

Brief Communication

PLASMA CHOLESTEROL IN SWINE
GENETIC VARIATIONS AND RELATION TO ALKALINE
PHOSPHATASE

A variety of environmental factors such as feeding and climate may influence the plasma cholesterol concentration. Earlier experiments have, however, indicated that genetic differences also exist (*Heidenreich et al.* 1964). The present study was undertaken to elucidate this possibility in pigs of Danish Landrace reared under strictly standardized environmental conditions. Besides, the plasma cholesterol concentration was compared with other genetically variable blood parameters to examine if any correlations existed. Only the relation to alkaline phosphatase (AP) will be dealt with here.

Fifteen lots of pigs from a progeny testing station were used for the study, each lot consisted of four littermates (2 female and 2 castrated male pigs). At the time of sampling the pigs were 80—90 days old with a body weight of 23—25 kg and had been on the station for approx. 3 weeks. Total cholesterol concentration in plasma was determined according to *Richterich* (1968) and AP activity was measured as mentioned by *Agergaard* (1976).

The total cholesterol concentration found agrees with earlier results on Danish and Norwegian Landrace pigs (*Kruse et al.* 1971, *Bakke* 1975), but is slightly lower than in Yorkshire pigs (*Tremere et al.* 1966). From the results presented in Table 1 it is obvious that differences between litters regarding plasma cholesterol level exist. An analysis of variance showed that the variation within litters was significantly smaller than that between litters ($P < 0.001$). Since differences in environment and feeding can be ruled out, these results show that the plasma cholesterol level in pigs is primarily genetically determined.

Another interesting finding was a significant positive correlation between total cholesterol concentration and AP activity in plasma, the correlation coefficient was 0.48 ($r \neq 0$, $P < 0.001$). Such a relationship has to the author's knowledge not been described before in pigs. The phenomenon can either be due to

Table 1. Total cholesterol concentration (mg %) in plasma from growing pigs.

| Group no. | Pig no. | | | | Mean of group |
|---------------------------|---------|-----|-----|-----|---------------|
| | 1 | 2 | 3 | 4 | |
| 1 | 148 | 118 | 98 | 116 | 120 |
| 2 | 104 | 100 | 95 | 96 | 99 |
| 3 | 56 | 69 | 68 | 71 | 66 |
| 4 | 86 | 76 | 82 | 80 | 81 |
| 5 | 87 | 92 | 87 | 100 | 92 |
| 6 | 97 | 84 | 86 | 106 | 93 |
| 7 | 82 | 79 | 91 | 111 | 91 |
| 8 | 107 | 92 | 108 | 113 | 105 |
| 9 | 90 | 75 | 82 | 60 | 77 |
| 10 | 97 | 92 | 105 | 93 | 97 |
| 11 | 48 | 73 | 86 | 75 | 71 |
| 12 | 112 | 100 | 81 | 90 | 96 |
| 13 | 75 | 94 | 96 | 112 | 94 |
| 14 | 109 | 108 | 83 | 98 | 100 |
| 15 | 81 | 75 | 78 | 72 | 77 |
| Overall mean \pm s.e.m. | | | | | 90 \pm 2.2 |

a direct coupling between loci responsible for the synthesis of cholesterol and AP or to the existence of a common regulatory mechanism in the biosynthetic pathways of the two compounds. Cholesterol synthesis as well as AP activity are influenced by the hormonal status of the animal especially regarding growth hormone and the function of the adrenal cortex and thyroid gland. Furthermore, cholesterol and AP are to a great extent synthesized in the same tissues namely liver and intestine.

The use of the two parameters dealt with here as selection criteria in animal breeding programmes has been subject to more investigations. A positive correlation has been found between plasma AP activity and growth intensity in swine (*Agergaard*). Studies on plasma cholesterol (*Heidenreich et al.*) indicated a positive correlation to daily gain of weight and a negative relation to lean muscle mass in pigs. More recently a positive correlation was found between cholesterol and growth rate in calves (*Edfors-Lilja et al.* 1978).

The influence of sex on serum cholesterol was studied by *Hale & McCommick* (1976). They found lower serum cholesterol concentration in boars than in gilts and barrows which agrees

well with the decreased cholesterol content in serum from pigs fed the anabolic steroid methyltestosteron (Cox & Hale 1960). Taken together the above cited results indicate that low plasma cholesterol concentration predominates in pigs with a high proportion of lean muscle tissue.

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