On plates exposed for 32 minutes, growth was markedly inhibited and practically no growth occurred on plates exposed for an hour or more.

The writers are indebted to Mr. Ernest C. Phillips for performing many preliminary experiments which were consistent with those herewith described.

9023 C

Body Temperature and Plasma Lipids in Rabbits.*

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Chauffard, Laroche and Grigaut demonstrated that there was an inverse relationship between body temperature and serum cholesterol in patients afflicted with typhus. This observation has been repeatedly confirmed in practically all of the commoner febrile conditions of man and of some animals. Boyd,[4] in whose paper a comprehensive bibliography appears, showed that not only did febrile temperatures affect plasma cholesterol but also the concentration of other lipids in both plasma and in the red blood cells. Similar data were simultaneously published by Stoesser and McQuarrie.[7, 8, 9] This work has proven that during an acute febrile condition there occurs a lipopenia (term introduced by Boyd[4]) or decreased concentration of blood lipids and that the decrease occurs in plasma and not in the red blood cells in which latter the lipid values may actually increase.

The present paper is concerned with further research into the significance of this febrile lipopenia and in particular represents an attempt to evaluate the effect of temperature *per se*. McQuarrie and Stoesser[6] reported that no change occurred in the value of

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4 Boyd, E. M., *Canadian Med. Assn. J.*, 1935, **32**, 500.

7 Stoesser, A. W., PROC. SOC. EXP. BIOL. AND MED., 1935, **32**, 1324.

8 Stoesser, A. V., PROC. SOC. EXP. BIOL. AND MED., 1935, **32**, 1326.

9 Stoesser, A. V., and McQuarrie, I., *Am. J. Dis. Child.*, 1935, **49**, 658.

6 McQuarrie, I., and Stoesser, A. V., PROC. SOC. EXP. BIOL. AND MED., 1932, **29**, 1281.

serum cholesterol in one patient given an artificial fever by the use of phenylethylhydantoin nor in a second case of diathermy. They[9] recorded that in 9 subjects given artificial fever by diathermy, phenylethylhydantoin and foreign protein the pyrexia did not affect either plasma cholesterol, "lecithin," or total fatty acids. They concluded that a rise in body temperature is not of itself sufficient to produce a lipopenia. In the present investigation variations in temperature of normal animals, variations not produced artificially or by interfering in any way with the normal metabolism of the animals, were compared with plasma lipid values.

The young rabbit proved a suitable species for this purpose. A colony of 30 animals, mostly males and averaging about 6 months old, was obtained from the farms and housed under supervised standard conditions in the animal house. After 1 to 2 months under these conditions, examination revealed a considerable variation in rectal temperature, a variation between 100 and 103°F., among the animals which strict examination revealed to be otherwise in apparent excellent health.

Blood was obtained by cardiac puncture under aseptic conditions and with the use of a mild ether anesthesia (not over 5 minutes of anesthetic in any case) after having fasted the animals over night. The blood was heparinized using 1 mg. of heparin (Connaught Laboratories) per 10 cc. of blood and immediately centrifuged to obtain the plasma. For the purposes of the present study it was deemed sufficient to select 2 lipids as examples of the plasma lipids and determine any relation between their values and changes in body temperature. The two lipids selected were phospholipid and free cholesterol. Extracts were prepared by adding 3 cc. of the heparinized plasma to 80 cc. of alcohol-ether and filtering without heating, using the principle of cold extraction of lipids developed by Boyd.[5] The resulting extracts were analyzed by Bloor oxidative micromethods as modified by Boyd.[1, 2, 3]

The principle of cold extraction of lipids was worked out by Boyd[5] on human plasma in which it was shown that a dilution of one part of plasma in 20 or more parts of alcohol-ether extracted immediately and without heat all lipids capable of being extracted by this solvent under any conditions. It was decided to prove at the beginning of this study if the same proportions and procedures did or did not hold for rabbit plasma. Extracts were thus prepared

[5] Boyd, E. M., *J. Biol. Chem.*, 1936, **114**, 223.

[1] Boyd, E. M., *J. Biol. Chem.*, 1931, **91**, 1.

[2] Boyd, E. M., *J. Biol. Chem.*, 1933, **101**, 323.

[3] Boyd, E. M., *J. Biol. Chem.*, 1935, **110**, 61.

from the blood plasma of 8 rabbits (a) using Boyd's[5] cold extraction and a dilution of 1 in 25 or better and (b) by boiling such extracts for a period of 15 minutes, adding fresh solvent to replace that lost by evaporation on the steam bath. The phospholipid and free cholesterol of these extracts were determined. It was noted that there was as much or more of these lipids present in the unheated as in the heated extracts in practically all cases. In fact the results suggested that boiling may destroy some of the more delicate phospholipid and hence be undesirable. It may thus be concluded that cold extraction with sufficient dilution is superior to the use of heat in preparing extracts of rabbit plasma, confirming the studies of Boyd[5] on human plasma.

TABLE I.
A Comparison of Values for Plasma Phospholipid and Free Cholesterol with Body (Rectal) Temperature in Normal Young Rabbits.

No. of Animals	Rectal Temperature	Phospholipid (Mg. per 100 cc.) (Mean ± St. Dev.)	Free Cholesterol (Mg. per 100 cc.) (Mean ± St. Dev.)
5	100—100.9°F	60±11	15± 9
10	101—101.9	65±26	12±11
15	102—103	62±29	15±11

In Table I the concentration of plasma phospholipid and free cholesterol of the 30 normal young rabbits have been shown in relation to increasing rectal temperatures of the group. The percentage of plasma phospholipid in the animal with lowest body temperature was 55 mg. % and that in the animal with the highest body temperature was 47 mg. %. Corresponding values for plasma-free cholesterol were 10 and 14 mg. % respectively. These results typify what may be seen from an inspection of Table I, namely, that there was no inverse relationship between the concentration of these 2 plasma lipids and increasing body temperatures in this group of animals. When the results were plotted a similar lack of any relationship was seen.

The rectal temperatures of these animals were followed subsequently to the initial bleeding for a period of some 2 months. Variations were seen to occur in individual animals comparable to the variations in the group. About 6 weeks after the initial bleeding a second blood sample was taken and its plasma phospholipid and free cholesterol estimated and compared with the change in body temperature of each animal which had meanwhile taken place. This second set of analyses was done on 21 of the original 30 animals. In 13 out of 21 an increase in rectal temperature had occurred and in 8 a decrease or no change. In 15 of the 21 animals plasma phos-

pholipid fell in value and in 6 it rose. Plasma-free cholesterol had fallen in 10 and risen in 11 rabbits. A reciprocal change between body temperature and plasma phospholipid was noted in 12 of the 21 and no reciprocal change in 9. Plasma-free cholesterol varied inversely with the recorded change in temperature in 9 of the 21 animals and directly in 12. In other words, there was no consistent reciprocal relation between the concentration of plasma phospholipid and free cholesterol and changes in body temperature in these individual rabbits. These experiments demonstrate thus that there is no relation between variations in the normal body temperature of rabbits and the concentration of plasma phospholipid and free cholesterol. In conjunction with the previous work of Stoesser and McQuarrie[6, 9] they indicate that body temperature itself is not the factor responsible for the variations in blood lipids seen in the lipopenia of fever.

Summary. Plasma phospholipid and free cholesterol were estimated by oxidative micromethods in 30 normal young rabbits and their concentration found to bear no relation, individually or collectively, to variations in normal body temperature between 100 and 103°F.

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Effect of Amputation of Apical Portion of Uterine Horn Upon Labor.

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Visual inspection of the monkey uterus in labor indicates that the uterine contractions start in the region of insertion of the tubes and then spread over the body of the uterus.[1] One obtains the idea that the region of the tubes serves as a sort of "pace-maker" for the uterus. In the post-partum uterus of the dog many waves of contraction start at the apex of the horns. This suggests that in the dog as well as in the monkey the waves might originate preferentially in the region of the tubes. In the uterus of the pregnant dog the contractions appear to originate usually in the ampulla that is being

[1] Ivy, A. C., Hartman, C. G., and Koff, A., *Am. J. Obst. and Gynec.*, 1931, **22**, 388.