mented (Porter) beer, for which they report that 5 liters of beer for 60 kg. rat promote a growth which is not entirely normal. Our results show the vitamin-B concentration of beer to be approximately the same as that of milk.[6]

These results show that beer is a wholly inadequate source of vitamin B for the rat. When allowed free access to beer, this animal will not drink enough (at 10 cc. per day) to prevent marked symptoms of polyneuritis; if allowed free access to beer solids or concentrates, it will eat only enough (at the equivalent of 30 cc. of beer per day) of these to show about one-half normal growth because of B deficiency. Assuming that the vitamin-B requirement of the human species per unit weight is not less than one-third that of the rat, a 30-pound child eating the equivalent of 1 liter of beer per day, would show marked symptoms of B deficiency, unless this vitamin were supplied from another source; and even at 3 liters of beer per day there would be subnormal growth.

Summary. By the rat growth method, 5 samples of commercial beer, 3 of which were advertised as a source of vitamins, were found to contain from 0.05 to 0.1 Sherman units of vitamin B per cc. of beer. The concentration of vitamin G is greater than that of B. Pasteurization does not change the concentration of these vitamins. Filtration through paper removes practically all of the vitamin G from beer; filtration through sintered glass has no such effect.

At best, beer is a very poor and inadequate source of vitamin B for rats, and probably also for humans.

8443 P

Adrenal Glands in Dogs with High Intestinal Obstruction.

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In high intestinal obstruction in man,[1] in the dog,[2] and in the monkey[3] the essential changes in the blood chemistry are primarily

[6] Macy, I. G., and Outhouse, J., Graham, A., and Long, M. L., *J. Biol. Chem.*, 1927, **73**, 189; Samuels, L. T., and Koch, F. C., *J. Nutrition*, 1932, **5**, 307.

[1] Haden, R. L., and Orr, T. G., *Bull. Johns Hopkins Hosp.*, 1923, **39**, 26.

[2] Haden, R. L., and Orr, T. G., *J. Exp. Med.*, 1923, **37**, 365.

[3] Haden, R. L., and Orr, T. G., *J. Exp. Med.*, 1925, **41**, 107.

a fall in blood chlorides; usually a rise in alkaline reserve and a rise in non-protein nitrogen. The fall in the blood chlorides is not always conditioned by loss of chloride through vomiting.[3] The group of conditions associated with hyperazotemia and hypochloremia[4] bear certain clinical and chemical similarities; loss of weight, asthenia, and marked prostration, decline in blood pressure, rapid pulse, shallow respiration, dehydration and anhydremia.

The mechanism of the nitrogen retention in these conditions is not well understood, but it would appear to be intimately related in a majority of instances to alterations of salt and water metabolism.[4] Both clinically and biochemically the syndrome of hypochloremia and hyperazotemia resembles adrenal insufficiency in Addison's disease.

The findings recorded were observed in studies to determine whether the adrenal glands are altered morphologically in the hypochloremic state of high intestinal obstruction as a representative type of this syndrome. The literature contains, to our knowledge, no reference to histologic studies of adrenal glands in high intestinal obstruction.*

High intestinal obstruction was induced on a series of 12 dogs by sectioning the duodenum by cautery and closing the ends by inversion. No food was given for 24 hours before operation and none during the experiment. Water was allowed *ad libitum*. The blood for chemical analysis was obtained from the femoral vein the morning before operation and every morning thereafter until the animal was killed or died. Studies were made for NaCl, urea, CO_2 combining power of blood plasma, specific gravity of blood plasma, and red blood cell count. Immediately after death the adrenal glands were removed and placed in 4% formalin in saline; prepared for histologic study by the paraffin method, and stained with hematoxylin and eosin.

Our studies show that within 24 to 48 hours after operation there

[4] Wohl, M. G., and Brust, Raymond W., *J. Lab. and Clin. Med.*, 1935, **20**, 1170.

* In a paper by George J. Heuer and Wm. D. Andrus, appearing in the *Annals of Surgery*, Oct., 1934, they state: "Further, since the relatively close similarity in postmortem findings in animals dying after bilateral suprarenalectomy and in those dying following the injection of loop toxin was first emphasized by Sweet[5] this fact has been frequently commented upon." This reference to Dr. Sweet as well as to his other writings[6] is incorrect, and there is no specific comparison of the two conditions. Dr. Wm. D. Andrus in a personal communication to the senior author on June 14, 1935, acknowledges this error.

[5] Sweet, J., *Penn. Med. J.*, 1915, **19**, 492.

[6] Sweet, J., *Arch. Int. Med.*, 1910, **6**, 536.

is not only a fall in blood chlorides, a rise in urea nitrogen and a rise in CO_2 of the blood plasma as already found by other observers,[1, 2, 3] but also an increase in specific gravity of the blood plasma and an increase in the red blood cells. The histologic changes of the adrenal glands were as follows: the zona glomerulosa was well demarcated from the zona fasciculata; the former presented a "moth eaten" appearance with loss of cell contour and shrunken nuclei, while the latter had a granular cytoplasm apparently devoid of lipoid material.

Two dogs received 500 cc. of physiological salt solution intravenously on the day of operation, and 400 cc. every day after operation. The blood urea remained within normal limits, from 10.4 mg. % on the day of operation, to 14 mg. % on the day the dogs were killed; the blood chlorides were slightly higher on the 15th day, when the dogs were killed, from 446 mg. % to 495 mg. %, the CO_2 had risen only to 47.2 from an initial volume % of 44.5 and the red blood cells decreased from 6,510,000 to 4,670,000. The specific gravity of the blood plasma decreased from 1.0263 to 1.0185. Clinically the animals showed no signs of toxicity but showed loss of 2.4 kilos of weight. The adrenal glands showed the zona glomerulosa clearly defined with plump nuclei, its cells being well filled with lipoid droplets; zona fasciculata was also completely filled with lipoid showing no evidence of depletion.

Two dogs received 400 cc. of physiological salt solution intraperitoneally every other day; the blood urea increased from 20.5 mg. % to 39.4 mg. % on the 14th day, and blood chlorides decreased from 467 mg. % to 274 mg. %. CO_2 increased from 38.1 to 86 volumes %. The specific gravity was not greatly altered. The red blood cells decreased by 1,700,000. Clinically the animals were toxic and died on the 14th day of the experiment. The adrenal glands showed histologically irregular lipoid depletion, a picture midway between the so-called "lipoid-exhaustion" of extreme degeneration and the normal adrenal.

It is suggested that the function of the adrenal cortex is in some way interfered with in experimental high intestinal obstruction in animals. While our studies are not as yet conclusive it appears that intravenous administration of salt solution in adequate amounts tends to prevent the toxemia and alteration of NaCl and blood urea as compared with dogs that received insufficient or no salt solution. The adrenal glands in animals receiving sufficient amount of salt, are intact.

Work is now in progress with large doses of Cortin alone and

simultaneous salt solution administration in dogs with high intestinal obstruction. Since burns are chemically characterized by hypochloremia and hyperazotemia we are experimenting with Cortin and salt solution as a detoxifying agent. The results will be reported elsewhere.

8444 C

Differentiation of Ergosterol from Cholesterol.

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Ergosterol and cholesterol are sterols each containing in its molecule 3 benzene rings with the configuration found in phenanthrene, one 5-membered ring with a side chain and one secondary alcohol grouping. Ergosterol, however, has one more carbon atom than cholesterol, one hydrogen in the side chain being replaced by a methyl group, and it also has 3 double bonds instead of one double bond.

The greater degree of unsaturation of ergosterol argues for its greater reactivity. Heilbron and Spring[1] report that ergosterol yields a red color with antimony trichloride, but no reaction takes place with α- and β-dihydroergosterol, with α- and β-ergostenol (tetrahydroergosterol) with allo-α-ergostenol (hexahydroergosterol), or with cholesterol. They also report that the trichloracetic acid reaction with ergosterol, which is negative with cholesterol, is not given by partially or completely saturated derivatives of ergosterol.

Several other tests reported for ergosterol fail to give responses with cholesterol. Among these we may mention the reaction (1) with chloral hydrate,[2] (2) with a solution of bromine in chloroform (Tortelli-Jaffé reaction)[1] (3) with concentrated nitric acid or with a solution of mercuric acetate in nitric acid,[3] and (4) with a solution of selenium dioxide.[4] Montignie[4] and also Callow and

[1] Heilbron, I. M., and Spring, F. S., *Biochem. J.*, 1930, **24**, 133.

[2] Rosenheim, O., *Biochem. J.*, 1929, **23**, 49.

[3] Rosenheim, O., and Callow, R. K., *Biochem. J.*, 1931, **25**, 24.

[4] Montignie, E., *Bull. Soc. Chem.*, 1932, **51**, 144.

[5] Callow, R. K., and Rosenheim, O., *J. Chemical Society of London*, 1933, 387.