selecting these particular periods is that ketonuria during these is demonstrated not only by the customary qualitative test but also by quantitative estimation. It is evident from our data, without much comment, that protracted hypoglycemic conditions may persist and can entail ketonuria despite carbohydrate intake that is far beyond the measure normally consumed.

When hypoglycemia persists during the administration of glucose, practically all of the glucose is deposited as glycogen in the peripheral tissues, while at the same time glycogen breakdown in the liver continues at an increased rate. When hepatic glycogenolysis is accelerated, the formation of ketone bodies is also increased.[1] The observations on February 3 and 4 clearly show this relationship. It may be noted that ketonuria ceased only after the hypoglycemic attack had subsided; as indicated by a slight glycosuria at the end, the large amounts of injected glucose eventually led to hyperglycemia, and at the same time the qualitative test for acetone became negative. The third period (February 26 and 27) in Table II is noteworthy in this respect, that it shows that ketonuria due to hypoglycemia may develop to serious dimensions. The excretion of ketone bodies rose to more than 0.5 g per hour due to the fact that in this instance hypoglycemia was not combatted as vigorously as in the preceding 2 periods.

Summary. Hypoglycemia, either induced by hyperglycemia or occurring spontaneously ("hyperinsulinism"?), is frequently accompanied by ketosis (ketonemia and ketonuria). Increased rates of formation of ketone acids, known to occur in the liver, are coincident with increased rates of hepatic glycogenolysis.

11781

Effect of Sulfanilamide on Wound Healing.*

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Bricker and Graham[1] reported that sulfanilamide had an inhibitory effect upon the healing of stomach wounds in dogs. Their deter-

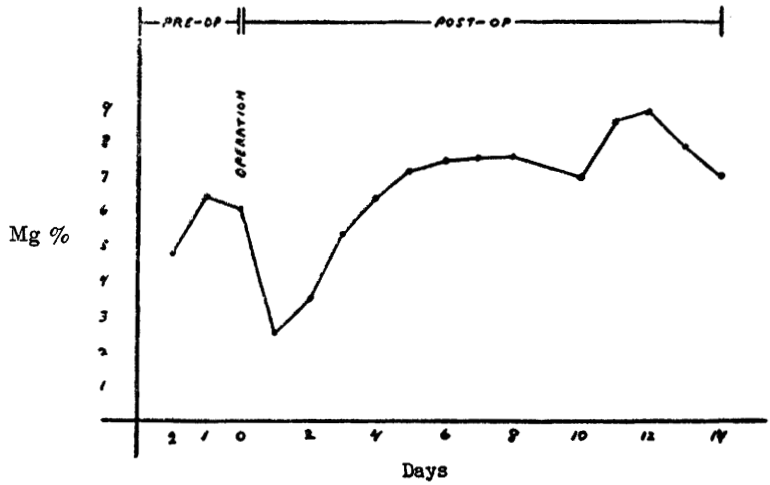
*Aided by a grant from the Fluid Research Funds of Yale University School of Medicine.

1 Bricker, E. M., and Graham, E. A., *J. A. M. A.*, 1939, **112**, 2593.

minations were made on the 3rd, 5th and 7th postoperative days. In view of the widespread and growing use of sulfanilamide and its related compounds, it seemed important to repeat these studies and to carry the determinations through all the normal phases of healing.

The experiments were performed on adult white rats weighing about 250 g. The tensile strength of the wound was used as an index of healing. In addition comparative histological studies were made of the wounds.

I. Control Group—51 animals. This group was maintained throughout the duration of the experiment on a diet of Purina dog chow. On the 3rd day of the diet a longitudinal wound measuring about one cm in length was made under ether anesthesia through the anterior wall of the stomach at its cardiac end. The wound edges were immediately re-approximated in one layer with a running continuous Connell suture of No. 000 plain catgut which, as has been previously shown, loses its tensile strength well within the 4th day. The abdominal wall was closed with 2 layers of fine No. A silk. On each of the 4th, 6th, 8th, 10th, 12th and 14th postoperative days 5 to 8 animals were sacrificed, and the strength of the wounds immediately determined by distending the stomach with air and noting its bursting point. The details of this method were described by Harvey and Howes.[2] Inasmuch as it has been shown that for approximately 4 days after the injury the wound has only the strength contributed by the holding power of the sutures, no studies were made during this

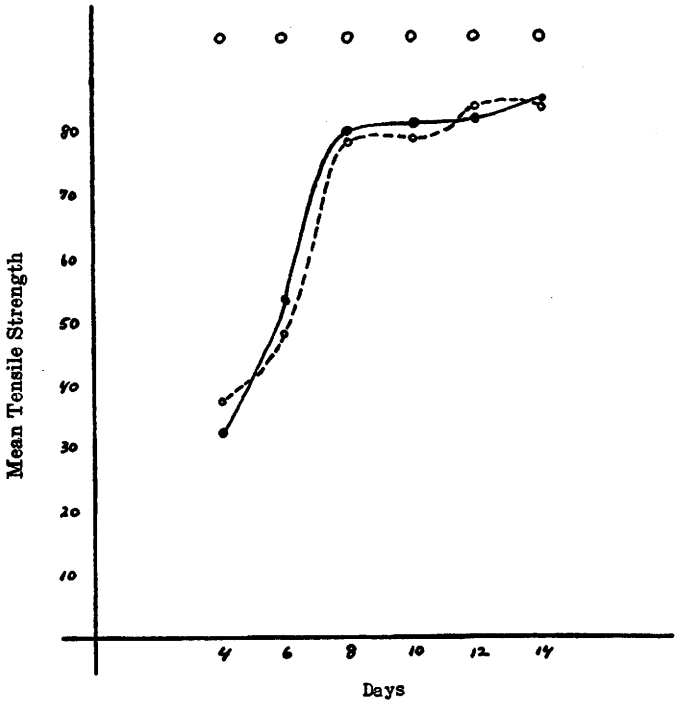


GRAPH I.
Mean of daily concentrations of free sulfanilamide in blood in all animals of experimental group.

2 Harvey, S. C., and Howes, E. L., *Ann. Surg.*, 1930, **91**, 641.

first phase of healing. At each time interval the stomachs of 2 animals were allowed to remain intact and were reserved for histological study of the wounds.

II. Experimental Group—48 animals. This group was maintained on a diet of Purina dog chow containing 1% of sulfanilamide† by weight.[3, 4] The drug and the chow were finely powdered and both were allowed to mix intimately in a ball mill over many hours. The animals appeared to relish the drug diet and partook of it at once and freely. The average daily consumption was about 20 g per rat. Preliminary studies disclosed that the concentration of free sulfanilamide in the blood was adequate and sustained over a 24-hour period.



GRAPH II.

† The sulfanilamide was kindly furnished by Mallinckrodt Chemical Works.

3 Bieter, R. N., Larson, W. P., Cranston, E. M., and Levine, M., *J. Pharm. and Exp. Therap.* (Proc.), 1939, **66**, 3.

4 Litchfield, J. T., Jr., White, H. J., and Marshall, E. K., Jr., *J. Pharm. and Exp. Therap.*, 1939, **67**, 437.

In these experiments a determination of the drug concentration in the blood was with few exceptions made once every day on every animal. (Graph 1.) The method of analysis described by Marshall and Cutting[5] was employed. On the 3rd day of the drug diet, wounds exactly similar to those of the control group were made. Tensile strengths and histological studies were similarly carried out from the 4th through the 14th postoperative day. A few of the animals in this group failed for one reason or another to build up and sustain "therapeutic" blood levels of the drug. These were discarded.

In 4 instances, 2 in the control and 2 in the experimental group, small localized abscesses were discovered adjacent to the operative site in the stomach. These were discarded. In the remaining animals the wounds healed *per primam.* In each group the averages of the breaking strength for every postoperative interval, as well as the standard deviation, were computed. Fisher's formula for small samples was applied to determine whether the difference in the means of the 2 groups was statistically significant.

Results. Sulfanilamide did not appear to retard or inhibit the healing of stomach wounds in rats. The curves of healing of these wounds as measured by their tensile strengths were practically identical in the control and experimental groups. (Graph II.) Histological studies of the wounds at each time interval revealed no striking differences in the 2 groups. The oral method of administering the drug was found to be effective and easy of application.

11782 P

Single Responses of Motor Units in Consequence of Volitional Effort.

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Since the demonstration by Adrian and Bronk[1] that action potentials could be recorded from single skeletal motor units* during

5 Marshall, E. K., Jr., and Cutting, W. C., *Bull. Johns Hopkins Hosp.*, 1938, **63**, 328.

1 Adrian, E. D., and Bronk, D. W., *J. Physiol.*, 1928, **66**, 81.

* Stetson and Bouman used the term *motor unit* to denote (p. 210) " . . . a time interval during which occur contractions more or less synchronous of groups