exposed to sunlight was higher than was the case with the other group, by approximately the same amount as in the previous trial. For the other pair of litter mates no difference was noted.

The results of the two trials are in general agreement in indicating that sunlight increased the assimiliation of calcium in the calcium-deficient ration and prevented the development of the stiffness over the four-months experimental period.

On gross examination, the femurs of the pigs in the no-sunlight group in both trials showed lesions similar to those previously reported by the writers.[1] The cortical bone was soft and porous. The marrow in the shaft was reddened throughout or near the epiphyseal cartilage. The latter was thickened and very irregular. There were hemorrhages under the articular cartilage of the head of the femur. In one pig there was a subperiosteal hemorrhagic zone over the entire extent of the cortical bone, apparently containing spongey, osseous or osteoid tissue. The bone of the femurs of the sunlight group was much denser and was more completely calcified. There were only scattered reddened areas in the marrow of the shaft. The epiphyseal cartilage was irregular but less so than for the no-sunlight group. Thus the results of the pathological examination of the femurs were in agreement with the chemical analyses in showing that the sunlight has a marked influence on bone development.

238 (2761)

A method for the quantitative study of intestinal absorption.

By CARL F. CORI.

[*From the State Institute for the Study of Malignant Disease, Buffalo, N. Y.*]

In previous methods for the study of absorption, isolated intestinal loops of dogs, cats and rabbits were used, and generally one of two principles was followed: Either an acute experiment was made, which involved narcosis of the animal and a laparotomy; or a Vella fistula was established in a preceding operation. One disadvantage of these methods is that experiments made on

different animals are not strictly comparable because of the difficulty to isolate in each animal intestinal loops of exactly the same absorbing surface. Furthermore, by working only on a part of the intestine, the mechanism of absorption of the whole intestinal tract as a physiological unity cannot be studied, nor can the total absorbing capacity of the whole intestine be estimated. Finally the element of body weight cannot be taken into account. Yet it seems of importance for many problems to be able to measure and express absorption in terms of unit of body weight and hour of time, or to establish a relationship between the amount of substance that has passed into the blood stream in a given time and the body weight.

The method that is proposed below allows quantitative estimation of the absorbing capacity of the whole intestinal tract under entirely physiological conditions. So far only the absorption of different sugars has been studied. Since only small laboratory animals can be obtained in sufficient number and of the desired uniformity of stock, age and nutritional condition, the method was worked out on rats. The principle is briefly as follows: A known amount of the substance under investigation is fed by stomach tube. After a given time the animals are killed and the amount of substance remaining in the intestine is determined quantitatively. The difference between the amount fed and the amount recovered from the whole intestinal tract is then the amount of substance absorbed. Rats between two and three months of age, weighing from 120 to 180 grams, were found most suitable. They were starved for 48 hours previous to the experiments, which diminished the amount of reducing substances remaining in the intestine to a negligible minimum. Generally 1.25 to 2.5 cc. of a 50 per cent sugar solution, warmed up to 40° C., were fed. Urethral catheters Nos. 4 or 5 served as stomach tube. The rats were killed in hourly intervals after the sugar feeding, a larger group of rats serving for each 1 hour period. After placing ligatures around the oesophagus and the rectum, the stomach, small intestine and the whole large intestine were carefully detached from the mesentery, placed in a beaker and cut open. The intestine was washed out with successive portions of hot distilled water. The washings were made up to a definite volume, the interfering substances precipitated with colloidal iron, and the sugar determined in an aliquot part of the final

filtrate. Numerous control experiments were made to test the accuracy of the different steps involved in this method. If rats were killed immediately after the sugar feeding, 99.4 to 99.8 per cent of sugar was recovered.

In order to use animals of different weight, one would have to show that the absorbing surface of the intestine is proportional to the body weight, or in other words that the quotient *Intestinal surface/Body weight* or *Amount absorbed/Body weight* is a constant. Our experiments revealed that, within the range of body weights investigated, both sexes showed a proportionality between the amount absorbed (and hence between intestinal surface), and body weight. The amount of substance absorbed per 100 gram body weight in one hour has been called the absorption coefficient. The following example illustrates the constancy of the results that can be obtained with this method: 2.5 cc. of a 50 per cent glucose solution were fed to 8 rats weighing 117.7 to 173.7 grams. They were killed after one hour. The average absorption coefficient was 0.196 grams ± 0.014 grams, or a maximum deviation from the mean of 7.1 per cent. By allowing the absorption to proceed for 2.3 hours and more, definite absorption curves can be constructed for each substance.

239 **(2762)**

The rate of absorption of hexoses and pentoses.

By CARL F. CORI.

[*From the State Institute for the Study of Malignant Disease, Buffalo, N. Y.*]

With the method described in the preceding abstract, the rate of absorption of the sugars referred to in Table I has been investigated. Over 100 rats have been used for obtaining the data recorded in this table. The absorption coefficients represent an average of 1, 2 and 3 hour periods in the case of galactose and glucose, and of 1, 2, 3, 4 and 5 hour periods in the case of the other sugars. It will be noted that a relatively slight change in