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Chylomicron Content and Total Lipids of Blood Plasma as Determined on Dogs.

EDITH H. MAC ARTHUR. (Introduced by P. A. Fish.)

From the Nutrition Laboratory, College of Home Economics, Cornell University.

The method described by Gage and Fish¹ of studying the visible lipemia of the blood by means of the dark-field microscope is simple and requires only 1 drop of blood and a few minutes to count the chylomicrons. By using a net micrometer in the eyepiece of the microscope and by counting very rapidly the chylomicrons in each small square, a fairly accurate count is made. An accuracy within the limits of experimental error in many physical measurements is obtained.

Since the chylomicrons have been shown to be dependent on the fatty portion of the diet, it was thought that the determination of the chylomicrons by the dark-field microscope might give a measure of the total amount of fat present. It was the purpose of the present investigation to find out if the chylomicrons measure the total amount of fat present or what the relationship may be between the fat in the blood determined by chemical means and the chylomicrons.

In the present study in which dogs were used, blood was taken from the heart, in order to obtain a 15 cc. sample.

The method of feeding used for previous determinations² was followed. The dogs were fasted overnight, about 20 hours. A 15 cc. sample of blood was taken from the heart, the chylomicrons counted in a sample of the blood and the remainder used for analysis³ to find the total lipids in the blood. The animals were then fed 40 gm. of butter and every 2 hrs, thereafter 15 cc. of blood were taken. It is the opinion of the writer that when more than 40 gm. of a fat are fed, it becomes too difficult to count the chylomicrons with any degree of accuracy.

Several mongrel dogs, weighing between 11 and 19 kg. were used. The history of the dogs, their age and diet previous to the time they came to laboratory are not known. But for at least one week before the experiment, they were fed on dog biscuit from the Kennel Food Supply Co., and water. A summary of the results for each hour the samples were taken is given in Table I.

¹ Gage, S. H., and Fish, P. A., *Am. J. Anat.*, 1924, **34**, 1.

² MacArthur, E. H., *J. Biol. Chem.*, 1930, **87**, 299.

³ Bloor, W. R., *J. Biol. Chem.*, 1928, **77**, 53.

TABLE I.
Average Data Obtained for Digestive Cycle of 4 Dogs Fed Butter.

Average Weight in kg.	Sample Taken	Blood		Coefficient Correlation
		Total Lipids mg. per 100 cc.	Chylomicrons	
13	Before feeding fat	741	54	0.46 ± 0.24
	2 hours after	778	67	
	4 " "	792	71	
	6 " "	665	70	
	8 " "	830	61	

In the morning before food is taken the chylomicron count is higher in the dogs used than with normal human beings. The total lipids in mg. per 100 cc. of plasma, however, differ little from results on fasting dogs of Terroine.⁴

A considerable variability among the dogs was found with not a high correlation between the chylomicron counts and the total lipids of the blood. Terroine⁴ also, reported great variation among dogs, due, as he believed, to the fat reserves of the different animals. But Bloor,⁵ by means of the nephelometric method, reported the percentage of fat in the blood to be fairly constant. He said also, that fasting may or may not produce an increase in blood fat depending apparently on the "nutritional condition of the animal." An animal which did not ordinarily show an increase of blood fat in fasting, he said, showed the usual curve of increase of blood fat in fasting, after being stuffed with fat food for a week before the fast. This would indicate that we might expect variations due to the fat reserves of the different animals, as Terroine showed.

Knudson and Grigg⁶ reported 2 experiments with dogs that were fed 70 cc. of olive oil. Chylomicron counts and the determination of total cholesterol and total fatty acids of the blood were made. Coefficients of correlation between the chylomicrons and the total lipids of each of their experiments were 0.36 ± 0.26 and 0.75 ± 0.13 , respectively. From these determinations they concluded that the fat in the blood is not all in chylomicron form.

Although the present investigation does not show whether or not the fat in the blood is all in chylomicron form, it would appear from the results that a greater relation exists between the total lipids in the blood and the chylomicrons than has been shown before.

⁴ Terroine, E., Theses, 1919.

⁵ Bloor, W. R., *J. Biol. Chem.*, 1914, **19**, 1.

⁶ Knudson, A., and Grigg, W. K., *Proc. Soc. Exp. Biol. and Med.*, 1923, **20**, 462.

A comparison of the fat in the blood found by the chylomicron count, using the dark-field microscope, with the fat found by chemical analysis was made, using dogs as the experimental animals. Under the conditions of the experiment there appears a correlation, although not high, between the chylomicron content of the blood and the total lipids of the blood found by chemical analysis.

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