

Experimental hypothyreosis and hyperthyreosis

An important function of thyroid gland hormones is to increase O₂ consumption in almost all metabolically active tissues. Insufficient secretion of these hormones causes a decrease of intensity of metabolism accompanied by a decrease of O₂ consumption. The reduction of thyroid hormones secretion can be induced by administration of thyreostatics. On the other hand, the increase of level of thyroid hormones can be achieved by administration of their synthetic analogues.

In this experiment we will compare the effect of hypothyreosis with the effect of hyperthyreosis on the metabolic rate in the laboratory rat. We have two experimental groups:

1. **Pharmacological hypothyreosis:** The rats from this group were receiving thiamazol (Thyrozol 10) at a dose of 100 mg per liter of drinking water for 3 weeks. The thiamazol is an antithyroid agent. It inhibits the attachment of iodine atoms to tyrosine, which means inhibition of the thyroid hormones neosynthesis.
2. **Pharmacological hyperthyreosis:** The animals were receiving levothyroxine (Euthyrox 100). The doses were raised gradually for 3 weeks - from the first (300 µg per liter of water) to the final dose (1000 µg per liter of water). The levothyroxine is a synthetic hormone with the same effect as thyroxine.

Measurement of O₂ consumption

O₂ consumption is measured by a respirometer (sealed container with an attached pipette). Air oxygen is consumed by the rat that is placed inside the container. A special substance (sodalime - a mixture of Ca(OH)₂ and NaOH) inside the container absorbs the expired carbon dioxide. Thus, the oxygen consumption can be measured as a decrease of air volume in the respirometer (movement of a soap bubble inside the pipette towards the container).

Put one rat and a bag filled with sodalime into the container. The container then has to be closed hermetically. Create a soap film at the end of the attached pipette and measure oxygen consumption by reading the exact position of the soap film inside the pipette.

The O₂ consumption is increased by a physical activity of the animal. Several measurements of the same rat can be different in the dependence on the actual activity of the rat. Therefore, we will measure the O₂ consumption in awoken and in anesthetized rats (general anesthesia induced by administration of ketamin and xylazin).

The experiment

1. Repeat the measurement at least five times.
2. Calculate oxygen consumption per minute (ml/min).
3. Calculate oxygen consumption per 1 kg of body weight (ml/min/kg).

	EXPERIMENT 1					EXPERIMENT 2				
Rat – number, experimental group										
Body weight										
Measurement	1	2	3	4	5	1	2	3	4	5
Time (s)										
O ₂ consumption (ml)										
O ₂ consumption per min (ml/min)										
Mean O ₂ consumption per min										
O ₂ consumption per minute per 1 kg of body weight										

