bonds took place before absorption and resynthesis of triglycerides in the small intestinal mucosa. If his basic assumption is correct, it is clear that the only possibility for formation of a disaturated glyceride labelled in the glycerol part was through hydrolysis to the monoglyceride stage, followed by re-esterification in the mucosa with two saturated fatty acids.

If however exchanges and/or resyntheses of glyceride ester bonds took place in the lumen, it is equally clear that the type of glyceride isolated by Reiser could have been formed in the lumen prior to absorption. A study of the composition of the lymph glycerides could not be expected to give any definite clue to the species of glyceride absorbed. The validity of this reasoning is acknowledged in Reiser's last paper (1). However he has presented there a recalculation of our data in an attempt to show that the magnitude of fatty acid exchanges is too small to be of any importance in calculations of the type made by him. He has cited one of our experiments (4), in which rats were fed olive oil containing 0.17% of labelled free palmitic acid. The animals were killed after 1 to 3 hrs., and the distribution of the labelled acid between the different glyceride fractions recovered from the intestinal contents was defined.

It was found that the specific activity of the recovered triglyceride fatty acids was about 20% of the specific activity of the total random mixture of fatty acids in the test meal. This result has been interpreted by Reiser (1) to show that resynthesized and exchanged fatty acid esters constitute at the most 0.1% of the intraluminary fat. He has arrived at this figure in the following way. Since only 1.7 mg. of labelled acid was fed in 1,000 mg. of triglyceride, this at the most could be incorporated into 5.7 mg. of triglyceride (one molecule of fatty acid per molecule of triglyceride). As the incorporation into the triglyceride fraction was stated to be about 20%, only 1.1 mg., or 0.11%, of the total fat could have been derived from acids recombined in the gut lumen.

HIS CALCULATIONS are based on the false assumption that it was only the small amounts of labelled acid present in the fed mixture that was exchangeable. On the contrary, the labelled free palmitic acid was rapidly diluted by acids liberated from the glycerides during digestion. The mean percentage of free fatty acids in the lipides recovered from the lumen in the same experiment was 21.9%, and the average dilution of the labelled free acid calculated from specific activities was 450-fold. According to the basic assumption in metabolic isotope work, the enzymes catalyzing fatty-acid, exchange reactions in the gut lumen are incapable of distinguishing labelled acids in the fed mixture from the unlabelled acids released by hydrolysis from the glycerides. Thus our finding that the labelling of the triglyceride fatty acids was 20% of the theoretical maximum limit indicated that 20% of the ester bonds of the triglycerides were formed by exchange or resynthesis during digestion.

Moreover the assumption made by Reiser that "at higher proportions of free acids the percentage incorporation should be expected to be even less" also is mistaken. Result obtained in similar experiments in human subjects (6) showed that 21 to 52% of the maximal theoretical exchange had occurred after feeding fat containing about 6% labelled free acids.

Thus it can be concluded that about one fatty acid in each triglyceride molecule found in the intestinal lumen is enzymatically exchanged with fatty acids liberated from other glycerides by the hydrolytic action of pancreatic lipase. The recognition of these intralumen interchanges prior to absorption is basic to proper interpretation of Reiser's own experiments. His hypothesis that monoglycerides are the main species of glyceride passing through the intestinal mucosa is founded upon reasoning which neglects these facts.

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Letter to the Editor

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I appreciate the opportunity of answering Borgström's comments. He is certainly correct in his statement that enzymes do not distinguish between labelled and unlabelled fatty acids, at least to a degree significant in this type of study. However this fact is irrelevant to the argument. What Dr. Borgström ignores is the dynamic and changing situation in the intestine.

At the beginning of the digestive period very active, undiluted free fatty acid is incorporated into the triglycerides. In the study cited the transfer of only 0.34 mg. of the active, free fatty acid into the inactive triglyceride at this stage would give Borgström his 20% incorporation; yet only 0.034% rather than 20% of the total ester groups would have been exchanged.

As digestion proceeds, the highly active, free fatty acids become diluted with inactive fatty acids so that their incorporation will change the activity of the triglyceride at a rapidly decreasing rate. It thus follows that under these conditions the activity in the triglycerides is not a measure of the degree of ester exchange. Since this is Borgström's assumption, his conclusions are correspondingly faulty as are criticisms of our work he bases on them. It is obvious that his experiments cannot measure the degree of ester exchange in the lumen.

We are currently engaged in a study with a different approach, which we hope will give a more unequivocal answer to this problem. In the meantime it appears most unreasonable, if only from a consideration of the relative rates of hydrolysis and resynthesis of triglycerides by lipase in an aqueous medium and the rapid rate of absorption of the products of fat digestion, that significant amounts of ester exchange can take place during digestion.

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