pensions of collodion particles sensitized with histoplasmin for the determination of antibodies against histoplasmin is described. The sensitized suspensions uniformly showed the presence of antibodies against histoplasmin in rabbits which had been immunized with 3 different strains of *H. capsulatum*. Antisera against *B. dermatitidis* reacted in low dilution, while that of *B. braziliensis, S. schenckii, C. neoformans* and *C. albicans* as well as normal rabbit sera failed to agglutinate the histoplasmin-coated particles. These results suggest the use of this technic with human sera. The findings of such studies are now being analyzed in this laboratory.

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Intestinal Absorption of Vitamin A from Aqueous and Oily Menstruum.*

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Oral intake of vitamin A in aqueous dispersions produces a significantly higher rise of the blood vitamin A level than in oily menstruum.[1,2,3] This was considered evidence of improved intestinal absorption, especially since after intake of the aqueous preparation, the fecal excretion of vitamin A appeared reduced[2] and the storage in the liver increased.[2,4] The use of aqueous preparations appeared especially superior in improving the response to vitamin A in patients with liver[5] or celiac[6] disease. This suggested the direct observations of the intestinal absorption of vitamin A in aqueous and oily solution in rats by fluorescence microscopy.[7]

Material and Method. Thirty-three albino rats, all weighing between 140 and 170 g and previously on a stock diet, were sacrificed at different intervals following feeding of various doses of vitamin A as unsaponifiable fraction of fish liver oil in corn oil, or dispersed in water with a sorbitan monolaurate derivative. Both preparations† contained 25,000 U.S.P. units of vitamin A per cc and were made from the same vitamin A concentrate. Pieces of duodenum, upper jejunum, lower jejunum and ileum were fixed in 10% formalin. Frozen sections were prepared and studied microscopically for vitamin A fluorescence.[8] Total amount of vitamin A fluorescence and its site were recorded. Vitamin A fluorescence is seen in the intestinal wall of the rat only after feeding high doses of vitamin A.[7]

Results. Independent of variations of the amount of vitamin A fed and of the time interval between administration and sacrifice (Table I), the amount of vitamin A in the intestinal wall was larger after an equal dose of vitamin A in aqueous than in oily menstruum. The difference was especially evident with reduction of the amount of vita-

* Supported by a grant from Endo Products, Inc., Richmond Hill, N. Y.

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TABLE I.
Distribution of Vitamin A in Intestinal Wall of Rats Killed at Different Intervals After Feeding of Various Amounts of Vitamin A in Oily and Aqueous Menstruum.

Rats examined	Units of vitamin A given, × 1000	Time before rats were killed, hr	Site of fluorescence peak in jejunum		Amt of fluorescence at peak	
			Oily*	Aqueous*	Oily*	Aqueous*
6	5	1	U† or L†	U	± to +	++-+++
2	15	1	L	—	+++	—
8	25	1	L	U	+++	++++
4	25	24	L	U	+	++-+++
4	25	48	L	U	0-±	++
5	25	72	L	U	0-±	++
2	75	1	U	—	++++	—
1	75	48	L	—	++	—
1	75	72	U and L	—	++	—

* Menstruum. † L—lower; U—upper.

min A fed or extension of the time interval. In such instances, hardly anything was seen after administration of the oily solution, whereas, the animals fed the aqueous dispersion still revealed significant amounts. One hour after administration of 25,000 units of vitamin A the peak of absorption occurred usually higher in the upper jejunum with the aqueous preparation while the lower jejunum showed the most after feeding vitamin A in oil;[7] vitamin A fluorescence was found after feeding the aqueous preparation in the lacteals and histiocytes of the villi at all examined levels, whereas, it was found only in the villi of the jejunum after the same amount in oil. In the lacteals of muscularis and subserosa it was found only in the jejunum, however, in much higher degree after administration of the aqueous dispersion. Three days after feeding of 25,000 units of vitamin A in aqueous preparation, considerable vitamin A fluorescence was encountered in the lamina propria of the villi and the lacteals of muscularis and subserosa, whereas the epithelial lining was free of it. Administration of the same amount of vitamin A in oil failed to produce significant fluorescence in the same time interval, whereas, 75,000 units in oil produced a similar picture as 25,000 units in aqueous emulsion. In general, the administration of vitamin A in oil produced approximately the same picture as feeding in aqueous dispersion if a triple amount in oil was given. No difference was found in location and degree of the vitamin A fluorescence of the intestinal content which decreased rapidly from the jejunum downward.

Discussion. Direct observation confirmed the indirect evidence obtained by the tolerance curve that vitamin A is absorbed in increased amounts if fed in aqueous instead of in oily menstruum. Rough estimation suggests that three times as much vitamin A is absorbed if given dispersed in water in agreement with findings on liver storage tests.[4] The peak of the absorption occurs in higher parts of the jejunum and vitamin A migrates quicker through the intestinal wall and is retained longer if given in aqueous dispersion. However, these differences seem to be only expressions of larger amounts of vitamin A in the intestinal wall since tripling the dose of the oily solution produces the identical histologic picture. No evidence was seen that vitamin A is absorbed or transported in a qualitatively different manner if given in water. Absorption of vitamin A through blood vessels is not visible as could have been expected after the studies of Frazer[9] and be explained by increased lipolysis. Fine particulate state of vitamin A, therefore, hastens its passage through the epithelium of the intestinal villi, but does not change the mode of its absorption within the villi. This supports the opinion that the faulty absorption of vitamin A in oil, which is found in hepatic or celiac disease, is due to a defect in emulsification and not in lipolysis.

The delayed disappearance of vitamin A after administration of large amounts indi-

cates that vitamin A is temporarily stored in the lamina propria of the villi. This lag in release after excessive absorption requires further explanation.

The increased absorption of vitamin A in aqueous dispersion is of practical significance because of sparing of vitamin A, the correction of absorption difficulties[4,5] and the increased speed of absorption. The latter was claimed to be of importance in the treatment of infants with tendency to vomiting.[1]

Summary. Observation of the vitamin A fluorescence in the intestine of rats showed that greater amounts of vitamin A—approximately three times as much—were absorbed if the latter was administered in an aqueous instead of an oily menstruum. In addition vitamin A in water penetrated the intestinal wall faster, the peak of absorption occurred at a higher level of the intestine and vitamin A remained longer in the villi. These differences were explained by passage of increased amounts of vitamin A through the epithelium if given in aqueous dispersion and not by a different physical state of vitamin A after passage.

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Amino Acid Imbalance of Zein: Relation to Nicotinic Acid Deficiency in the Chick.*

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Krehl *et al.*[1] were the first to show that a nicotinic acid deficiency could be induced in the rat by feeding corn as a part of a low-protein diet. Subsequently[2] it was observed that *l*-tryptophane as well as nicotinic acid was effective in counteracting the growth depression in rats caused by the feeding of corn. The activity of tryptophane in this connection indicates that it is an important precursor of nicotinic acid.[3,4,5] Tryptophane-low proteins such as gelatin, zein and acid-hydrolyzed casein have been shown to behave similarly to corn.[6,7] That the action of these proteins may be due to amino acid imbalances has been suggested in work with the rat[8,9] and the chick.[10,11] The subject

* Scientific Paper No. A201. Contribution No. 2117 of the Maryland Agricultural Experiment Station (Department of Poultry Husbandry).

A preliminary report of part of this work was published in *Fed. Proc.*, 1947, **6**, 257.

We are indebted to Merck & Co., Inc., Rahway, N. J., for crystalline vitamins; Wilson & Co., Inc., Chicago, Ill., for 2X gelatin; Allied Mills, Inc., Portsmouth, Va., for soybean oil; Abbott Laboratories, North Chicago, Ill., for Haliver oil; U. S. Industrial Chemicals, Inc., Baltimore, Md., for DL-methionine; and to Lederle Laboratories, Pearl River, New York, for pteroylglutamic acid.

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