Objectives
Respiratory Regulation
To discuss the case study scenario related to blood gas imbalance.
To define and discuss pulmonary embolism.
To identify the modes of breathing regulation.
To describe the appropriate anatomical features and blood gas detectors associated with breathing regulation.

ER Scenario
.....patient from a house fire
Arterial Blood Gas Analysis (ABG) gives indications of dissolved gases in the blood.
PaO2 = quantity of oxygen dissolved in the plasma (in the arterial system).
PaCO2 = quantity of dissolved CO2.
SO2 = measure of percent oxyhemoglobin.

paO2
Index of lung function.
When paO2 is significantly less than alveolar pO2 → indicates respiratory impairment.
Normal 80-100 mm Hg
Newborn 40-60 mm Hg
In Elderly 80 ( -1 for every year over 60)

SO2
Oxyhemoglobin percentage =
SO2 = (Oxyhemoglobin / Total hemoglobin) * 100
This value is influenced by:
PH
Temperature 95-100% normal
Measurement is a comparison on the oxygen-hemoglobin dissociation curve.

What if SO2 is low?
Low is below 95%
Indication that the hemoglobin is unable to react with oxygen.
May be due to CO poisoning → carboxyhemoglobin
Carbon monoxide competes with oxygen for binding sites on the hemoglobin, with an affinity 200 x's greater than affinity with oxygen.

Hyperbaric Therapy
Exposure to high pressure.
Oxygen can then dissolve into the blood (plasma specifically) to slowly displace the CO from the hemoglobin.
Other uses:
  Decompression sickness - nitrogen narcosis
Pulmonary Embolism
Obstruction of the pulmonary artery.
Usually a blood clot. Happens most typically in post-op patients.
Symptoms:
> Chest pain
> Bloody cough
> Tachycardia – faster than normal heart beat.
> Rapid & Shallow breathing (shortness of breath)
600,000 patients in the U.S./yr
60,000 patients die

Respiratory Parameters
during Pulmonary Embolism
Rapid pulse
BP – high
Tachypnea - Rapid breathing rate
pO2 – Lower - hypoxemia
pCO2 – Higher - hypercapnia
pH – More acidic

Regulation of Respiration
I. Medulla Respiratory Centers
Regulate rhythm
1) Dorsal respiratory group – Inspiratory
2) Ventral respiratory group –
   Has neurons for both Relaxation & Inspiration.
   More important in “forced” expiration.

II. Pons:
   fine tuning breathing rhythm
   prevents lung over-inflation
III. Cortical Controls:
   conscious/voluntary control
IV. Hypothalamus:
   emotions & rapid temp changes

Chemical Factors
Changes in blood chemistry.
I. Central chemoreceptors – ventrolateral medulla. Responds to CO2 levels
II. Peripheral chemoreceptors – greater vessels in the neck. Respond to both increased pCO2 and low pO2 and pH.
   - Aortic bodies
   - Carotid bodies

For Lab next time
Answer sheets for pages 23-29.
Worksheet set with 16 blanks.
Bring data sets related to Spirometry (which we will discuss in further detail).