Experiment: Chemical Control of Respiration

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Objectives:

Understand the study designs, interpret their results and apply the knowledge in order to

1. Describe the roles of $O_2$ and $CO_2$ in control of ventilation

2. Describe the effects of the stimulation of central and peripheral chemoreceptors on cardiovascular and respiratory system

3. Understand the interaction between the cardiovascular and respiratory system
Preparation I

Physiological Signals

Electrocardiogram

Electrode

Amplifier/High Gain Coupler

Lead II

High Gain Coupler

Graphic Display

Physiograph
Preparation II

Physiological Signals
Chest movement

Transducer
Pneumograph

Transducer Coupler
Transducer coupler

Graphic Display
Respiratory Rate, Depth, Pattern

Respiratory Rate,
Preparation III

Physiological Signals
- Sound, Cuff Pressure

Transducer
- Electrosphygmograph

Transducer Coupler

Graphic Display
- Blood Pressure
Physiograph

Respiration

Blood pressure

EKG

Timer
Calibration: Blood Pressure

Systolic Blood Pressure = 100 mmHg

Cal cm = 100 mmHg

Korotkoff sound
cuff pressure

set pump rate: every 0.5 min

Systolic Blood Pressure

Diastolic Blood Pressure
ความสูง tracing (cm)

cal

BP (mmHg)

40 80 120 160
Physiogram

- EKG
- Respiration
- Blood Pressure
- Timer
Recording and Measurements

• Control
  Breath Room Air for 2 minutes as CONTROL measurement

• Experiments (4 DISTINCT Experiments)

• After-Effects
Experiments

1. Breath-holding: as long as possible

2. Inhale 5% CO₂ in Douglas Bag
   • via mouthpiece with noseclip on
   • subject closes eyes
   • breath room air via mouthpiece for 2 minutes as control
   • adjust 3-way valve for CO₂ inhalation
Experiments

3. Voluntary hyperpnea (deep and rapid breathing) for LESS THAN 2 minutes

4. Inhale via mouthpiece connected to Haldane tube
   • via mouthpiece with noseclip on
   • subject closes eyes
   • breath room air via mouthpiece for 2 minutes as control
   • adjust 3-way valve
Soda lime $\rightarrow$ absorb CO$_2$

$\Omega$ 2.5 cm, L 1.2 m, volume 0.6 L

~ Tidal volume