the lower bowel that the balance is swung one way or the other depending primarily on the ability of the tissues to utilize these elements.

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Botulinum toxin in the alimentary tract.

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The great variation in the susceptibility of different animal species to oral injections of botulinum toxin may conceivably be due either (1) to the destruction or adsorption of the toxin by the intestinal contents, or (2) to the difference in permeability of the intestine to the toxin. Type A botulinum toxin was used in these experiments.

There was no evidence that botulinum toxin was adsorbed by the intestinal contents of guinea pigs *in vitro,* even where the pH was shifted with M/3000 HCl or Na_2HPO_4.

A loop of small intestine in each of six rabbits was injected with botulinum toxin and perfused with blood from the same animal for intervals varying from 30 minutes to 2 hours and 20 minutes. Very small quantities of toxin were demonstrated in the perfused blood, often only sufficient to produce symptoms of botulism in mice receiving 0.5 cc. quantities. No toxin was ever demonstrated in 0.1 cc.

In each of two hogs a loop or small intestine was perfused in a similar manner. In one case a very small amount of toxin was found in the blood, a mouse receiving 0.5 cc. of serum taken after an hour and a half of perfusion died in 4 days. In the other case toxin was not demonstrated. The toxin introduced into the ligated loop of intestine showed little if any decrease in potency during the course of the perfusion experiments.

Hogs were found to be very resistant to large oral doses of toxin; in some cases as much as ten million M. L. D.'s for mice were fed without producing any ill effects. Toxin was not demon-

strated in one cc. of blood taken after 90 minutes from a hog which had been fed nine million (mouse) M. L. D.'s.

Toxin was not demonstrated in the blood of rabbits 90 minutes after feeding botulinum toxin. Two rabbits received intravenous injections of small graded doses of toxin. Toxin was demonstrated in the blood stream 18 hours later.

Two rabbits receiving large doses of toxin in the small intestine showed symptoms of botulism within seven days. One died on the seventh day and the other on the fourteenth day. Toxin was not demonstrated in a half cc. of blood taken from each of these animals after 90 minutes or in one cc. taken after 18 hours.

Two rabbits received intracecal injections of toxin. One of the rabbits remained normal. The other died the following day and toxin was found in the blood.

Toxin could not be demonstrated after 90 minutes in the blood of guinea pigs which had received injections of toxin in the ligated stomach but was demonstrated in the serum from the heart blood taken after death. Toxin was not demonstrated in the blood of animals receiving injections of toxin in the ligated small intestines or ligated cecum, either after 90 minutes or in the serum from the heart blood taken after death. There was one exception in a guinea pig which had received an intracecal injection, the cecum of this animal being ruptured.

Two guinea pigs were given intracecal injections of toxin; one died seventeen days later with typical symptoms of botulism; the other remained normal.

Mice fed botulinum toxin failed to develop any symptoms of botulism. Toxin was demonstrated in the stomach and small intestines of mice 3 hours after they had been fed toxin but not 12 hours later.

When susceptible animals are fed toxin the evidence from these experiments indicates (1) that there is some absorption from the small intestine and (2) that there may be some continued absorption from the cecum. Further studies are being made on the absorption of toxin from the cecum.