stance in which mild rickets developed although this amount of irradiated ergosterol had been given daily, 6 teaspoonfuls of cod liver oil subsequently brought about healing in a few weeks as demonstrated by radiographs.. In other words, 6 teaspoonfuls of cod liver oil brought about cure where 20 drops of irradiated ergosterol (supposed to be the equivalent of 10 teaspoonfuls of cod liver oil) failed to afford complete protection. Such a result does not mean that the antirachitic action of irradiated ergosterol is weak or unreliable, for undoubtedly complete protection or cure would have been brought about by a larger dosage. Cod liver oil not infrequently fails to fully protect when given to infants in the customary dose of 3 teaspoonfuls a day. An observation of this kind indicates rather that we have a faulty conception of the relative potencies and dosages of the two specifics.

These inconsistencies may be due to the fact that irradiated ergosterol contains a phosphate-raising factor in addition to its well recognized antirachitic fraction. However this may be, it would seem evident that the present method of standardizing irradiated ergosterol is unsound from a clinical point of view, as it is based on the assumption that the relative antirachitic potency of cod liver oil and of irradiated ergosterol is the same in the rat and the infant, and that the units are interchangeable. Instead of an indirect method which computes activity on the basis of "cod liver oil units", it would be better to determine the number of protective or curative "rat units" and to use this direct determination as the basis of standardization.

4908

Inorganic Constituents of Blood and Urine in Dogs with Pancreatic Fistula.

T. F. ZUCKER, M. GUTMAN-NEWBURGER AND B. N. BERG.

From the Department of Pathology, College of Physicians and Surgeons, Columbia University.

Several studies on the effects of drainage of pancreatic juice have appeared during the last few years, verifying and extending Pawlow's original observations. Elman and McCaughan[1] demonstrated that drainage of the pancreatic juice through a fistula will cause

[1] Elman and McCaughan, *J. Exp. Med.*, 1927, xlv, 569.

death in a short time. Gamble and McIver[2] showed that the symptoms and death were due principally to a loss of fixed base and chloride, which resulted in dehydration of the blood. The fixed base and chloride of the plasma progressively diminished and water was lost while the plasma protein increased quite markedly. Hartman and Elman[3] confirmed the findings of Gamble and McIver and alleviated the symptoms and prolonged life by the injection of salt solutions.

Our own work on pancreatic fistulas, having initially a different objective, dates back to 1927. Observations were made on total base of serum, pancreatic juice and urine (methods of Stadie and Ross[4]), specific conductivity of serum (Kohlrausch) serum protein (refractometer), chloride and bicarbonate. Chlorides and creatinin were also determined in urine. Depression of freezing point of the pancreatic juice was also done in a large number of samples.

The results were as follows: A series of over 20 dogs was studied. The dogs on a diet containing salt showed a mean survival time of 15 days, or else failed to show any evidence of dehydration. The dogs on a diet without salt showed a survival time of 8 or 9 days. All dogs injected with NaCl or NaCl + $NaHCO_3$ after dehydration had begun, showed a response to treatment. The initial dehydration could be entirely overcome by the injection of electrolyte in quantities a little more than equivalent to the juice secreted. In dog 29, the rise and fall of total base in the serum was followed at intervals of a few days throughout 53 days of intermittent injections. When the volume of isotonic saline injected was considerably larger than the juice secreted, the serum protein fell distinctly below normal, but the total base never rose above normal.

The initial total base was not affected by diet, but the susceptibility to dehydration apparently was. This would suggest that with constant serum base, other tissues may store or lose base. Previous feeding on a salt-containing diet raises the animal's resistance to dehydration and a salt-free diet lowers it. It also appears that, while normal animals do not show much change in serum base after injection of salt an animal with pancreatic fistula is markedly influenced in this regard.

We find a good agreement between the results of total base determination by the method of Stadie and Ross and the specific conductivity corrected for protein, the ratio in a given animal being

[2] Gamble and McIver, *J. Exp. Med.*, 1928, xlviii, 849.

[3] Hartman and Elman, *J. Exp. Med.*, 1929, l, 387; Elman and Hartman, *Arch. Surg.*, 1930, xx, 333.

[4] Stadie and Ross, *J. Biol. Chem.*, 1925, lxv, 737.

quite constant (within 2½%, which is about the limit of error of method).

As a check and an alternative method for total base in pancreatic juice we have used the freezing point depression and here also the ratio Δ/T.B. ran very nearly constant.

The total base content of the pancreatic juice is very constant from animal to animal, being a few milli-equivalents higher than that of the plasma, and during depletion of plasma base, decreases proportionately. Under these same conditions, the urine is decreased very markedly in both volume and total base. As a secreting gland, therefore, the pancreas takes precedence over the kidney in its lien on both water and base, as may be seen from metabolism experiment on dog 48. This dog was on a diet containing about 30.7 milli-equivalents of total base per day. Before operation a 24-hour urine contained 29.0 milli-equivalents. Five days after operation the urine contained 14.2 milli-equivalents of base, while 39.5 milli-equivalents were lost through juice secretion. After 3 days more, pancreatic secretion had practically ceased owing to a plugged canula, and 24.5 milli-equivalents of base were found in urine.

The symptoms observed, although due to loss of electrolyte, are not dependent simply on the electrolyte level in the plasma. The rate of change is a large factor. Under conditions of slow dehydration the animal may, without any symptoms, attain a low level of electrolyte, which would be fatal if the change were a rapid one.

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The Killing of Moulds by an Ordinary Electric Bulb.*

BASILE J. LUYET. (Introduced by Ross G. Harrison.)

From the Osborn Zoological Laboratory, Yale University.

Darkness provides optimum condition for the growth of moulds, and ultraviolet rays exert a rapid and violent fungicidal effect on them, but one does not usually suspect the extreme sensitiveness of the *Mucoraceae* to the feeble light of an ordinary electric lamp. Our

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