ASSESSMENT OF THYROID GLAND FUNCTION IN RATS BY RADIOACTIVE IODINE ABSORPTION

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The determination of the functional state of the thyroid gland by means of radioactive iodine in chronic experiments on rats is of considerable importance, for rats are a convenient subjectfor experimental investigation on a large scale.

The assessment of the function of the thyroid gland by means of radioactive iodine is complicated in these animals by the difficulty of keeping them during the required period of time in the appropriate position in relation to the counter, which interferes with observations on the trend of iodine absorption by the thyroid gland.

We have invented a device for fixation of rats, which has made it possible to determine the quantity of radioactive iodine absorbed by these animals during the course of prolonged experiments, by means of the Geiger-Muller counter.

This device is shown in Fig. 1, and consists of a base – a wooden board (1) measuring 200-400 mm, covered with tinfoil – to the front edge of which, the bed for the screen housing of the MS-4 counter tube (2) is rigidly fixed.

The counter tube is enclosed in a lead tube, 47 mm in diameter, with a wall 12 mm in thickness. In the middle part of the tube, and for half its diameter, a rectangular piece is cut out to a width of 40-45 mm (3), in which the rat's neck is placed. Since the counter tube is in the center of the lead tube, its upper half projects above the base of the cut-out portion, which guarantees firm contact between the counter and the anterior surface of the animal's neck.

A small cage (4) for the rat is placed next to the counter, screened as shown, at the site of the cut-out part of the tube, and is fixed to the baseboard by means of nails. The cage also has a base – a wooden board measuring 300 × 50 mm, covered with tin. Starting at the front edge and for a distance of 150 mm, a number of flat metal arches (5) are fixed to this base, and make the wire of the cage sufficiently firm. The animal is placed in the arched space thus formed.

A series of holes for escape of urine (6) is made in the base of the cage, in the front part near the arch. In the posterior part, holes are made in the midline of the base at intervals of 10 mm for fixation of the posterior, movable door of the cage by means of a bent pin (7).

To the front arch is attached a transparent plastic cap (8), bent to the shape of the animal's neck (in the form of half a truncated cone). The attachment of this cap is hinged, so that its height can be regulated by means of a special flat lever (9).

Movement of the rat in an anteroposterior direction is prevented in front by means of a special stop, consisting of a metal cone with holes, which is attached by means of shackles to the edge of the cut-out portion of the lead housing of the counter tube (10), and at the

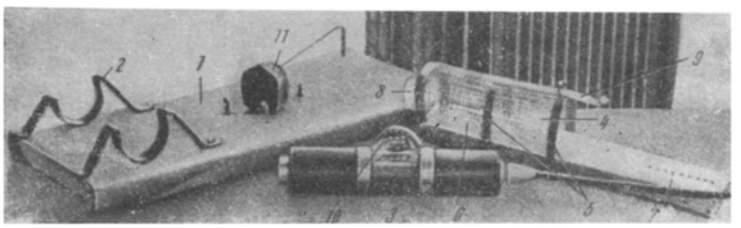

Fig. 1. Device for fixation of rats (in unassembled view). For explanation see text.

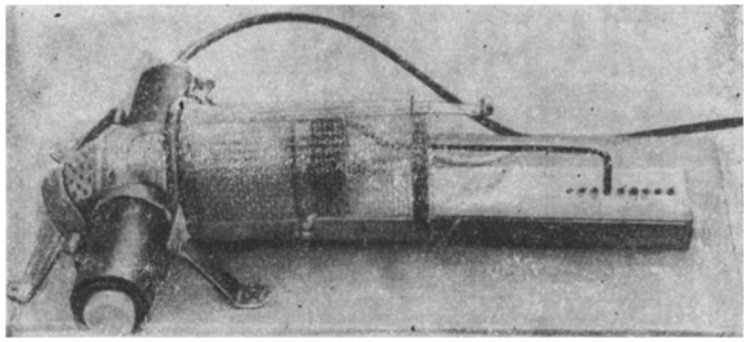

Fig. 2. General view of the device for fixation of rats with an experimental animal in situ.

back by a movable wall (11), whose position is regulated to conform to the size of the rat, and is fixed by means of a pin in a hole in the base of the cage. A portion of the lower part of the posterior wall is cut out to accommodate the rat's tail.

In order to place the rat in the cage, the posterior wall is removed, the animal is placed inside by means of tongs, and the movable posterior wall is pushed up to the animal. The rat moves forward and puts its head out under the cap. In this position the posterior wall of the cage is fixed, and the cap is lowered by means of the lever. The cap must fit firmly to the rat's neck and to the counter, while its front edge supports the head behind the ears. As can be seen in Fig. 2, the rat's head is outside the cap, and in these conditions the rat can freely breathe and perform slight movements of the head.

Escape of the rat from the cage is prevented by the constricted end of the cap and the front stop, which partially covers the head without compressing it.

This apparatus has been tested on a large number of rats.

Observations on the dynamics of iodine absorption were conducted on the same animals for 3 days. Counting was undertaken every 2 hours after intraperitoneal injection of the isotope. During the counting the rat was present in the cage for 30 minutes. During this time 2-3 separate determinations were made.

As our results showed, during each of these determinations the number of impulses counted per minute in this interval of time (30 minutes) differed only very slightly from the others, thus demonstrating the stability of the position of the rat's thyroid gland in relation to the counter, and enabling curves to be drawn to show the absorption of iodine by the thyroid gland.

SUMMARY

A device for fixation of white rats is described. It aids in determining the quantity of radioiodine absorbed by the thyroid gland in chronic experiments (by means of the Geiger-Muller counter).

This adjustment was tested on many rats. Observations of iodine absorption dynamics were conducted for a period of three days in the same animals. This device guarantees stability of the thyroid gland with respect to the counter and enables the curves of iodine absorption by the thyroid gland to be plotted.