

(10) Preliminary observations on twenty Mann-Williamson dogs indicate that: (a) Urine from normal individuals contains a "protective factor" against Mann-Williamson ulcers. (b) This "protective factor" is definitely absent from the urine of patients having peptic ulcer.

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Pectin as a Prophylactic and Curative Agent for Peptic Ulcers Produced Experimentally With Cinchophen

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IT has been well established that the administration of cinchophen to dogs will produce chronic peptic ulcers (1, 2, 3, 4 and 5). Pathologically such ulcers have been found to be identical with the peptic ulcers seen in man and are similar in progression and healing. In work on the prophylactic treatment of such experimentally produced ulcers, Reid and Ivy (2) found that gastric mucin was markedly effective in preventing the gastroduodenal ulcers and "acute" toxicity of the cinchophen in dogs. Stalker et al (3, 4 and 5) reported some benefit from the use of the diet of milk alone, from duodenal extract and from mucin. The mucin appeared definitely beneficial in some cases, while in other cases so treated, ulcers developed in spite of its administration. It was noted that chronic ulcers were not produced when a diet of alkali and milk was used.

We have been impressed by the excellent results obtained from the use of a pectin-agar combination in the treatment of various types of digestive disturbances in children (6) and from the use of pectin on wounds.† Since pectin and mucin have a chemical similarity in that both contain uronic acid and are similar in physical properties, it was theorized that pectin might have an effect corresponding to that

of mucin upon such experimentally produced peptic ulcers.

PROCEDURE

In general our procedure followed that of Reid and Ivy (2). Thirteen healthy dogs were used. Both cinchophen and pectin were given to the 9 dogs in the experimental group, while the 4 control dogs received only the cinchophen. The cinchophen was made into a starch paste (20 gm. cinchophen, 40 gm. starch and 2000 cc. water) and given in a dose of 100 mg. per kilo to each dog daily. The dogs in the experimental group were given 180 cc. of 3% pectin‡ (200 grade) solution one hour before the cinchophen and a second administration of 180 cc. of the 3% solution 4 or 5 hours later. The solutions were all given by stomach tube and the regular stock diet of Purina dog checkers, baker's bread and fresh meat was fed to all of the dogs. The administrations of cinchophen and pectin were continued in the experimental group until the dogs were sacrificed on the 62nd, 64th and 96th days. In the control group one dog was sacrificed on the 36th day and exploratory gastrotomies were performed on the other 3 on the 46th, 50th and 54th days. In these latter animals ulcers were demonstrated, then photographed and the incisions closed. All surgical procedures were performed aseptically under sodium amytal anesthesia. Following the finding of the ulcers the cinchophen was continued uninterrupted during the postoperative period and in addition, pectin was

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given as in the experimental group. One of these dogs died on the fourth postoperative day and the other 2 were sacrificed on the 21st and 25th postoperative days. At the end of the experiment all the animals were killed with chloroform. The gastro-intestinal

tracts of all animals were examined completely. Photographs of the stomachs and any suspicious areas of the stomachs and intestines were taken. Sections of these areas along with portions of the liver, kidney and adrenal gland were removed from each dog for



Fig. 1a. Lesion in stomach of control Dog 10 found during exploratory gastrotomy. Dog had received 100 mg. cinchophen per kilo 50 days.

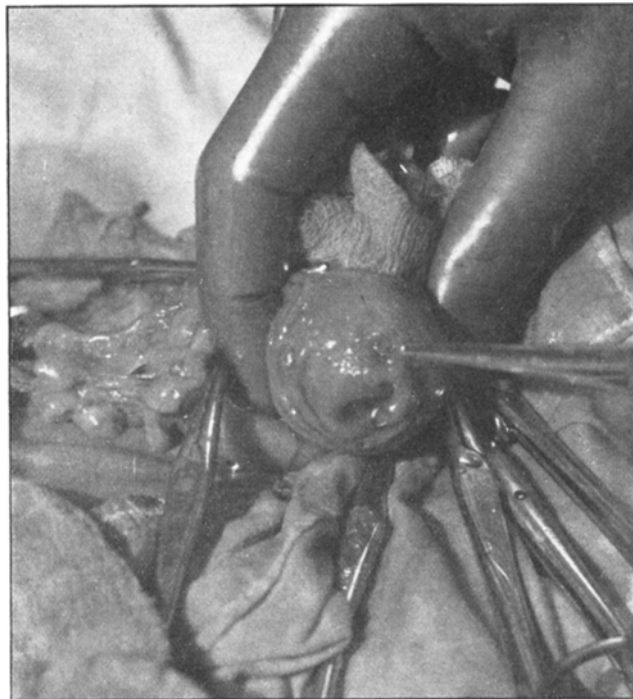


Fig. 2a. Lesion in stomach of control Dog 11 found during exploratory gastrotomy. Dog had received 100 mg. cinchophen per kilo 54 days.

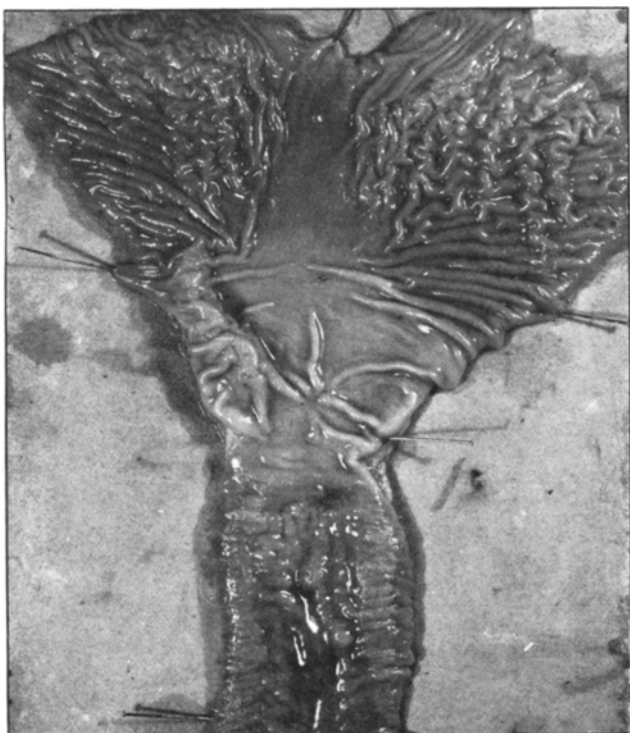


Fig. 1b. Normal appearing stomach of same dog after 25 days of cinchophen and pectin treatment.

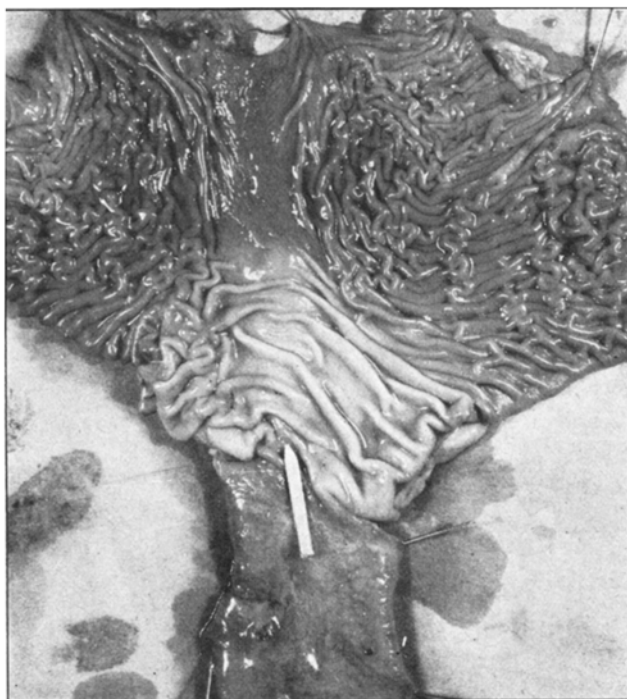


Fig. 2b. Same dog after 21 days of cinchophen and pectin treatment. Ulcer completely healed.

TABLE I
Dogs received 100 mg. cinchophen per kilo daily

Dog No.	Experimental Days	Gain or Loss in Pounds	Ulcer	Autopsy Findings and Comments
10	50	4.5	+	Exploratory gastrotomy revealed several ulcerated areas in the pyloric region of the stomach. Dog was then given both the cinchophen and 360 cc. of 3% pectin solution daily for 25 days. When sacrificed the areas appeared healed.
11	54	-3.0	+	Ulcerations found in pyloric region during exploratory gastrotomy. Dog then given both cinchophen and pectin for 21 days. When sacrificed the areas appeared healed.
13	46	-0.5	+	Large ulcer found in pyloric region during exploratory gastrotomy. Dog died 4 days later.
14	36	3.0	+	Sacrificed—several small acute ulcers in pyloric region, duodenum hemorrhagic and contrasted distinctly with the gastro-intestinal tracts of the dogs fed pectin.
Average of 4 dogs:				
	46.5	1.0	100.0% ulcers	

Note: Control dogs 12 and 15 died before they had received the treatment 20 days and are not included in this table. Dog 12 died after 3 days from a bowel obstruction and Dog 15 died on the 16th day from a severe mouth infection.

histological study and were immediately fixed in 10% formalin solution. All sections were stained with eosin and haemotoxylin.

RESULTS

Control—In the control group (Table I) all dogs were found to have ulcers in the pyloric region of the stomach. All of the dogs in this group showed intermittent bloody diarrhea. During the last 3 weeks anorexia and marked nausea were prominent symptoms. Three of these dogs (Dog. 11, 13 and 14) were so nauseated at times that it was difficult to prevent the vomiting of the cinchophen. The dogs that were operated and then given the pectin were sacrificed on the 21st and 25th days postoperatively. They showed gains in weight of 3.8 and 1.8 pounds. Macroscopic and microscopic examination of the intestinal tracts showed healthy mucosa throughout with apparently complete healing of the ulcers in the pyloric regions of the stomachs. (Figs. 1a, 1b, 2a and 2b)

Experimental—In this group (Table II) all animals were found to have normal gastro-intestinal tracts except two. One of these animals (Dog 6) was found to

have a large peptic ulcer (Figs. 3a, 3b) which microscopic examination revealed to be of rather recent origin but gave evidence of active healing. The other, (Dog 1) on gross examination, showed a few suspicious areas that appeared ulcerous but healed. However, microscopic examination of these areas failed to verify ulcer formation. In general the dogs in this group were in excellent condition throughout the experimental period. All but two of them showed marked weight gains. Of the two dogs who lost weight, one (Dog 5) developed an eye infection that ultimately ended in the loss of the eye. The other (Dog 7) developed a superficial tumor and was sacrificed at the end of the experiment. During the 3rd week, Dog 7 had a bloody diarrhea for 2 days and during the last 2 weeks, Dog 1 and 6 showed occasional nausea. Dog 2 delivered four well-developed and apparently normal pups on the 74th day.

Postmortem examination of the gastro-intestinal tracts of the animals fed pectin revealed the interesting fact that the mucosa of the entire intestinal tract was covered with a film of gelatinous-like material

TABLE II
Dogs received 100 mg. cinchophen per kilo and 360 cc. of 3% pectin solution daily

Dog No.	Experimental Days	Gain or Loss in Pounds	Ulcer	Autopsy Findings and Comments
1	64	3.5	—	Sacrificed—in the pyloric region there were a few suspicious areas that appeared ulcerous but healed. Microscopic examination failed to verify ulcer formation.
2	96	Same	—	Sacrificed—entire gastro-intestinal tract appeared normal. Dog delivered 4 normal pups on the 74th day of the experiment.
3	62	4.3	—	Sacrificed—Stomach appeared normal grossly. Several areas in the intestines which were thought to appear suspicious, on microscopic examination were found not pathological.
4	62	1.0	—	Sacrificed—entire gastro-intestinal tract appeared normal.
5	62	-1.7	—	Sacrificed—entire gastro-intestinal tract appeared normal.
6	64	3.0	+	Sacrificed—a large ulcer in the pyloric ring. Microscopic examination showed it to be of rather recent origin but to be actively healing.
7	62	-1.2	—	Sacrificed—entire gastro-intestinal tract appeared normal.
8	62	5.3	—	Sacrificed—entire gastro-intestinal tract appeared normal.
9	64	4.0	—	Sacrificed—entire gastro-intestinal tract appeared normal.
Average of 9 dogs:				
	66.4	2.02	11.1% ulcers	



Fig. 3a. Ulcer in the pyloric ring of experimental Dog 6. The dog had received pectin and cinchophen for 64 days. This is the only ulcer found in the pectin fed group.



Fig. 3b. Photomicrograph of ulcer from Dog 6.

which was very difficult to remove. In the lower two-thirds this film was thicker and more tenacious. The mucosa in these dogs, as a rule, were normal in appearance and were in marked contrast with the definitely hemorrhagic condition of the duodenal mucosa of control Dog 14, this being the only control dog sacrificed without operation.

Histological examination of the sections of the livers, kidneys and adrenal glands from all the control and experimental animals showed no significant changes.

While this report is from a small series of animals, the uniformity of the results would lead one to believe that pectin has possibilities in the prophylaxis and treatment of ulcers of the gastro-intestinal tract.

SUMMARY AND CONCLUSIONS

In a series of 13 dogs, 4 control animals were treated with cinchophen and 9 experimental animals with cinchophen and pectin. Those treated with only cinchophen showed 100% incidence of ulcer, while those given both the cinchophen and pectin showed an incidence of only 11.1% ulcers.

In general all animals receiving the pectin were in excellent condition while those of the control group showed intermittent bloody diarrhea, anorexia and nausea.

Two control dogs, definitely proved by operation to have ulcers, were treated postoperatively with cinchophen and pectin. On the 21st and 25th postoperative days, postmortem examination of these dogs showed well healed ulcers.

On the basis of this experiment in a small series of dogs pectin has been shown to have prophylactic and curative properties for peptic ulcers produced experimentally with cinchophen.

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Gross Hemorrhage as a Complication of Peptic Ulcer

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INTRODUCTION

ONE of the most alarming and often the most insidious complication of gastric, duodenal, or anastomotic ulcer is gross hemorrhage. Manifesting itself either as hematemesis or melena, or both; ac-

companied if acute by syncope, or, if less acute, by weakness, pallor, and vague gastric distress, it usually is of sufficient importance to bring the patient to the physician or to the hospital.

In the past we have felt that this complication, though occasionally fatal, carried with it a fairly good prognosis. Our attitude was based on a study made by S. D. Manheim (1) in 1926. At that time statistics

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