This balance is constructed of drawn seamless brass tubing of such diameter that the spiral spring just fits inside the inner tube and the inner tube fits inside the outer tube with clearance to prevent friction. Over the outer tube is placed a slotted tubular slip joint for setting off zero with the empty tube on the scales. The spring is made of 22- or 24-gauge music wire annealed and tempered. The calibration is placed on the inner tube. To calibrate the balance for a particular diameter of core, the equivalent weight of 1 inch of water in a tube of the same diameter as the core is placed on the spring and the unit stretch determined. The gradations are placed on the barrel of the inner tube by rotating the tube against a sharp tool in a lathe which is adjustable to 0.001 inch.

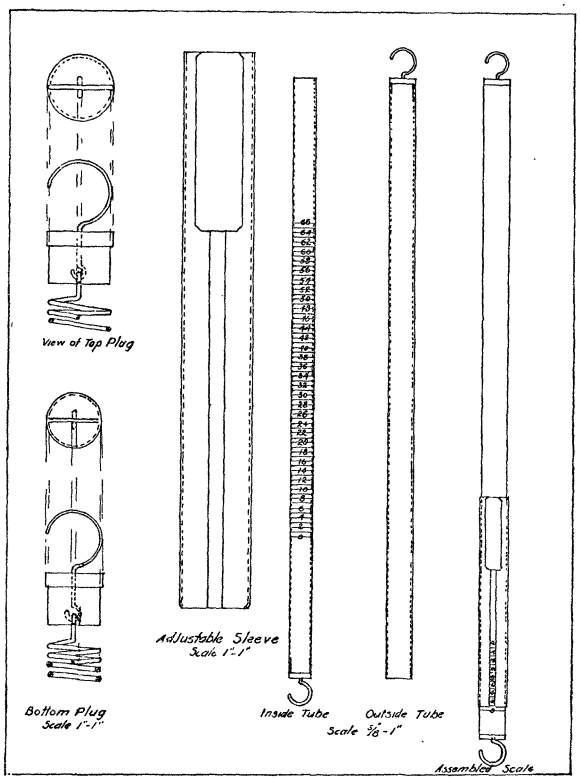

FIG. 1. Parts and assembly of tubular spring balance for measuring water content of snow.

Fig. 1 shows each part of the balance as well as the assembled balance. The hooks are made from 32-gauge piano wire. The plugs are turned out of a bronze rod and the spring is made from 22- or 24-gauge music wire. The drawn seamless brass tubing fits with ample clearance so that there is little friction. The slip sleeve fits the outer tube with spring tightness so that the zero with the empty tube on the scales can be set off. The gauge of wire and diameter of the spiral of the spring will govern the capacity of the balance. A scale having a capacity of 72 inches of water has a distance between each gradation of 0.15 inch. The over-all length of this scale with no load on it is 23 inches; when fully extended it is 41 inches long. This scale weighs 19 ounces. A scale having a capacity of 24 inches has a distance between gradations of 0.21 inch. This scale, weighing only 11 ounces, is 13 inches over all when telescoped and 20 inches long fully extended.

GEORGE D. CLYDE

SPECIAL ARTICLES

COMPARISON BETWEEN IRRADIATION OF DIET AND SUPPLEMENTAL IRRADIATION OF ANIMALS IN VITAMIN A AND D DEFICIENCY[1]

IN an experiment in which eight young rats, about one month old and averaging about 35 g in weight, were placed on a diet that was A-free and low in Vitamin D, on October 14, 1929, and had become well depleted on January 17, 1930, it was found that the addition of 1/100 mgm of irradiated ergosterol daily stimulated their growth for three weeks, but after that time they rapidly succumbed.

In a second experiment (see graph), four lots, consisting of forty-one rats, one month old and averaging 37 gm in weight, were placed on the Sherman No. 380 diet, known to be low in Vitamin D and deficient in Vitamin A, and allowed to become depleted from January 24, 1930. After a period of over eight weeks two of the lots were given irradiated ergosterol, each individual receiving 1/100 mgm daily, mixed with a small quantity of the A-free diet. The other two lots served as positive and negative controls.

RESULTS

The stimulating effects of the Vitamin D thus supplied became quite apparent and lasted for 10 days, then began to subside. The animals in Lot 2 were allowed to exist on the Sherman No. 380 diet, with supplemental Vitamin D, in the form of irradiated ergosterol, but in Lot 1 the animals were also irradiated daily except Sundays, for 30 seconds, at a distance of 18 inches from a Macbeth carbon arc lamp.

Beginning April 28, the additional irradiation was found to markedly stimulate growth for a short time,

[1] Investigations supported by a grant from the National Research Council.

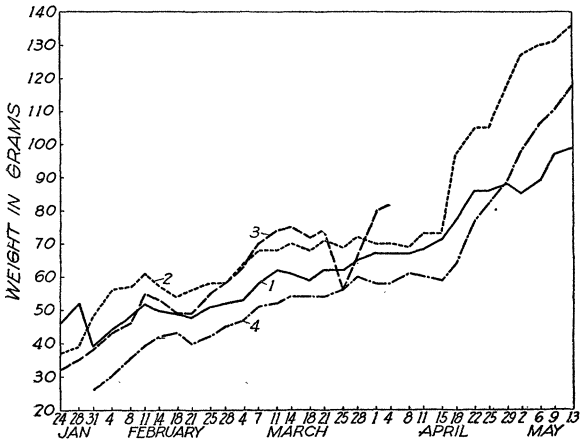

FIG. I IRRADIATED ERGOSTEROL, WITH AND WITHOUT IRRADIATION OF THE ANIMALS

FIG. 1. Lots and Treatment.

1. Sherman No. 380; ergosterol, animals irradiated, April 28.
2. Sherman No. 380; ergosterol.
3. Sherman No. 380; control.
4. Sherman No. 380; cod-liver oil, control.

but did not produce the striking effects on growth and longevity elsewhere described[2] when iodide of iron was added under similar conditions of diet and irradiation.

The chief purpose of our study was of course for comparison with the results obtained with various iodin combinations furnished under the same conditions as in these experiments. It should be noted, however, that the relatively short exposures to ultraviolet light, combined with irradiated ergosterol feeding, did not induce a marked hypervitaminosis.

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HYDROGEN-ION CONCENTRATION OF THE ALIMENTARY TRACTS OF FOWL, CAT AND RABBIT

INVESTIGATORS of biological subjects have long realized the importance of knowing the chemical reactions of biological fluids. Much critical work has shown the quinhydrone electrode and its many modifications suitable for these determinations.

Both in this country and abroad, determinations of the pH of the alimentary tracts of animals[1] have been made. With these observations in mind and having the necessary apparatus available, the writer has attempted to determine the pH of the alimentary tracts of the fowl, the rabbit and the cat.

Animals used in this work were dispatched in the most rapid and painless manner. In the case of fowls the cervical vertebrae were separated by sudden tension. Rabbits were stunned by a smart blow on the head with a blunt instrument, after which they were bled. Cats were rendered insensible by means of overdoses of chloroform. Their respective alimentary tracts were then rapidly and carefully removed to warm physiological salt solution where they were well washed, following which they were again well washed in several changes of distilled water.

Material taken from several points along the tract was then dissolved in distilled water, filtered and the determinations were made upon the filtrate according to the methods outlined by Clark and Collins.[2] The experiments with fowls were nearly all made in the afternoon after the birds had fed at will. Under these conditions, digestion was in active progress. An average of the results obtained from eight fowls shows the following: proventriculus, 5.59; gizzard, 3.39; duodenum, 6.295; ileum, 6.216; cecum, 1.917. These fowls were altogether upon a grain ration; it is possible that somewhat different results might have been secured had there been some meat in their diet.

The alimentary tracts of the rabbits used in these experiments were all healthy and in the absorptive state. Practically all experiments were made from one to two hours after a full feeding of alfalfa and rolled barley. The averages of determinations upon eight rabbits are as follows: stomach, 1.83; duodenum, 7.35; ileum, 7.99; cecum, 6.26.

Some difficulty was experienced in securing cats, which like rats appear not to thrive very well in this locality. Most of the cats were "tramps" of the wandering kind and appeared quite hungry. Some of them harbored ascarid worms and showed slight intestinal irritation. The averages secured from seven cats were as follows: stomach, 3.34; duodenum, 6.51; jejunum, 6.905; ileum, 6.79; colon, 5.25.

Because of the lack of uniformity in the case of cats, the writer does not consider the data secured as consistent and wishes to present it merely as preliminary. It is interesting to note that the intestinal contents of one cat which had been starved for 24 hours showed great uniformity throughout its entire length. In other cases, although the acidity in the

[2] *Proc. Soc. Exp. Biol. and Med.*, 28: 2, 1930.

[1] Hedon and Bremond, "The pH of the Intestine of the Dog," *Bull. Soc. Med. Biol.*, 7: 484, 1926; C. Schwartz and associates, "The pH of the Stomachs of the Cow," *Pflügers Arch. ges. Physiol.*, 213: 587–592, 1926; Danninger, Pfragner and Schultes, "The pH of the Intestinal Tracts of Horses and Cattle," *Pflügers Arch. ges. Physiol.*, 220: 430, 1928; Grayzel and Miller, "The pH of the Gastro-intestinal Tract of the Dog with Relation to Diet and Rickets," *Jour. Biol. Chem.*, 76: 423, 1928.

[2] Clark and Collins, "The Quinhydrone Electrode and Soil Reaction," *Soil Science*, 24: 453, 1927.