were significantly increased when pigs were individually exercised for 5 minutes.

The usefulness of a tranquilizer, triflupromazine hydrochloride, in quieting pigs for blood sampling, and the influence of this drug upon PCV, hemoglobin, plasma protein, and heart rates were studied in three trials using 42 pigs averaging 20 kg. Four levels of tranquilizer, zero, 4.4, 6.6 and 8.8 mg per kg of bodyweight were mixed with diet (100 gm of diet per pig) and fed to fasted pigs. PCV, hemoglobin, and plasma protein values for tranquilized pigs did not differ from those of control pigs (zero level). Heart rate of tranquilized pigs was significantly increased 2 hr. after pigs were fed the

tranquilizer but after 5 hr. returned to that of the control pigs. The tranquilized pigs seemed to be in a state of stupor and were chewing on a metal fence and salivating excessively.

These studies suggest that exercise of pigs should be avoided when blood samples are taken. Also, the tranquilizer used in this study was of no benefit in quieting the pigs.

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TABLE 1. EFFECT OF ORAL TRANQUILIZATION ON PACKED CELL VOLUME HEMOGLOBIN, PLASMA PROTEIN AND HEART RATE

Treatments	No. of pigs	Criteria <sup>a</sup>			
		Heart rate no./min.	PCV %	Hemoglobin gm./100 ml.	Protein gm./100 ml.
Control					
2 hr. <sup>b</sup>	16	140 <sup>c</sup>	33.8	10.3	5.55
5 hr. <sup>b</sup>	11	141	33.8	10.3	5.48
Low tranquilizer <sup>d</sup>					
2 hr.	10	153	33.0	10.1	5.43
5 hr.	5	144	31.7	9.6	----
Medium tranquilizer <sup>d</sup>					
2 hr.	6	155	33.0	10.2	5.77
5 hr.	6	147	33.1	10.1	5.45
High tranquilizer <sup>d</sup>					
2 hr.	10	156	32.2	9.6	5.12
5 hr.	5	134	31.4	9.7	----

<sup>a</sup> The pooled standard deviations were 12, 2.1, 0.7 and 0.5, respectively, for heart rate, PCV, hemoglobin, and plasma protein. Each S.D. is estimated with 56 d.f.

<sup>b</sup> Time after feeding tranquilizer.

<sup>c</sup> Significantly ( $P < .01$ ) less than other values at 2 hr.

<sup>d</sup> Mg. triflupromazine HCl per kg bodyweight, 4.4, 6.6 and 8.8, respectively.

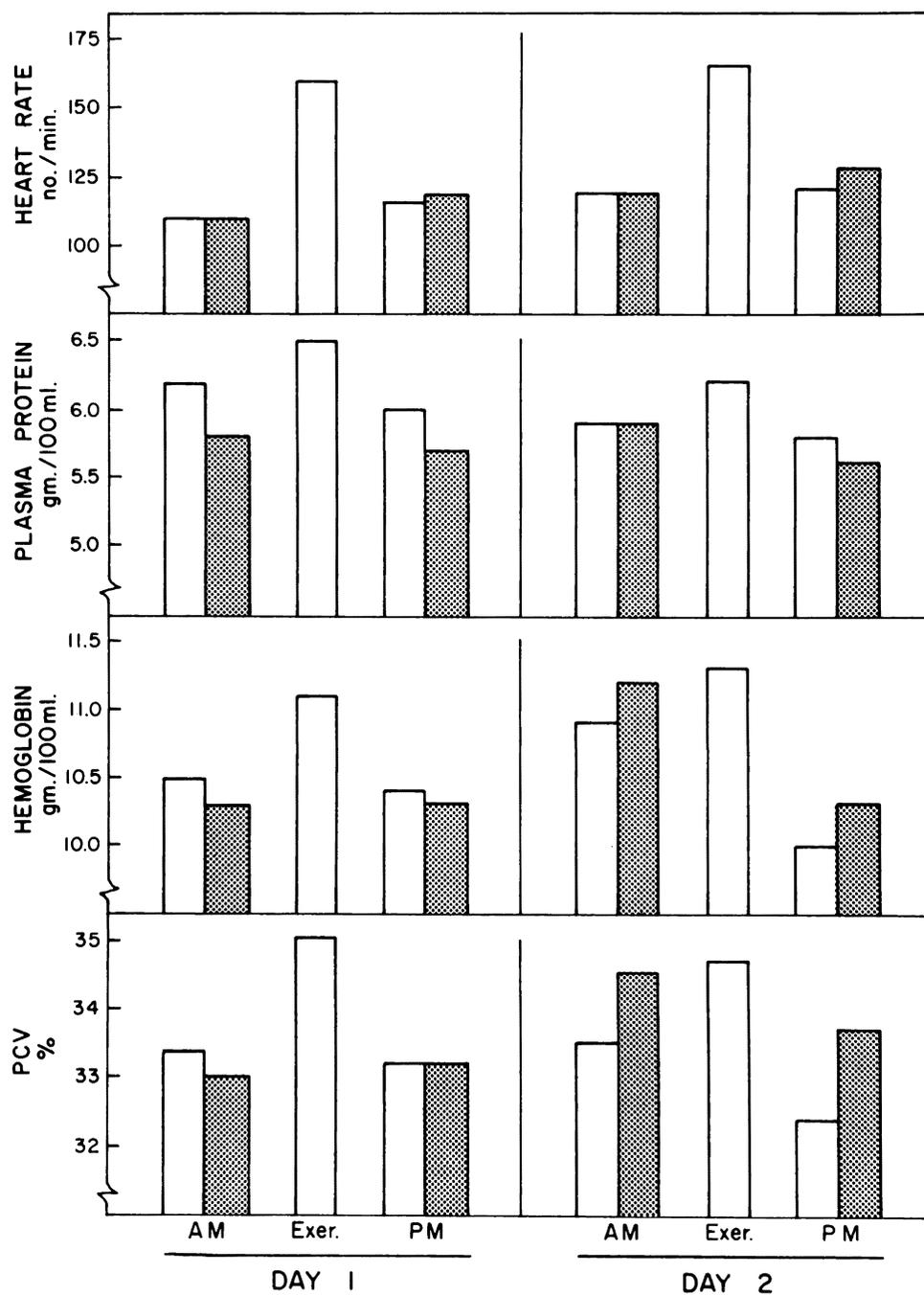


Figure 1. Effect of exercise on PCV, hemoglobin, plasma protein and heart rate. Shaded bars are control and clear bars are treatment. Five pigs (av. body weight, 23 kg.) were used in each treatment group. The pooled standard deviations were 1.4, 0.4, 0.4, and 10, respectively, for PCV, hemoglobin, plasma protein and heart rate. Each S.D. is estimated with 40 d.f.