some component of this ore was apparently absorbable and was physiologically active in increasing the deposition of the radionuclide in the skeletal structure of the chicks. An alternate explanation may be that an absorbable Sr-complex was formed similar to that reported with Sr-lactate complexes(7). These findings are in direct contrast to those reported using verxite in ruminant animals(5) using Sr^{89} and Cs^{137} and those in rats using Cs^{134} and Rb^{86}(4). The use of flakes of verxite in place of granules, however, showed an inverse relationship between the dietary amount of verxite and the deposition in the bone, although those groups receiving the lowest level of verxite flakes deposited essentially as much or more of the radiostrontium than those which received the radiostrontium but no verxite.

If radiostrontium were chelated by verxite ore and the complex formed was unabsorbable, the rate of excretion of radiostrontium would be expected to be directly proportional to the amount of dietary vermiculite supplied. However, this was not the case. In fact the opposite relationship was observed, indicating increased retention of the radioisotope as the dietary verxite was increased.

Summary. Data from an investigation of oral administration of radiostrontium (Sr^{89}) to chicks indicates that feeding either untreated or acid activated verxite, a high purity hydrobiotite, is not effective in preventing absorption and deposition of radioactive strontium in the chick.

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An Automated Basal Metabolism Apparatus for Small Animals.* (31377)

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Various devices have been described for determining the basal metabolic rate (BMR) of small animals(1,2,5). However, except for one complex apparatus(1), none of these allow the investigator to eliminate periods of stimulated oxygen consumption due to physical activity of the animal from the determination of the BMR. The system to be described allows for the detection, and therefore the elimination from the BMR calculation the increased oxygen consumption periods due to physical activity as well as other factors which influence this measurement. This apparatus automatically records oxygen consumption, respiratory rate and physical activity using equipment which is readily available in many laboratories. The method is based on the principle that oxygen consumption is proportional to the decrease in pressure in a closed system(2). An equilibration device returns the internal pressure to atmospheric at approximately one-

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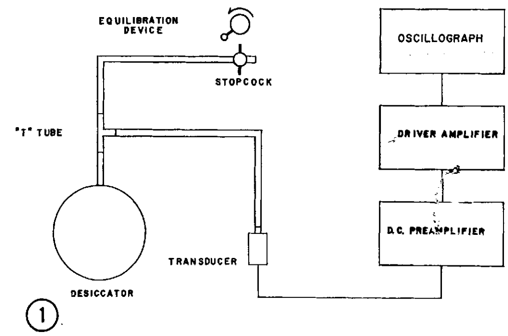

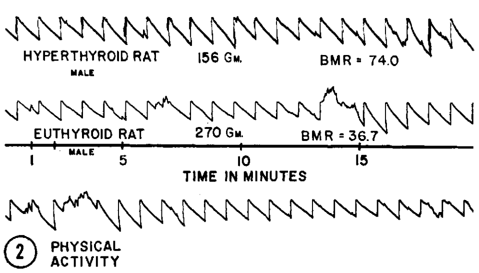

FIG. 1. Schematic diagram of automatic basal metabolism apparatus. The desiccator is a Corning #3120, 200 mm i.d. with sleeve, the transducer is a Statham #P23BC, 0-5 cm Hg, the oscillograph and associated components are a Grass Model 5D polygraph, and the equilibration device consists of a Gorrell and Gorrell Monodrum kymograph motor and metal stopcock.

FIG. 2. Typical oxygen consumption recording showing weight, sex, and BMR of 2 animals under different treatments. The BMR is expressed in cal/sq meter/hr. The lower recording shows the effect of physical activity on oxygen consumption and on the character of the recording.

minute intervals. By employing electronic transduction and amplification as well as a multichannel recorder, a highly sensitive system has been developed which simultaneously records oxygen consumption of 3 animals. No temperature controlling device was employed since it was found that no detectable change in temperature occurred during the short measurement period when the animals were inactive.

Description of apparatus. The system consists of 3 identical units, one of which is shown diagrammatically in Fig. 1. The rat is placed in a 4.8 liter desiccator in a wire mesh holder over 200 g of soda lime which serves as a carbon dioxide absorbant. The desiccator is connected to both a transducer and a stopcock by way of rubber tubing and a glass "T" tube. The transducer is in turn connected to the amplifier and the oscillograph. The stopcok is spring-loaded to hold it in a closed position. The equilibration device consists of a shaft rotated by a constant speed kymograph motor with a projection which forces the stopcock open. An atmosphere of essentially 100% oxygen is maintained in the metabolism chamber by running tubes from each stopcock into a 1 liter flask constantly filled with oxygen from a cylinder. A thermometer is mounted on the animal holder to record temperature inside the desiccator. Barometric pressure was read from a laboratory barometer.

Operation of the apparatus. After placing the rat in the holder, the desiccator was flushed with 100% oxygen for 2 minutes. The desiccator is then sealed and the recording begun. Animal weight, temperature inside the desiccator and barometric pressure were noted. The apparatus was calibrated by withdrawing a 5 ml volume by means of a pulsation pump and adjusting the recorder sensitivity to give a 1 cm pen deflection.

Tests of function of the apparatus. The gas handling characteristics of the apparatus were studied. It was found that closure of a desiccator at least 5 minutes resulted in no detectable change of pressure in the closed system. The introduction of 5 ml of air caused an upward deflection of the recorder pen which remained at that level for at least 5 minutes, demonstrating that the system did not leak. The introduction of 5 ml of 100% carbon dioxide resulted in an initial rise of the recorded pen but it returned to the baseline within 15 minutes, indicating complete absorption of the carbon dioxide.

The time necessary for absorption of carbon dioxide to reach equilibrium was studied by introducing 5 ml of 100% CO_2/minute into the system by means of a pulsation pump while the system was being equilibrated every 55 seconds. It was found that 15 to 20 minutes were necessary for this equilibration to take place. The chamber temperature was found to be very stable during period in which no activity occurs. All of these parameters were again observed after the installation of a small fan but since no significant change was noted and since it disturbed the animals the fan was not included in the system.

It was possible to record the oxygen consumption of unanesthetized rats by taking advantage of their nocturnal nature of being relatively inactive during the day. It was found that they were usually quiet after being in the chamber about 1 hour. Since the various parameters had reached a steady state by 1 hour, readings obtained after this time were used in calculating the basal metabolic rate.

The carbon dioxide concentration of the gas mixture in the desiccator was measured at 5, 60, and 120 minutes. It was found that the CO_2 content remained constant at 0.76%, 0.78%, and 0.77%, respectively, at 5, 60 and 120 minutes.

Results. A typical recording of 2 rats under treatment is shown in Fig. 2. The stimulatory effect of activity on oxygen consumption as well as a typical activity recording can also be seen at the bottom of Fig. 2. The stimulatory effect of minor activity on oxygen consumption noted in these experiments is in agreement with the findings of a similar study(1). This effect is masked somewhat by the rise in temperature which occurs during activity. Basal metabolic rates were calculated by averaging 10 or more of the smallest deflections occurring during periods when the rats were inactive as noted from the recording. Respiratory rate can be measured by increasing the recorder chart speed from 0.25 mm/second to 2.5 mm/second.

The basal metabolic rates of a group of euthyroid control rats and a group of triiodothyronine-treated rats are given in Table I. The control basal metabolic rate values are in agreement with a value in the literature(3) as are the values obtained with thyroid hormone treatment(4).

TABLE I. Basal Metabolic Rates (BMR) of Euthyroid and Hyperthyroid Rats.

Treatment	Euthyroid saline injection daily for 10 days	Hyperthyroid L-triiodothyronine at 150 μ/kg/day for 10 days
BMR cal/sq m/hr ± S.D.	34 ± 1.8	64 ± 3.7
No. of animals	7	7

This apparatus, which is easily assembled, automatically measures and permanently records oxygen consumption, respiratory rate, and physical activity in small animals such as the rat. This system has the distinct advantage of allowing the investigator to avoid the inclusion of periods of stimulated oxygen consumption due to physical activity in calculation of the basal metabolic rate.

Rats were rendered hyperthyroid by treating with Liothyronine Sodium, kindly donated by Smith Kline and French Laboratories, Philadelphia. The authors wish to acknowledge the assistance of Mr. Jim Fisher in analyzing the gas samples.

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Differential Nucleic Acid Metabolism of Planarial Segments. (31378)

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Recent studies(1) by Best and Elshtain have shown that in planaria, electrical discharge of different classes of neurons in the animal can be related to the voltage used to produce an unconditioned response. This was attributed to a relatively low rheobasic intensity and long chronaxie in the long neurons compared with short neurons. It was demon-