

**Effect of Insulin and Glucose on Normal and Obstructed Intestine.\***

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Since the original experiments of Bulatoa and Carlson<sup>1</sup> concerning the effect of glucose and insulin on the motility of the stomach, a number of similar investigations have been made. Most of the observations have been made on the stomach alone. Quigley and Solomon,<sup>2</sup> however, determined the effect of insulin and glucose on the duodenum of humans and on the colon of dogs. The results of all investigators agree that the administration of insulin causes an increase in gastric and colonic tonus, whereas the glucose causes a cessation of these movements. Because intravenous infusions of glucose are so popular in the treatment of many conditions including intestinal obstruction, the present investigation was undertaken to determine what effect glucose and insulin exert on normal and obstructed small intestine. Eighty-four observations were made on 30 dogs, 20 on the normal animal, 11 on animals with 24-hour obstruction, 22 on animals with 48-hour obstruction, 22 on animals with 72-hour obstruction, and 9 on animals with 96-hour obstruction. Repeated observations on the same animal were made possible by employing the following technic. Under aseptic precautions the terminal ileum was divided and each end inverted by a purse string suture. About 5 cc. proximal to the stump of the proximal end a fenestrated tube was introduced through an enterostomy opening and allowed to extend proximally in the lumen of the bowel for about 20 cm. About 5 cm. proximal to this a second tube carrying a balloon was introduced through another enterostomy opening, the end carrying the balloon being directed proximally, but so placed that the fenestrated enterostomy tube extended beyond the balloon. Both tubes were brought out through the omentum, and the abdominal wall was closed in layers. The animal was allowed to recover completely and after 24 hours the tube carrying the balloon was connected with a Marey tambour and kymographic tracing obtained. Concomitant respiratory tracings were made. Observations were made on the normal unanesthetized animal, following which the enterostomy tube was clamped producing a mechanical obstruction.

\* The insulin used in this investigation was kindly furnished by Eli Lilly and Company.

<sup>1</sup> Bulatoa, E., and Carlson, A. J., *Am. J. Physiol.*, 1924, **69**, 107.

<sup>2</sup> Quigley, J. P., and Solomon, E. I., *Am. J. Physiol.*, 1930, **91**, 488.

Observations were made daily as long as the animal survived.

The effects on the motility of the intestine of insulin alone, the combination of insulin and glucose, glucose alone, glucose preceded by insulin, and insulin preceded by glucose were observed. Blood sugar determinations were also made. The results obtained were consistent as regards the action of glucose and insulin on the gut. There was little difference between the reactions of the normal and obstructed gut to the insulin and glucose except that possibly insulin alone exerted a slightly more marked effect on normal gut and that which had been obstructed for 24 hours than that which had been obstructed for longer periods of time. The total results obtained are given in Table I.

TABLE I.

| Solution                    | No. of observations | Increase in intestinal activity | No change | Decrease |
|-----------------------------|---------------------|---------------------------------|-----------|----------|
|                             |                     | %                               | %         | %        |
| Insulin alone               | 17                  | 58.8                            | 35.2      | 5.9      |
| Insulin + glucose           | 10                  | 40.0                            | 50.0      | 10.0     |
| Glucose alone               | 18                  | 0.0                             | 11.1      | 88.8     |
| Glucose preceded by insulin | 37                  | 75.6                            | 13.5      | 10.8     |
| Insulin preceded by glucose | 7                   | 71.4                            | 28.5      | 0.0      |

*Conclusion.* From these results, it is suggested that glucose alone should not be used postoperatively and certainly not in the presence of intestinal obstruction, because glucose alone in the majority of instances exerted an inhibiting effect on intestinal activity. Insulin, or the combination of insulin and glucose produced an increase in intestinal activity. The best results were obtained when insulin preceded the administration of glucose by about one-half hour's time. There was no correlation between the intestinal activity and the blood sugar findings.

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#### Comparative Study of the Rabbit Leucocytic Count Following Injection of Various Antigenic Substances.\*

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The reactions described here bear a relationship to the subject of nonspecific protein therapy although there is no intention at this time

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