

4428

The Action of Volatile Fatty Acids on the Gastric Motor Mechanism in Dogs.

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A fat splitting enzyme lipase has been demonstrated in the normal gastric secretion. Mathews¹ states that the digestion of emulsified stomach fats occurs to the extent of about 50 to 80% of the available total. Starling² showed that a considerable amount of fat is broken down in the stomach following a fatty meal. Evidence of fat hydrolysis was the presence in the stomach contents of a large proportion of free fatty acids. Edelstein and Czonka³ found some volatile fatty acids present, including butyric, caproic, caprylic and acetic acids in infants' stomachs.

Bahrdt and Bamberg⁴ found that small amounts of lower volatile fatty acids, given by mouth produced increased peristalsis in the stomach as seen by fluoroscopic examination. The effect on the small intestines as reported by Bokai⁵ was to increase peristalsis. Catel and Graevenitz⁶ found the action of butyric acid on intestinal motility variable. In low concentrations it was sometimes stimulating, at other times inhibitory. In higher concentrations it was always inhibitory. Babkin⁷ reported that fatty acids were stimulating in some portions of the intestines and inhibitory in other parts.

Carlson⁸ reported the effects on gastric motility of various acids introduced into the stomach of dogs and man, but did not use the volatile fatty acids.

This work was undertaken to determine the effects of butyric, caproic, caprylic and caprinic acids on the tonus and motility of the gastric motor mechanism in dogs.

The experiments were carried out on young, healthy, female dogs having a gastric fistula. Four different dogs were used and more

¹ Mathews, Albert P., *Physiol. Chem.*, 1916, 2nd ed., 350.

² Starling, M. D., *Guy's Hospital Reports*, 1910, 165.

³ Edelstein, F., und v. Czonka, F., *Z. f. Kinderh.*, 1912, iii, 312.

⁴ Bahrdt and Bamberg, Karl, *Z. f. Kinderh.*, 1912, iii, 322.

⁵ Bokai, *Arch. f. Exp. Path. u. Pharmak.*, 1888, xxiv, 153.

⁶ Catel, W., und Graevenitz, F., *Jahrb. f. Kinderh.*, 1925, cix, 249.

⁷ Babkin, B. P., *Canad. Med. Assn. J.*, 1928, xviii, 267.

⁸ Carlson, A. J., "Control of Hunger in Health and Disease," Chicago Univ. Press. 1916.

than a hundred observations made. Changes in motility and tonus were recorded by means of an intragastric balloon connected to a manometer recording on a kymograph. Various concentrations of butyric, caproic, caprylic, and caprinic acids were used. Solutions of .01% to 5% concentrations were tested. 5 cc. of the acid dilutions were placed inside the stomach by means of a glass pipette introduced through the fistulae. Observations were made on both the quiescent and the active stomach.

Following the introduction into the quiescent stomach of solutions of butyric acid, from .01% to 0.4%, no effect on the gastric tonus or tonus rhythm was noted. With concentrations of 0.5% there was an immediate fall in gastric tonus with little or no inhibition of the tonus rhythm. With higher concentrations of butyric acid, up to 5%, a constant fall in tonus with a variable inhibition of tonus rhythm occurred. Following the initial sharp fall in tonus and inhibition of tonus rhythm, there was a slow rise of tonus and a gradual return of rhythm to the level and amplitude present at the onset of the experiment. The fall in tonus was from 1 to 2 cm.; while the duration of inhibition was from 1 to 15 minutes.

In the fasting stomach, during periods of activity, the introduction of 5 cc. amounts of dilute butyric acid had no effect. With 0.5% concentration there was a quick fall in tonus with incomplete inhibition of the gastric hunger contractions. With higher concentrations of the acid, up to 5%, the fall in tonus was constant, while inhibition of hunger contractions became stronger until complete inhibition of the hunger waves occurred. The fall in tonus was from 1 to 4 cm., with recovery in 1 to 5 minutes.

The duration of the inhibitory action on the hunger contractions was from 2 minutes to an hour or more. Recovery of activity after total inhibition occurred in the following sequence: First, recovery of tonus to its primary level. Next return of tonus rhythm, then the return of hunger contractions of increasing amplitude. Caproic acid was less markedly active in inhibitory effect than butyric. In concentration of 4%, however, it usually produced complete inhibition. Caprylic acid was comparable to caproic acid in its effect. Caprinic acid was the least active of the group tested. In concentrations of from 3 to 5%, however, it was also inhibitory.