# LETTERS TO THE EDITORS

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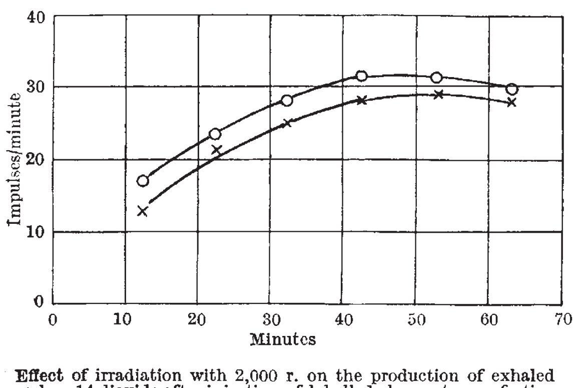
## Effect of Irradiation by X-Rays on the Exhalation of Carbon Dioxide by the Mouse

IT has been shown previously that the rate of formation of deoxyribonucleic acid is depressed by a sublethal dose of X-rays. Both the incorporation of phosphorus-32 [1-5] and that of carbon-14 [6,7] was found to be reduced about 50 per cent. The rate of incorporation of carbon-14 into the purines of ribonucleic acid is reduced as well[7], though to a smaller extent than its incorporation into the purines of deoxyribonucleic acid. These blocking effects are presumably due to inactivation of enzymes involved in the synthesis of the deoxyribonucleic acid and ribonucleic acid compounds. One or a few days after irradiation, the incorporation of carbon-14 into purines of deoxyribonucleic acid has nearly returned to the rate for the non-irradiated controls. This suggests that a partial reactivation has occurred. The early metabolic changes produced by irradiation are not confined to interference with nucleic acid synthesis. We find that irradiation interferes with glucose metabolism as well.

Fully grown mice which had been fed *ad libitum* were placed in perforated metal boxes which prevented gross movement. In each experiment four such boxes were symmetrically placed in a metal cylinder containing carbon dioxide-free air and kept at 27°. Exhaled carbon dioxide was swept from the brass cylinder by carbon dioxide-free air at constant velocity and collected in a series of three wash-bottles containing barium hydroxide. At intervals of 10 min. the air stream was switched over to another aggregate of wash-bottles. The carbon dioxide was collected for one hour.

Glucose (60 γ having an activity of 0·03 μC.) labelled in all its carbon atoms was injected subcutaneously into each mouse immediately after irradiation. Collection of carbon dioxide started 8 min. after injection. The increase in weight of barium carbonate with increasing time shown in the graph has no significance, as it is a result of the fact that the content of exhaled carbon dioxide in the metal cylinder increases with time. We wished only to determine the ratio of carbon dioxide exhaled by irradiated and control mice, not the total amount exhaled.




Effect of irradiation with 2,000 r. on the production of exhaled carbon-14 dioxide after injection of labelled glucose to non-fasting mice. O, control ; ×, irradiated

We found that the non-fasting irradiated mice exhale only some 80 per cent of the amount of carbon dioxide exhaled by control mice. This result does not necessarily prove an impaired catabolism of body glucose. Since only about one-half of the exhaled carbon dioxide originates from catabolism of glucose[8], the other half having its origin in catabolism of fatty acids and other body constituents, it may be that the catabolism of the last-mentioned compounds and not that of glucose is responsible for the reduced exhalation of carbon dioxide by the irradiated mouse. The fact, however, that if labelled glucose is administered the irradiated mice exhale a smaller amount of carbon-14 labelled carbon dioxide than the controls proves unambiguously that irradiation depresses the glucose catabolism of irradiated mice. The graph indicates that the depression is already apparent after the lapse of 8 min. and may possibly be still more pronounced at an earlier time.

It is of interest to note that Lourau and Lartigue observed that addition of glucose to the diet of the guinea pig increases its radiosensitivity[9], that irradiation with 500 r. produces hyperglycæmia in the irradiated animal[10] and, quite recently, that 12–15 days after irradiation glycogen formation in the liver is reduced 1–2 hr. after feeding glucose[11].

The reduced catabolism of glucose in the irradiated mouse is reflected in an increase of forty to one hundred per cent in the carbon-14 content of liver fats.

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## The Philippine Trench and its Bottom Fauna

VERY little is known about animal life in the greatest ocean depths; only two previous hauls seem to have been made below 6,000 metres. In 1899 the U.S. Fish Commission steamer *Albatross* obtained siliceous sponges in the Tonga Trench at 4,173 fm. or 7,632 metres[1]. A similar deep haul was not made until 1948 when the Swedish Deep Sea Expedition trawled holothurians, a fragment of a polychæte, an isopod and a few amphipods in the Porto Rico