

Practical class 2

Spiroergometry

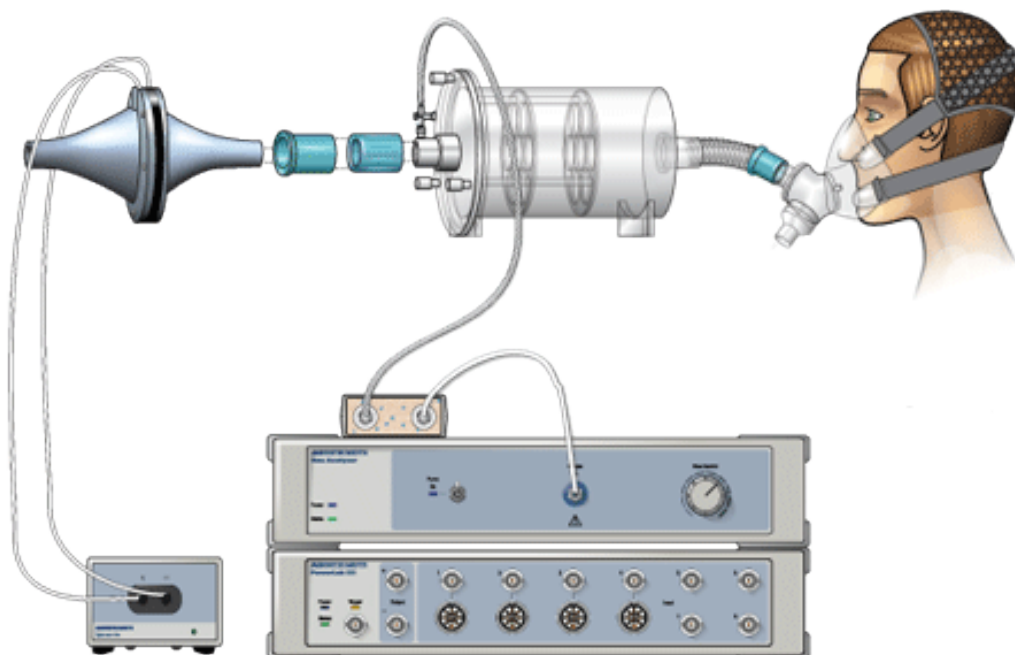
Theory

In this examination the patient is subjected to physical stress by riding bicycle ergometer. There is a mask on patient's face through which ventilatory gases will be continuously measured. In the case of spiroergometry, the % O₂, % CO₂ from the expired air are measured. The sample free of condensig vapour goes from face-mask to the Gas Analyzer. The Gas Analyzer has an infra-red transducer to measure CO₂ concentration and a visible spectrum transducer to measure oxygen concentration. The Spirometer and attached flow head together function as a pneumotachometer, with an output signal proportional to the airflow rate during breathing. Derived tidal volume x respiratory rate gives the person's minute ventilation.

In this examination the load on the bicycle ergometer increase in a step-wise manner. In order to get a reliable result, the test should be maximal or nearly maximal, i.e. the patients should cycle as long as they possibly can.

Increase physical stress causes increase in oxygen consumption and increases expired CO₂ output. R.Q. = Ratio of the volume of carbon dioxide produced to the volume of oxygen used. The range of respiratory coefficients for organisms in metabolic balance usually ranges from 1.0 (representing the value expected for pure carbohydrate oxidation) to ~0.7 (the value expected for pure fat oxidation), these values represents various mixture of the three chemical energy sources.

Face-mask, flow head and the Gas Analyzer



Instructions

Aim

The aim of the practice is to understand why the R.Q. during physical stress changes.

Channel description

- expired O₂ (%)- channel 1
- expired CO₂ (%) - channel 2
- expiratory flow (l/s) – channel 3
- respiratory rate (calculated from channel 3) - channel 4
- tidal volume (l) - channel 5
- minute ventilation (l/min) – channel 6

Procedure

You will be cycling on a bicycle ergometer. The load of the bicycle ergometer will increase in a step-wise manner. In order to get a reliable result, the test should be maximal or nearly maximal. There will be a mask on your face through which ventilatory gases, the % O₂, % CO₂ from the expired air, will be continuously measured. You ride 60-70 RPM, load is continuously increased in 20W steps by 1 or 2 minutes. During the test are following values graphically displayed – minute ventilation, expiratory flow, respiratory rate and volume. As results we can see graphical dependence of O₂, CO₂ and R.Q. in time.

Questions

1. Which factors influence the respiratory quotient?
2. Explain differences in R.Q. during normal ventilation and higher physical exercise.