Regulation of Ventilation

- Case Study – Heroin Overdose
  - Called to psych ward for an emergency
  - Patient, male, late thirties, unconscious, lying on floor, blood oozing from vein between ring and little finger
  - Barely breathing, 5 shallow breaths/min from a face mask supplying 5L/min
  - Pupils pin-point
  - Empty syringe near by
  - Ordered Narcan, an ECG, and blood gases
  - Difficult to find a vein that was not sclerotic, used the jugular vein

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- After about 1 min. breathing became more normal, 12 b/min, remained unconscious
- Cardiac monitor showed, normal cardiac rhythm, strong pulse with normal blood pressure
- ABG #1 – 5 min. after Narcan, 11P.M.
  - FiO_2* 0.40
  - pH 7.11
  - $PaCO_2$ 78 mmHg
  - PaO_2 136 mmHg
  - SaO_2 98
  - $[HCO_3^-]$ 25 mEq/L
  - Base excess –7
- On the way to ICU patient's breathing began to diminish (8b/min), injected Narcan once again and breathing returned to normal, he awoke not knowing where he was
- When asked what he took, he insisted cocaine

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- After about 15 min in ICU speech began to slur and he nodded off to sleep, more Narcan was given

- ABG's were taken periodically but not further treatment was required

- ABG #2 – 12 A.M.

  - FiO_2* 0.28
  - pH 7.31
  - $PaCO_2$ 54 mmHg
  - PaO_2 125 mmHg
  - SaO_2 98
  - $[HCO_3^-]$ 28 mEq/L
  - Base excess 0.4

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- ABG #3 – 2 A.M.
  - FiO_2* 0.21
  - pH 7.36
  - $PaCO_2$ 49 mmHg
  - PaO_2 98 mmHg
  - SaO_2 88
  - $[HCO_3^-]$ 28 mEq/L
  - Base excess 1
- Case Discussion
  - What are the effects of heroin and how does one treat an overdose?
    - Effects and Uses
      - » Relieves pain
      - » Reduces coughing
      - » Slows diarrhea
      - » Venodilator (congestive heart failure)
      - » Inhibits autonomic respiratory rhythm (suppressing pons and medulla)
      - » Inhibits voluntary respiration as a result of decreased wakefulness when taken in high doses

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- How to distinguish cocaine use from heroin use
  - » Pupillary constriction in heroin, dilation in cocaine
  - » Reversibility with Narcan (naloxone), works for heroin not for cocaine – has a shorter half life than heroin so might need to be given frequently
- What to do if Narcan is not readily available
  - » Keep patient awake so that respirations can be initiated voluntarily, activity stimulates the RAS

    coffee

    walking, along with stimulating RAS stretch receptors in joints relay information to the medulla informing the brain that activity is taking place and increased breathing should occur

    slapping in face

    cold water

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- What do the ABG's indicate?
  - ABG's #1
    - Acidosis – what were the two (2) causes?
      - » Hypoventilation (respiratory acidosis)
      - » Increased CO_2 concentration inhibited cardiac cells, tissue hypoxia resulted in lactic acid production – What was the indication of this?

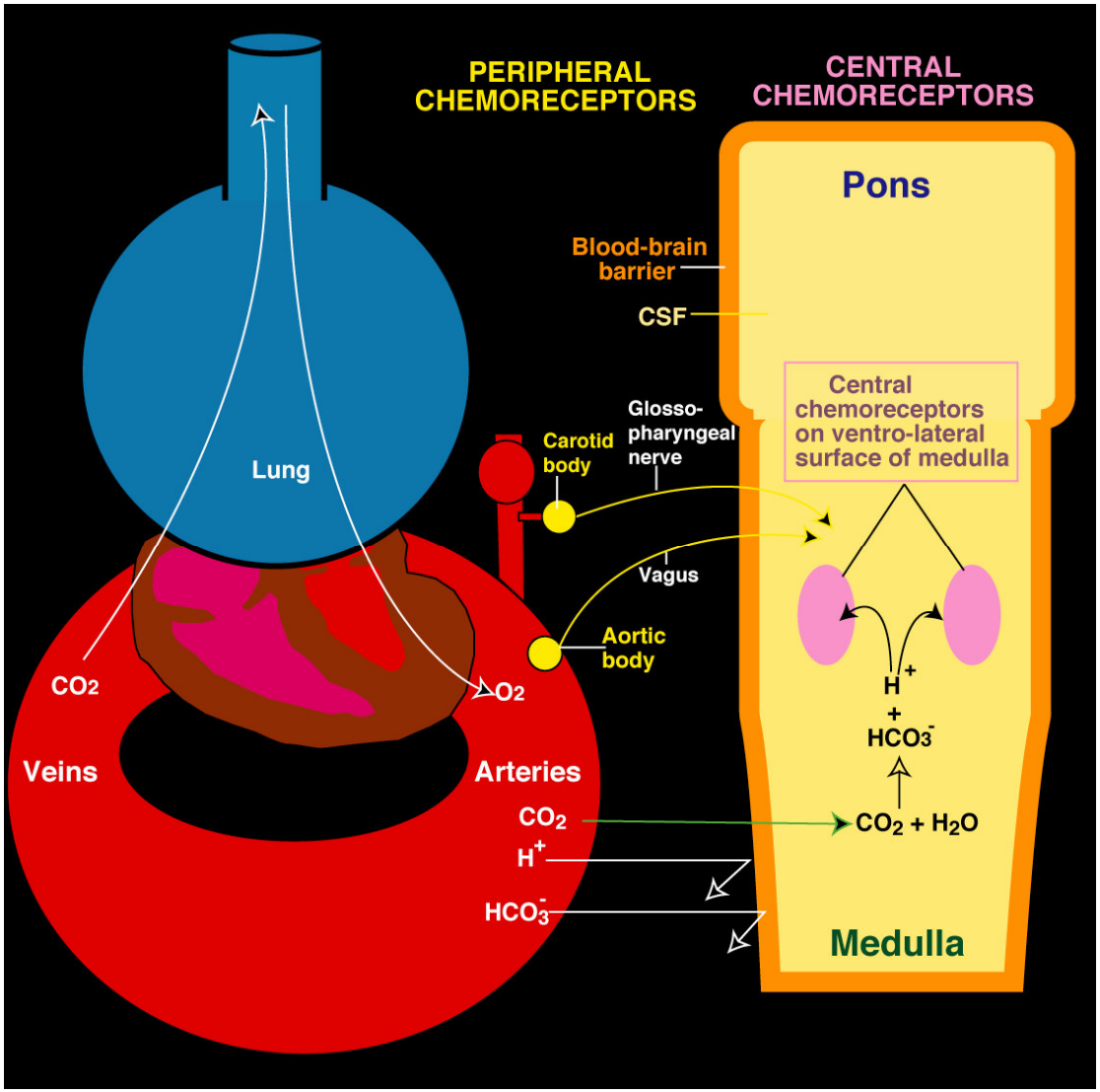
        Base excess of –7 (metabolic [lactic acid] acidosis)
  - ABG's #2
    - Slight respiratory acidosis
  - ABG's #3
    - Relatively normal
  - Why was his A-a so poor, 52 in ABG's #1? (from 52 to 1)
    - Possibly congestive heart failure

Regulation of Ventilation

- Considerations when treating heroin overdose
  - Use Narcan with caution
    - Works quickly and induces instant withdrawal
    - Patient frequently becomes very angry
    - Use only when very necessary, in cases of acute respiratory suppression – how can one tell?
      - » Light skinned people use cyanosis as a clue
      - » Dark skinned individuals more subtle hypoventilation

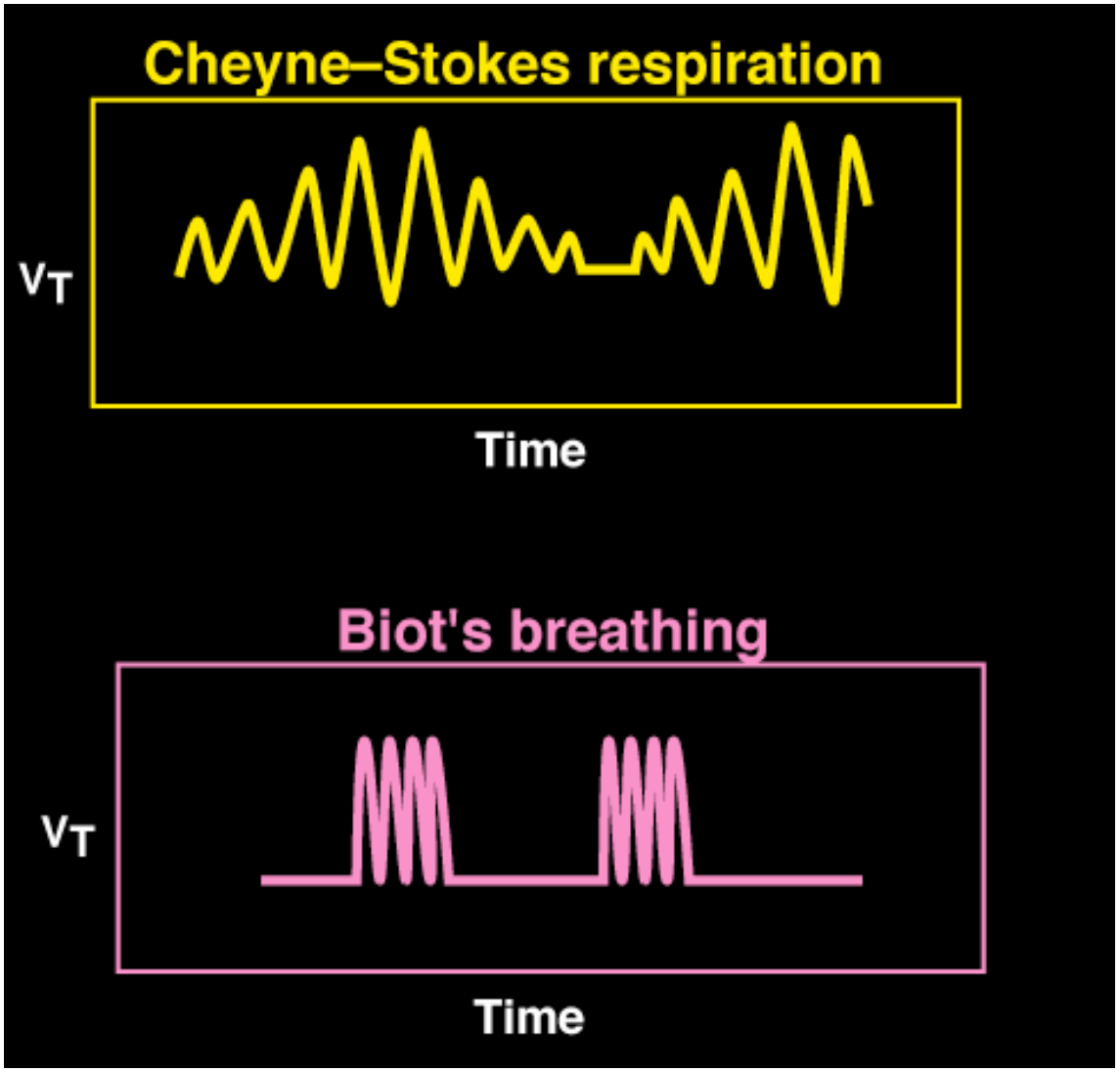
Regulation of Ventilation

- Chemical Regulation of Ventilation



Regulation of Ventilation

- Abnormal Patterns of Breathing



Gradual increase in rate and depth, then a similar decrease followed by apnea, repeats – believed to be impaired blood flow from lungs to brain

Faster and deeper than normal, interspersed with periods of apnea – seen in spinal meningitis and other CNS disorders