(*c*) The irradiation disrupts the natural cellulose of the wood, which, unlike filter paper, is not susceptible to digestion by rumen bacteria.

The present study does not favor or eliminate any of these possibilities.

This work will be reported in detail elsewhere.

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The Determination of Cholinesterase Activity in Whole Brains of Developing Rats

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The cholinesterase activity of the chick brain has been determined by Nachmansohn (*1*). Later, Sawyer (*2, 3*) demonstrated the correlation between cholinesterase activity and motility of the developing embryo of *Amblystoma maculatum.* Using Sawyer's modification of the microtitrometric method of Glick (*4*), we have measured the activity of cholinesterase in the brain of the developing white rat. The experimental data from this investigation are shown in graphic form in Fig. 1.

The determinations were made on rats ranging in age from the 14-day fetus to the adult. In order to obtain embryos of known age, rats were bred during one night and the age of the fetus was considered to be one day at midnight of the first night thereafter. In the 14-day fetus, the earliest stage employed, the fetus weighed less than 0.1 g, and the entire top of the head was considered to be brain tissue. In 16-day and older fetuses, the brain is sufficiently well outlined to allow removal by dissection.

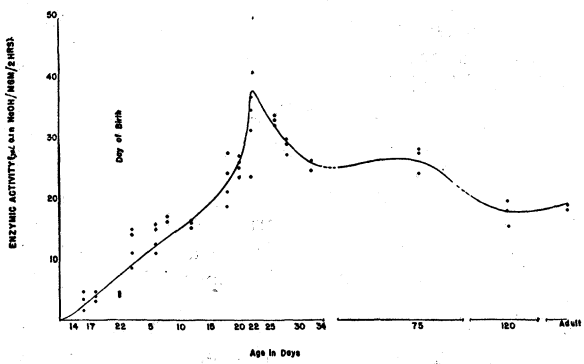

FIG. 1. Cholinesterase activity in the brain of the developing rat.

The cholinesterase content of the 14-day, or earliest, fetal rat brain studied was less than the error of the method, but in the 16-day fetus a measurable quantity of cholinesterase was found. Although the rat fetus shows a considerable increase in size from the 16th day of gestation until birth, the activity of the esterase remains constant until the 2nd postnatal day. From the 2nd to the 22nd day after birth a rapid increase in the concentration of the enzyme is apparent. In contrast to this early increase, the activity of cholinesterase declines sharply from the 26th to the 32nd day, after which there is a gradual decline to the adult level, this being reached at about 120 days after birth.

In our study stages from the day of birth to the 32nd postnatal day were spaced about 2 days apart. In order to bridge the gap between the young stages and the adult, animals of about 2½ and four months of age were included.

The curve obtained when the activity of cholinesterase in the whole brain of the rat is plotted as a function of age is similar to the one shown by Sawyer (*2*) for *A. maculatum.* In his observations on early embryos, Sawyer used the whole brain and the spinal cord as far caudal as the level of the anus, whereas in studies of some of the later stages he made separate determinations on the brain and the spinal cord. Sawyer found that the activity of the enzyme was present to some small extent even before the larvae were motile, but that the activity began to rise sharply as the organism reached the swimming stage and continued to rise for several days after feeding had begun, reaching a peak about 20 days after initial feeding. From this point the curve declined, rapidly at first, and then more slowly during metamorphosis until it reached, late in development, the level characteristic of the adult. Sawyer found the rapid rise in the enzyme concentration during the early larval period to occur at a time when the larva shows maximum activity as indicated by rapid feeding reflexes and low threshold to external stimuli. The same author postulated that the decline in the activity seen in the adult was due to the development of esterase-diluting structures in the brain.

Our curve showing cholinesterase activity in the rat agrees well with the work of Sawyer. The immaturity of the rat at birth probably explains why changes similar to those found by Sawyer do not occur until the first weeks after birth; nor until 2 days after parturition does the enzyme activity in the rat begin to rise, and then it rapidly increases to a peak on the 22nd day after birth. By the 26th day the activity begins to decline. This decrease, like that found by Sawyer, can probably be explained by the formation of tissue that is not rich in cholinesterase. Angula (*5*) reports that the 14-day fetus is nonmotile, and from that time until birth there is a slight increase in ability to respond. Stone (*6*), reporting on the growth of responses in the postnatal rat, reports a rapid in-

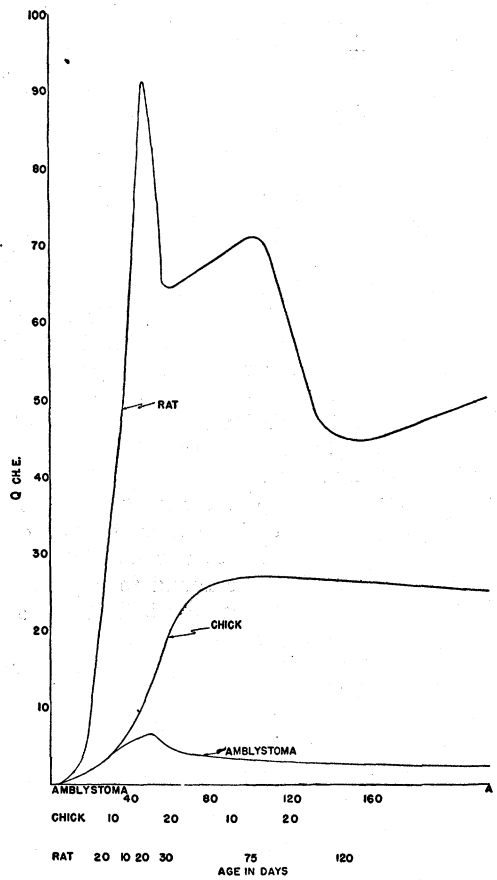

FIG. 2. Comparison of the *Q CH.E.* of rat, chick and salamander nervous tissue, during comparable stages of development.

crease in muscle coordination from the day of birth and continuing through the 22nd day, at which time the rat possesses virtually all the adult responses. These data correspond very well with the rise in the esterase content in the rat brain. In the early fetal stage, in which Angula found the animal to be nonmotile, the enzyme content was too low to be measured. The development of reflexes is accelerated in the days just following parturition. The rise in esterase activity during this period is probably responsible for the increased use by the organism of functional nervous pathways.

Nachmansohn (*1*), in his examination of the esterase content in the brain of the chicken, found that the activity of the enzyme increases sharply to the 8th day after hatching and subsequently fell only slightly in the later development. Nachmansohn made a series of determinations from early embryonic stages to the time of hatching. At the 6th day of incubation, the *Q CH.E.* was 1.38, increasing to 20.8 at 20 days' incubation, and reaching the highest value of 26.0 at 8 days after hatching. The value for the adult is 25.6. These data show that the curve in the chick begins to rise at an early developmental stage, probably as a result of the very rapid early development of the embryo within the egg. By the time of hatching the chick is well developed and has most of the adult reflexes. Determinations made by Nachmansohn (*7*) on a few isolated stages of the sheep embryo indicate merely that the enzyme activity increases from the 75th day to the 138th day of life.

The data relative to the development of cholinesterase in the nervous tissue of *Amblystoma* as described by Sawyer, in the brain of the chick as observed by Nachmansohn, and in the rat brain can be plotted for comparison on the same coordinates in a manner similar to the one employed by Sawyer (*3*) (Fig. 2). In obtaining our *Q CH.E.* values for the rat brain tissue, the fresh weight of the tissue was assumed to be four times the dry weight, this being sufficiently accurate to show the similarity of the curves for the three animals.

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The Effect of Radiations on Galactozymase Formation in Yeast

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Adaptive enzyme formation in microorganisms is reduced or prevented by such cell poisons as azide (*1*), arsenate (*2*), and 2,4,dinitrophenol (*1, 3*), which probably interfere with protein synthesis in general. Since various radiations readily prevent cell division, it has been thought that they interfere with protein syntheses (*4*). A study of the effects of radiations upon adaptive enzyme formation therefore seemed pertinent. Galactozymase formation in yeast after addition of galactose is easily followed manometrically and occurs in resting cell suspensions in the absence of exogenous nitrogen (*1*); it is therefore an excellent test material. In a strain of *Saccharomyces cerevisiae* used, the adaptation, after addition of galactose to the suspension of yeast, began in about 90 min at 27° C, as indicated by a rise in rate of oxygen consumption. It was complete in about 180 min, as indicated by the achievement of a maximal rate. In the experiments reported 20 mg of galactose were added to each Warburg vessel containing in the order of 10^7–10^8 cells/ml, as determined by a count with a hemocytometer.

Whereas ultraviolet dosages of approximately 18,000 ergs/mm² from a sterilamp striking the face of the vessel merely retard the appearance of adaptation, a dosage twice as large inhibits it entirely. Dosages of ultraviolet sufficient to prevent adaptation have little