teolysis, and that some such process is in general responsible for the fact that a portion of one block behaves so differently from what would be predicted when subjected to electrophoresis a second time. Changes in the electrophoretic behavior of enzyme preparations on standing and the degree of reproducibility in the same and different preparations do not, however, support this explanation. The problem requires further study, but we are inclined more to the view that some explanation involving dissociation of a complex provides the answer.

Summary. A crude preparation of alkaline phosphatase from bovine intestinal mucosa, obtained by treatment with butanol to release enzyme from the microsomes, was subjected to sequential electrophoresis on starch blocks. The results indicate that the phosphatase may have been present initially in a complexed form and that the complex was disrupted during repeated electrophoretic separation. Such behavior, together with the rather small amounts of enzyme protein which appear to be present in the starting material, may account for some of the difficulties encountered in attempts to purify intestinal alkaline phosphatase. An approximately 260-fold purification was achieved, but the amounts of final product obtained were too small for further study.

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Effect of Season on Appetite and Food Consumption of the Lizard, *Anolis carolinensis.* (22086)

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The problem of the regulation of food intake by vertebrate animals has received much attention in recent years(1). Among the factors which seem to be implicated in appetite control are the fat stores of the animal and differences between arterial and venous blood glucose levels. Since the lizard, *Anolis carolinensis,* undergoes marked seasonal changes in total body fat as well as changes in both the concentration and distribution of other metabolites(2,3), a study of the food consumption of lizards at different times of the year was undertaken to determine if such changes in composition are correlated with variations in appetite.

Methods. Adult male specimens of *Anolis carolinensis* which had reached the plateau stage of growth were used. Colonies of 8 to 15 specimens, used to determine seasonal changes in food consumption, were formed in different months of the year from lizards recently captured in the New Orleans area. Colonies were kept for duration of each experiment (1.5 to 2.5 months) in small cages in a constant temperature (28° ± 2°C), exposed to natural hours of light (30° latitude) through a north window. An excess of meal worms, the larval form of the insect, *Tenebrio mollitor,* was kept in cages except during the 4-day fasting period preceding body weight measurements. Food intake was determined from the weight of meal worms eaten. Fortunately, large specimens of meal worms are relatively constant in gross composition if

they are well nourished and hydrated(4). Samples of meal worms were analyzed periodically and found to consist of 13% ether extractable lipid, 20% protein, 2% ash and 60% water. Using these results and the value of 2% carbohydrate obtained by Mellanby (4), the caloric equivalent of the meal worm diet was approximated as 2 kcal/g of meal worms. This value, although subject to obvious limitations, was used throughout this paper to express results obtained and to equate caloric intake with standard metabolism and fat stores of the animals. To obtain the best possible comparison of appetite in different seasons, the total food consumption during the first month in captivity was averaged and caloric intake was calculated on the basis of original body weight of the animals. Lipid content of droppings was never higher than 2% of the total caloric intake of the colony. At the end of each experiment, animals were sacrificed for organ size and composition measurements. Methods of chemical analysis were the same as those described elsewhere(3).

Results. The standard metabolic requirement of *Anolis*, as calculated from O_2-uptake studies(2), averages 24 cal/g body wt/day. Seasonal variations from the mean are of the order of 10-15%. Energy consumed in excess or deficit of the average standard metabolic requirement is shown in Fig. 1a. Appetite is much greater in summer than in other seasons. For example, animals brought in from the field in June or in July are ravenous in their hunger for meal worms. One large male caught in July consumed 1.2 g of worms within an hour after being placed in the cage. To consume a comparable amount of food, an adult man would have to eat about 40000 kcal at one meal. In contrast to the intense appetite in summer, lizards captured between October and April have little appetite for meal worms. Food eaten by these animals, even at summer temperature of laboratory, is about equal to or less than is required to meet standard metabolic requirements. It is of interest that the nitrogen contained in the food consumed by those colonies of lizards having the poorest appetite was

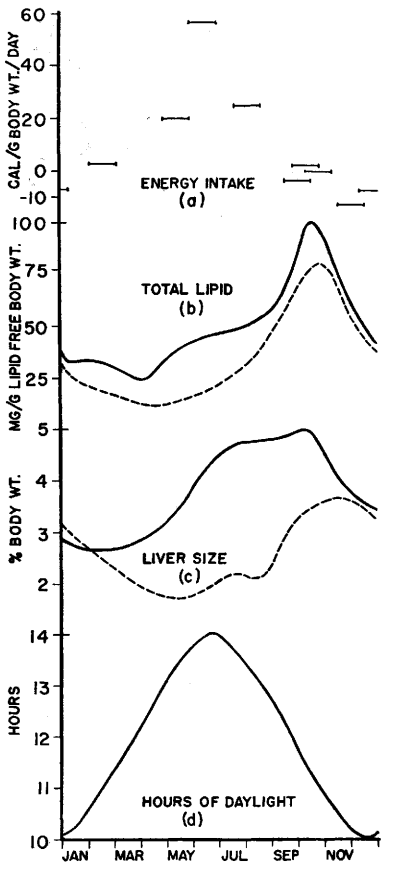

FIG. 1. (a) Seasonal fluctuations in avg energy intake of colonies of adult, male lizards kept in the laboratory at 28°C, exposed to natural hours of light. Each bar shows excess or deficit in calories eaten during the first 30 days of feeding. (b and c) compare total body lipid and liver size of animals at termination of each feeding experiment with values found for animals in the wild. Feeding ————; wild – – – –. (d) Hours of light between sunrise and sunset at 30°N. latitude.

only slightly less than the total N losses of completely starved lizards during the same period(5). In winter lizards reach their peak food consumption 2 or 3 weeks after being brought into the laboratory, whereas animals captured during the remainder of the year exhibit their greatest appetite during the first few days of exposure to laboratory conditions.

In Fig. 1b total lipid content of captive animals is compared with that of lizards in the wild. During months of intense appetite, lizards increase in body weight and in total lipid content. The fat storage process occurs throughout the summer but appears to be

most efficient during late summer and fall. The time lag between peak appetite and maximum fat deposition may be due to differences in the activity of *Anolis* in these two seasons(6). Calories consumed in excess of standard metabolic requirements exceeded greatly the caloric equivalent of fat stored by mid-May to mid-July captive colony but were only slightly greater than the caloric equivalent of fat stored by mid-July to October colony. From the time of maximum fat storage in the fall until mid-January, appetite is minimal and animals undergo a progressive decrease in body weight and in fat content. Although fat stores have diminished considerably by late December, appetite remains poor. Apparently, in this season, food consumption by the lizard is not directly correlated with lipid stores.

In Fig. 1c liver size of captive lizards after their average 2-month feeding period is compared to liver size of lizards in the wild(2). In late spring, with the return of appetite, the liver enlarges. This enlargement is relatively rapid in animals in captivity where the food is readily obtained and temperatures are always warm. The increase in size of the organ involves a growth as well as an increase in fat. Liver nitrogens of lizards from feeding colonies sacrificed between January and April averaged 0.717 ± 0.151* mg liver N/g lipid free body wt, but by June the average was 0.976 ± 0.159* mg liver N/g lipid free body wt. Apparently, once appetite returns, one of the first important changes in gross composition of the animal is synthesis of liver protein. Once liver protein reaches this peak value it does not vary greatly until the period of hibernation in early winter. The size of livers of captive lizards throughout the year is generally greater than size of organ of animals in the field. As the maximum liver protein in captive lizards in autumn is only slightly greater than the maximum value found in wild controls, the larger liver of captive lizards in this season is due primarily to an increased fat content of the organ.

Discussion. Besides *Anolis,* the lizard, *Eumeces fasciatus*(7), and the alligator(8) are known to have a diminished appetite during the winter. Since *Anolis* does not eat well when brought from the field into a warm laboratory in winter, factors other than mere temperature differences are involved in appetite control in this animal. The possibility that daylength may be such a factor is suggested by a comparison of the chart of energy intake during the different seasons with Fig. 1d which shows the hours of light between sunrise and sunset at different times of the year(9). Preliminary measurements of food consumption of experimental groups exposed to short and long periods of light substantiate this impression(10). It is highly possible that light as well as season of year are further factors which must be considered in any appraisal of the mechanism of appetite control in certain animal forms.

Summary. Food consumption of adult male lizards (*Anolis carolinensis*) at 28°C is maximal in summer and minimal in winter. This seasonal variation in appetite appears to be correlated with hours of daylight and is responsible in part for seasonal changes in body composition of this lizard.

* Standard deviation from the mean.

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