Table 2. BIOLOGICAL HALF-LIFE OF CÆSIUM IN THREE MEN CALCULATED FROM BODY CONTENT AND MEAN DAILY EXCRETION OF FALL-OUT CÆSIUM-137

	Subject *R* April 1959	Subject *R* April 1961	Subject *M* April 1961	Subject *C* April 1961
q (mμc.)	5·5	2·55	6·4	7·65
m (mμc./day) (urine + fæces)	0·081	0·036	0·051	0·042
a	0·885		0·93	0·93 (assumed)
λ_2 (day^{-1})	0·0130	0·0125	0·0074	0·0051
τ_2 (days)	53	55	94	136
τ_2 (days) (from acute exposure study)	58		100	—

from the gastro-intestinal tract to the blood, of cæsium-137 ingested in food, was at least 0·9.

The good agreement between the values for τ_2 determined by the two methods validates the integrated form of the acute exposure retention equation as applied to chronic exposure. The detailed results of the acute exposure study will be published elsewhere.

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[1] *Recommendations of the International Commission on Radiological Protection, Report of Committee II on Permissible Dose for Internal Radiation* (Pergamon Press, London, 1959).
[2] Rundo, J., *Proc. Second U.N. Conf. Peaceful Uses Atomic Energy*, **23**, 101 (1958).
[3] Richmond, C. R., Furchner, J. E., and Langham, W. H., *Health Phys.*, **8**, 201 (1962).
[4] Rundo, J., Paper presented at Second Intern. Congress of Radiation Research, Harrogate, 1962.
[5] Rundo, J., *Brit. J. Radiol.* (in the press).
[6] Rundo, J., *Nature*, **188**, 703 (1960).
[7] Rundo, J., and Newton, D., *Nature*, **195**, 851 (1962).

BIOLOGY

Second-day Minimum in the Growth Curve of Mice subjected to Magnetic Fields

IN a previous communication[1] it was shown that strong static magnetic fields retard the growth of young mice. The maximum weight difference, relative to identically housed controls, is reached after 10–12 days of residence in a homogeneous field of 4,200 œ strength. In the first such experiments, conducted in 1948 in the Institute for Experimental Physics of the University of Budapest, as well as in the twelve subsequent experiments conducted on several hundred mice in the laboratory of the Biomagnetic Research Foundation in Evanston, Illinois, a sharp drop in the weight of the mice was observed on the second day of residence in the field, followed by a steep increase up to the base line.

To investigate this 'shock effect' of the magnetic field, six 20-day-old female *IRC* strain mice were conditioned for 18 days to the $3\frac{7}{8}$ in. diameter and $1\frac{7}{16}$ in. high cages, used in the electromagnet and in the dummy magnets alike. The cages had automatic water and food supply (Rockland Mouse Diet), the floor of the cages was a copper plate covered with 'Mylar', thermally insulated from the lower pole (or the simulated pole of the dummy magnets) and kept through a thermocirculator at 28° C. Between cage wall and floor a circular opening provided free movement for the tails of the mice and helped to sweep excrements and food remnants from the cage area. When the Varian 4-in. electromagnet was energized, it produced a field of 9,400 œ in the centre of the cage and 8,900 œ, 0·5 in. from the cage wall. The average paramagnetic strength of the field was, therefore, about 1·5 mega-œ^2/cm. Water cooling of the electromagnet kept the magnet poles 2° below the room temperature of 23° C. The dummy cages, situated 2 ft. from the magnet, had identical lighting and ventilation conditions.

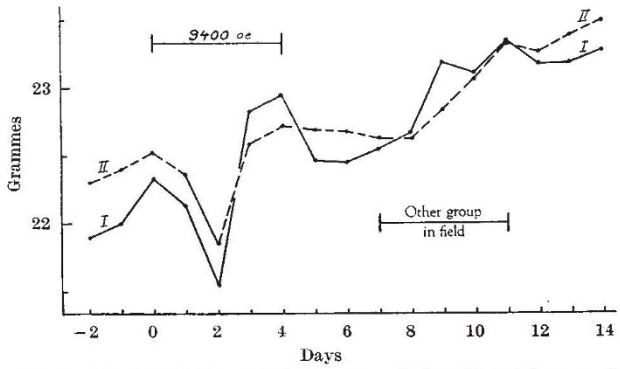

Fig. 1. Average growth curve of two groups of mice, alternately exposed each 14 days, for 196 h, to a vertical field of 9,400 œ

The six animals were divided into two groups, three in the magnet cage and three in the dummy magnet cage. The following sequence was adopted: The magnet was energized from 4 p.m. Monday until 4 p.m. Friday, when the magnet group was similarly placed in a dummy magnet cage. On the following Monday the previous dummy group was placed in the field from 4 p.m. Monday until 4 p.m. Friday and the sequence repeated. The weight of the mice was individually measured to 0·1 g every day at 4 p.m., when the cages were cleaned.

With this schedule, the same group was treated every 14 days for 196 h in the field. The 14-day cycle was repeated 5 times and covered the age-period of 5–16 weeks. Group I mice started and finished the 5 cycles one week earlier than group II mice; therefore, their average age and weight are less and their average growth rate slightly higher. Fig. 1 shows, for each group separately, the average weight variation during the 14-day cycle. It can be seen that the second-day minimum is definitely present. The average weight difference between zero hour and 48 h in the field is $-0{\cdot}95 \pm 0{\cdot}29$ g, and the difference between 48 h and 96 h in the field is $+0{\cdot}99 \pm 0{\cdot}37$ g. (Both corrected for average daily weight gain.) The existence of the second-day minimum is thus established on a probability-level of 1 : 3,000. The magnitude of the minimum does not decrease in subsequent cycles, proving that the mice do not get adapted to the 'shock' of the magnetic field, if repeated every 14 days. It seems that an after-effect of the field prevails for four days after removal, since during this time the normal growth is arrested.

The experiments were partly supported by graduate research grant No. 56–92–36 of the University of Illinois.

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[1] Barnothy, J. M., *Nature*, **200**, 86 (1963).

Loss of Liver Cell Antigens in Azo-dye Induced Hepatomas of Rats

THE immunizing ability of several chemically and virus induced tumours and immuno-chemical studies suggest that neoplasms of animals and man are characterized by a changed antigenic composition[1–3]. As yet, however, no regularity in these changes has been observed, probably due to the small amount of data available. It remains unknown whether the cell type of a tumour, the carcinogens used for tumour induction, or the genetic composition of the neoplastic cells affect the kind and