Rosenfield *et al.* suggested that the inheritance of the f antigen could be explained by the postulation of a pair of allelic genes *Ff* closely linked to the pairs *Cc, Dd,* and *Ee.* Chromosomes known to confer the antigen f on the cells would therefore be *cdef* and *cDef*, while typical examples of chromosomes not associated with the presence of f would be *CDeF, cDEF, CdeF,* etc. Implications of this hypothesis are that there should exist an antigen F and a corresponding antibody anti-F; also it would be expected that chromosomes such as *cdeF* and *CDef* would exist. The

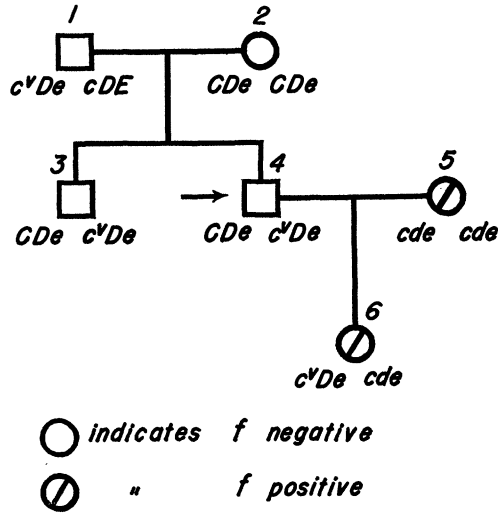

FIG. 1.

finding of *cde* chromosomes which were not associated with the antigen f supports in some measure the fourth locus hypothesis, these chromosomes presumably being *cdeF*. The failure to find chromosomes such as *CDef* and *cDEf* does not detract at this stage from the hypothesis, since it can be presumed that these chromosomes are rare.

The present authors suggested that another possible explanation of the data "would consider the f antigen to be the result of a 'position effect.' This hypothesis would state that when the genes *c* and *e* are together on the same chromosome the antigen f is present in the red cells" (*2*). It was further postulated that the "exceptions," that is, instances in which *c* and *e* are apparently on the same chromosome and the antigen f is absent, are due to the presence of alleles of *c* or *e* which fail to interact to produce f. The "position effect" hypothesis suffers the defect that it can be proven only if a crossover occurs in which the genes *c* and *e* are separated and at the same time the f antigen is lost. Such a crossover would simultaneously prove the truth of the Fisher-Race hypothesis of the inheritance of Rh antigens. The discovery of an anti-F serum would immediately invalidate the "position effect" hypothesis, as would the discovery of the f antigen in the absence of the genes *c* or *e*.

The family reported in this study is an example of a situation predicted by the "position effect" theory. In this family there are three individuals (the propositus, his father, and his brother) who are f negative and who possess the chromosome c^vDe. The daughter of the propositus who is f positive also possesses the chromosome c^vDe, but it is apparent that her f antigen is derived from the *cde* chromosome which she inherited from her mother.

The data provided by the analysis of the bloods of this family lend support to the "position effect" hypothesis, although they do not contradict the postulation of a fourth locus in the Rh complex; nor, for those who favor it, do they invalidate an extension of the multiple allele hypothesis.

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Fatty Acid Absorption and Chylomicrons

H. Singer, J. Sporn, and H. Necheles[1]

Department of Gastro-Intestinal Research, Medical Research Institute of Michael Reese Hospital, Chicago, Illinois

The absorption pathway of long-chain fatty acids is still controversial. Frazer (*1, 2*), working with rats, found that ingested oleic acid did not give rise to chylomicronemia and, therefore, reasoned that the absorption pathway of the fatty acid was through the portal system. However, Bergstrom *et al.* (*3*), Bloom *et al.* (*4*), Reisner (*5*), and Tidwell (*6*), have been unable to confirm this view.

Our attention was drawn to this controversy because of our interest in the effect of bile salt on lipid absorption. In a previous communication (*7*), it was shown that a neutral fat would give rise to chylomicronemia when absorbed from a Thiry fistula that contained no bile or pancreatic secretion, implying that neither was necessary for particulate fat absorption. If it could be shown that a fatty acid does give rise to chylomicronemia when placed into a Thiry fistula, a similar interpretation as with the neutral fat experiments could be made.

To study oleic acid absorption, 3 different types of experiments on dogs were designed. In the first, the fatty acid was ingested by the animals; in the second, the acid was placed into a jejunal Thiry fistula; and in the last, the fatty acids with a bile salt were put into a Thiry fistula.

The 3 Thiry jejunal fistula dogs were the same animals studied previously (*7*). In all experiments, 10 ml of c.p. oleic acid was used, as this amount of neutral fat has been shown to give rise to a significant chylo-

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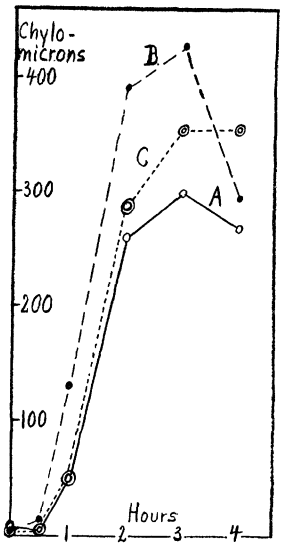

FIG. 1. Oleic acid absorption from Thiry loops in dogs. Curve A, 10 ml of oleic acid in Thiry loop; curve B, 10 ml of oleic acid + 1 g sodium taurocholate in Thiry loop; and curve C, 10 ml of oleic acid by mouth.

micronemia (*7*). The bile salt used was sodium taurocholate, 1 g was mixed with the oleic acid before being placed into the fistula.

Because of its insolubility, only 3–5 g of sodium oleate could be placed into a Thiry fistula, a quantity that would not give rise to chylomicronemia.

All chylomicron counts were made by one observer, as previously described (*7*). The counting error was 20%. Absorption of the fatty acid introduced into the Thiry fistula was confirmed also by observations on its disappearance from the Thiry loop.

The results of each group of experiments were averaged, and from these averages the curves in Fig. 1 were constructed. Table 1 gives the numerical averages and their spreads.

Curve A, Fig. 1, shows that oleic acid gave rise to chylomicronemia starting 1 hr after the fat was placed into the loop and continuing for 4 hr. Curve C shows that absorption of oleic acid given by mouth and consequent chylomicronemia occurred, and that they were of somewhat greater magnitude than when the fat was placed into a Thiry fistula. The addition of bile salt (Curve B) gave rise to greater degree of chylomicronemia, especially when compared to absorption of oleic acid from a Thiry fistula in the absence of bile.

The demonstration that oleic acid gives rise to chylomicronemia when given by mouth or when placed into a Thiry fistula implies that a long-chain fatty acid or its products can and do use the lymphatic pathway. Because it was possible to show that systemic chylomicronemia will result from fatty acid absorption, the role of bile salt in fatty acid absorption could be studied.

Riegel *et al.* (*8*), who investigated this problem with Thiry fistulae, concluded that oleic acid will not be absorbed in the absence of bile. Virtue *et al.* (*9*) disagreed and stated that if the salt of the fatty acid was used, absorption could be demonstrated. Our work, using a different approach, indicates that oleic acid can be absorbed easily in the absence of bile. The fact that the degree of chylomicronemia was greater in the presence of bile may mean that bile enhanced absorption.

The demonstration that oleic acid gives rise to chylomicronemia implies that its absorption pathway from the intestinal tract is through the lymphatics. Bile salt is not necessary for long-chain fatty acid absorption, but it may enhance it.

TABLE 1

ABSORPTION OF OLEIC ACID AND CHYLOMICRONEMIA

Substance and procedure		Hours after administration and chylomicron counts					
		0	½	1	2	3	4
A. Oleic acid in Thiry fistula; 10 expts.	Average	9	6	51	261	298	267
	Range	1–28	1–23	1–234	1–400	8–600	96–600
B. Oleic acid and bile salt in Thiry fistula; 9 expts.	Average	7	14	131	392	428	295
	Range	1–13	1–75	1–350	200–750	200–650	29–750
C. Oleic acid/os; 10 expts.	Average	7	7	53	238	356	356
	Range	0–34	0–24	2–159	24–500	42–850	12–850

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