plasia of refractory ovaries or a dormant uterus, the clinician must decide to what degree the patient is benefited whose amenorrhea is cured only to the extent of bleeding without a real awakening of the reproductive tract.

8. Upon these and similar facts a new theory of menstruation must be built. The sequence of events that occur in the ovulatory menstrual cycle, as determined by long and painstaking labor on the part of gynecologists during the last 100 years, will find a new explanation in the experiments here reviewed and menstruation will be placed upon an experimental footing.

5221

The Influence of Iodide of Iron on Rats Receiving a Vitamin A-Free Diet.

F. E. CHIDESTER, A. G. EATON AND N. K. SPEICHER.

From the Department of Zoology, West Virginia University.

In 1925, the senior author, who had been keenly interested in the endocrine glands since 1912, was struck by the fact that several medical writers had shown that thyroid extract was beneficial in cataract and certain other eye diseases involving keratization. Accordingly, he began experimenting with rats depleted of Vitamin A, using various iodin compounds.

Among the interesting discoveries was the fact that on a normal diet tiny quantities of iodin would induce greater growth. Subsequent studies carried on with various associates seemed to indicate quite definitely that xerophthalmia and other symptoms of Vitamin A deficiency would yield to iodin treatment, and the most effective combination proved to be with extremely small doses of ferrous iodide.[1]

Our studies of the efficiency of ferrous iodide have been carried on during 1929 and 1930, and we are convinced that the action of iodin is largely responsible for the prevention and cure of xerophthalmia, in our rats. But as the present findings indicate, the iodin-iron combination which is so effective in curing the major symptoms of Vitamin A deficiency, cannot replace the growth factor, since the iodin introduced is not balanced by unsaturated fatty acids such as are also present in cod liver oil.

[1] Chidester, F. E., Eaton, A. G., and Thompson, G. P., *Science*, 1928, **68**, 432.

Thirty-six young rats, 30 days of age, and averaging about 35 gm. in weight, were placed on a diet deficient in Vitamin A and low in Vitamin D (Sherman No. 380), on January 24, 1930. Individual round (Sherman) cages were used, and distilled water was constantly before the animals. Weights were taken twice each week.

After xerophthalmia and constant or reduced weight had indicated depletion, the animals were divided into 6 lots, with split litters and corresponding weights, and all but the 2 sets of controls were furnished 1/100 mgm. of irradiated ergosterol daily, beginning April 4. The effects of the added Vitamin D lasted until about April 10, and on April 16 lots 1 and 2 received 5 drops of FeI_2, and lots 3 and 4 received 3 drops of FeI_2 in concentrations such that 5 drops daily furnished 0.0005 grain of I_2, and 0.000165 grain of Fe; while the 3-drop dosage furnished 0.0003 grain of I_2, and 0.000099 grain of Fe.

In lots 1 and 3 the animals were also irradiated for 30 seconds 6 days a week, beginning April 28.

Results. Lot 1 showed improved condition and increased growth from April 16 to 22, and accelerated growth from April 28 to May 6, but were evidently receiving too much iron and particularly too much *iodin,* for their depleted condition. Irradiation effect was marked.

Lot 2 showed stimulation with the FeI_2 and improved rapidly from April 28 for 2 weeks, but apparently needed additional irradiation stimulus to release stored foods.

Lot 3 furnished irradiated ergosterol on April 4, received 3 drops of FeI_2, and were themselves irradiated from April 28. They showed that dosage and irradiation were almost the optimum and on May 13 had reached the average weight of 125 gm., in comparison with the 118 grams of the controls. On June 3, 131 days after they were started on the experiment, 3 of the original animals were still alive, with an average weight of 136 gm., while the controls had reached the weight of 135 gm.

On July 1, two survivors of this lot still averaged 125 gm. in weight and exhibited no signs of xerophthalmia. The iodin effect was exercised in the absence of added fats, however, and growth was not resumed. Since the experiment had begun 158 days previously, and the iodide of iron had been furnished for 76 days, it seems evident that despite the absence of adequate fat, the iodin-iron combination was beneficial. Growth resumption could not be expected, however, since the iodin administered would tend to require unsaturated fats.

Lot 4 received ergosterol on April 4 and FeI_2 on April 16, exhibiting remarkable weight increase from the iodide of iron, and rising from an average of 62 gm. on April 16 to the high point of 85 gm. on May 2, but rapidly dying off. Apparently irradiation of the animals in lots 1 and 3 had a beneficial effect in aiding in the catalysis initiated by the iron-iodin. It is well known that the catalytic effect of ferrous iron is produced when it is oxidized to a ferric salt. Ferrous salts are not readily oxidized by iodin, but the digestive chlorine readily furnishes the oxidizer.

Lot 5 were controls receiving Sherman No. 380 and distilled water, and all of them died in April. In another paper, we shall show the probable effect had they also received ergosterol.

Lot 6 were controls receiving the deficiency diet until April 17 when they were also given 1 drop of Patch's Cod Liver Oil daily. The Cod Liver Oil group were completely protected against symptoms of Vitamin A deficiency, and grew steadily. It was not until June 6, however, that they began to show slight superiority (7 gm. average) to the animals in Lot 1, receiving ergosterol and ferrous iodide, with supplemental irradiation.

5222

The Nature and Importance of Surface Films on Chylomicrons.

S. DEW. LUDLUM, A. E. TAFT AND R. L. NUGENT.
(Introduced by Stuart Mudd.)

From the Gladwyne Research Laboratory, Gladwyne, Pa., and the Department of Industrial Research, University of Pennsylvania.

It is generally recognized that blood transports free fat as an emulsion of minute droplets.[1, 2] Gage and Fish[1] in their classical study of the digestion, absorption and assimilation of fat, call these droplets chylomicrons, because they enter the blood with the chyle, the milky fluid containing absorbed food from the intestine which pours directly into the blood stream.

Blood serum containing chylomicrons forms an oil-in-water emulsion system[3] which may be called the chylomicron emulsion. Oil-in-

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

2 Bloor, W. R., *Physiol. Rev.*, 1922, **2**, 92.

3 Ludlum. S. DeW., Taft, A. E., and Nugent, R. L., *Colloid Symposium Annual*, 1929, **7**, 233.