active organisms. That such acquisition of protein is important to the oyster in the late summer after its exhaustion due to repeated spawning cannot be doubted.

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Age and Resistance to Ether in Mice.

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Wide variations have been observed in the length of time necessary to anesthetize mice by means of ether. Active adults as well as old and rather feeble animals reacted in perhaps one-tenth of the time of young a week or less in age. Two groups of mice were available for testing this observation, and a series of experiments was made with each group.

The first of these groups (here designated the K Strain) was a genetically heterogeneous lot, containing various combinations of the following mutant types: chinchilla, extreme-dilution, albinism, white-bellied-agouti, non-agouti, brown, short-ear, piebald, silver, dwarf, flexed-tail, and several new types of which the genetics is not fully worked out. A number of these mice were from the stocks of Dr. G. D. Snell of the University of Texas, to whom the author is greatly indebted for assistance in many ways. The second group (here designated the Inbred Strain) was, on the other hand, relatively homogeneous genetically, as a result of some 25 generations of inbreeding, and contained only the wild agouti type. These mice were kindly sent to the author by Dr. L. C. Strong of the Roscoe B. Jackson Memorial Laboratory, Bar Harbor, Maine.

The apparatus consisted of several 3-liter flasks with rubber stoppers; fresh "Ether Squibb"; a graduated pipette; platform scales; thermometer. The procedure was as follows: Into one of the flasks at room temperature (23°-26°C.) was introduced 2.4 cc. of liquid ether, which was allowed to vaporize while the stopper was loosely in place. Then with the stopper tight, the flask was inverted for one minute, after which it was allowed to stand for a further 10 to 15 minutes, when the temperature within the flask

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was about 2° lower than room temperature. With the flask inclined to permit the mouse to slide rather than drop to the bottom, the stopper was removed, the mouse introduced as quickly as possible, and the stopper immediately replaced. The time of introduction was recorded. When immobilized, the mouse (still within the flask) was rolled over in order to allow observation of the movements of the abdomen. The cessation of breathing (the assumed death point) was taken as the time at which these breathing movements of the abdomen were no longer detectable. This time was recorded to the nearest 5 seconds. The animal was then removed and weighed.

The results with the K strain (87 individuals) showed a definite negative correlation between age and cessation of breathing under etherization. Mice under 8 days of age ceased breathing in general only after 30 to 60 minutes; at 15 to 17 days of age cessation occurred in 5 to 10 minutes; and from 21 days to 32 days in 3 to 5 minutes. Higher age groups showed much less uniformity but most animals in these groups gave records of 3 to 6 minutes.

Averages for the different age groups (up to 32 days) are plotted in Curve A, Figure 1. There are many irregularities, some of which were probably caused by such interrelated factors as differences in weight, early or late maturing, number of sibs, and variation in the endocrine balance.[1] Since these factors might have a genetic basis, it seemed highly desirable to repeat the experiment upon a long-inbred strain of mice.

The results of the second series from the Inbred Strain (52 individuals) are shown in Curve B, Figure 1. As compared with Series K two differences appeared in this inbred series,—there was much less variation, and cessation of breathing occurred considerably later in the lower age groups. Young of lighter weight have greater resistance, the heavier animals generally behaving as though they were slightly older than their lighter sibs.

Sumner[2] gives information which suggests an explanation for the age differences in the susceptibility of mice to ether, that in young mice the heat-regulating mechanism of the body is poorly developed. A graph of Sumner's recordings (Curve S, Figure 1) of the body temperatures of mice is herewith combined with the author's observations of the effect of age on etherization-time. The line of the Inbred Strain follows Sumner's line so closely as to be

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1 Scott, W. J. M., *J. Exp. Med.*, 1923, **38**, 543.

2 Sumner, F. G., *J. Zool.*, 1913, **15**, 348.

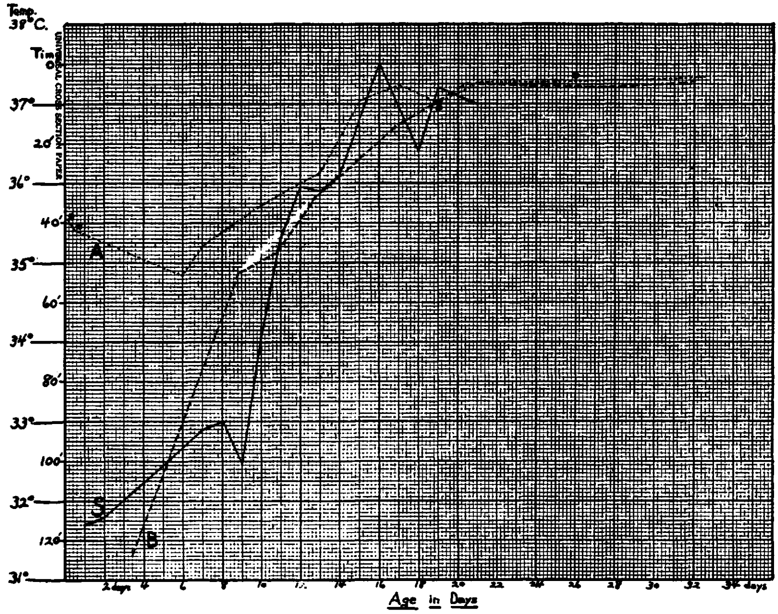

FIG. 1.

Age, Etherization-Time and Body Temperature of Mice.

The solid line "S" gives the body temperature of mice up to 3 weeks of age, as given by Sumner.[2]

Broken line "A" gives the time of cessation of breathing by etherization at various ages (up to 32½ days) of the K Strain.

Broken line "B" gives the cessation of breathing by etherization at various ages (up to 32 days) of the Inbred Strain, except that mice differing in age by three-tenths of a day or less, are charted as if belonging to the same age group.

* Indicates a point determined by only a single individual, and hence unreliable as a part of the curve.

strongly suggestive that the reason for the slower rate of etherization in the young mice is a lowered metabolism associated with a drop in their body temperatures after removal from the nest—the removal occurring about 5 minutes before the introduction into the flask.

The author hopes to obtain further evidence upon this explanation by running a similar Inbred Strain series at a temperature of 37°C.

The results of Avery and Johlin[3] in their tests with nitrogen, argon, hydrogen, carbon dioxide, carbon monoxide and illuminating gas, may possibly be similarly explained.

[3] Avery, R. C., and Johlin, J. M., PROC. SOC. EXP. BIOL. AND MED., 1932, **29**, 1184.