RRM MH Ch, 23 Respiratory. BIO 228

Ah…Respiratory…If you have worked in the medical field in the last 3 years you have learned much more than you care to know-and on the fly- about Respiratory due to the SARS COV19 Virus. For your hard work and dedication, I thank you.

See "Respiratory Therapist" career info on p. 892. Are you one?

Directions: Focus on these images: Do a tour FIRST. Start with Chapter Summary pp. 943 and 944 and please be sure to notice ALL of the "Learning Strategies" throughout the chapter (these are in green).

With a small post it or some sort of bookmark/highlight, **please highlight and/or bookmark** (and really look at…) each of these images. Fig 23.1, 23.3 (really look at the detail here, pulling much of our study together), Clinical Views p. 904, 23.9, 23.14, (all of p. 911), Fig 23.18 and 23.19, 23.21, 23.23, Clinical View 23.12, 23.25 (esp for lab), 23.26, 23.27. 23.28, 23.31, 23.32, Table 23.2.

If you can learn each of these images, you are doing the important work in this chapter.

1) Fig 23.1 What organs exist in the upper respiratory tract *Conducting Zone?*

   The Nose, Nasal Cavity, Pharynx, and Larynx.

   What *conductors* exist in the lower respiratory tract? Look for 4.

   Trachea, Bronchus, Bronchiole, Terminal Bronchioles.

   Where is the pharynx located in reference to the larynx and what is its role?

   The Pharynx is superior to the larynx. Its role is transporting air from the oral and nasal passages into the lungs and vice versa.

2) Mindful (and correct, most efficient, and effective) breathing consists of closed-mouth breathing. Why?

   Mindful breathing forces you to take in air through your nose, causing you to take longer and more focused breaths.

Bonus: Look up and watch James Nestor's video on "5 ways to Improve Your Breathing". And list them here for points:

Stop breathing through your mouth. Use your nose. Improve your lung capacity. Slow down. Hold your breath.

3) 23.9, 23.14 Why is the left lung smaller than the right lung in older patients?

Because the space is taken up by the heart.

4) Clinical Views p. 904:

a. Over Thanksgiving Break, your patient, Shelby, is home from college. She comes into your office with a bothersome cough, pain upon an inhale and sneezes frequently. You ask her how long she has had the cough and she states that she has had it since she left for school in early September. What is your diagnosis?

My diagnosis is Chronic Bronchitis.

b. Your patient, JJ has developed sensitivity to smoke in the air from the recent wildfires. He comes into ER and cannot breathe. What symptoms is JJ experiencing? What is your treatment?

JJ is most likely suffering from an Asthma attack. He most likely developed the condition as a result of being exposed to the wildfire smoke back in the Summer. He likely inhaled some kind of a trigger which is causing an inflammatory response in his bronchi/bronchioles. I would prescribe him a B2 agonist to help his lungs relax, and get his breathing renormalized.

5) P. 911 After working with so many patients due to the smoke-filled air this past summer and fall, you are really concerned about your roommate, who Vapes. (Know that Vaping is not well regulated and contains nicotine, propylene glycol, solvents, chemical flavorings). What can happen and what is the risk to her children (second and third-hand smoke)?

   Smoking (Let's call a spade a spade) coats the respiratory passages of the lungs with substances that are normally not found in great supply within the body. Because of how much exposure the lungs have, by comparison, to the outside environment, relative to other parts of the body. The cells have a high turnover rate, and are at a greater risk of developing cancer.

   And while the smoke may be more diluted, it can still be picked up by her children. Directly leading to the risks that are associated with second and third hand smoking.

6) 23.18. You have seen this diagram before! Please list these 8 steps (and 4 different processes) in your OWN words. Please be sure to include O and CO2 when appropriate.

Process 1 (Pulmonary Ventilation)

- Movement of O2 from the atmosphere to the alveoli
- Movement of CO2 from the alveoli to the atmosphere

Process 2 (Pulmonary Gas Exchange)

- O2 diffuses into the blood from the alveoli

- CO_2 diffuses into the atmosphere from the alveoli

Process 3 (Gas Transport)

- O_2 is transported to systemic cells from the lungs
- CO_2 is transported to the lungs from systemic cells

Process 4 (Tissue Gas Exchange)

- O_2 diffuses into the systemic cells from RBCS
- CO_2 diffuses into RBCS from systemic cells

Note: Learning Strategy p. 914! (Just read it an think about it)

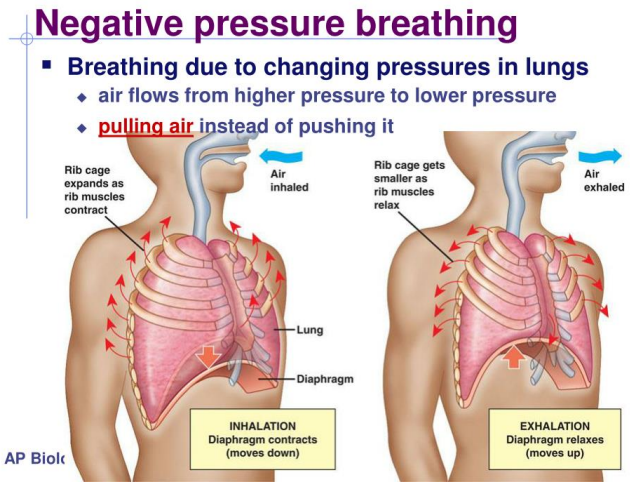
7) It's no secret that I highly value mindful breathing (as little as ten minutes a day and up to 20 minutes twice a day) as a huge method to stave off sleep apnea, help us sleep and help us beat depression and stress. It's truly a workout for muscles that don't get used correctly. One activity is to breathe in through your nose, then breathe in a tiny bit more, then hold, then breathe out through pursed lips, then breathe out a tiny bit more, then hold. (Do this 3-5 times). See Figures 23.19, 23.20, 23.22. What muscles are being used in quiet breathing?

The Diaphragm and External Intercostals

This changes the volume of the lungs and as a result, there is a P change between outside and inside the lungs. Keep reading to learn more…

8) 23.21, 23.23. Watch an infant or toddler breathe. They do not raise their shoulders nor elevate their chest but breathe into their lower lungs. Imagine sending air to your stomach. In doing this, we expand our ribs, which draws air in automatically. We are then not gasping

air in. Which of the gas laws does this illustrate? (See also 23.20) Boyle's Law



Note Learning Strategy 23.3 p. 920!

9) Clinical View 23.12 I know someone (asking for a friend 😊) who was diagnosed with sleep apnea and prescribed a CPAP which made her anxiety at night go through the roof. After ten years, a lab tech finally noticed that she has CENTRAL sleep apnea, rather than Obstructive Sleep Apnea. This means her brain and diaphragm are not working in tandem. Oh…that's *relaxing* to know…! How would the breathing practice in #7 above help this patient?

It would help her to retrain her brain and diaphragm to work in coordination with each other.

Note Learning Strategy 23.4 p. 922, and 23.5 p. 925

10) Figure 23.25: For lab, give all acronyms, and define, please.

MRC (Medullary Respiratory Center) is the control center for breathing that is located in the brainstem.

PRC (Pontine Respiratory Center) controls the muscle groups to ensure that everything is working in coordination.

11) Figs 23.27 and 23.28: . What is the role of hydrostatic P (think: P on a container when fluid is moving through, such as BP) in gas exchange? What does a pulmonary capillary *take in*…or does it *send out*?

The role of hydrostatic pressure is to facilitate the exchange of O2 and CO2 within the alveoli. Because of the low solubility coefficient of O2, it passes into the pulmonary capillary rather easily, where it is exchanged with CO2 from the blood, while being loaded onto the Hemoglobin for transport to the tissues.

12). Fig 23.26. You are backpacking with friends in Yellowstone National Park, which is about 8000 feet above sea level. (Traverse City is about 625 feet above sea level). You know you need to be in shape to haul a 40 lb. pack (and run faster than your friends if you scare up a grizzly! 😊). Furthermore, water takes longer to boil. Using any or all of the terms *molecules*, oxygen, *air, percentage* and *altitude*, please explain WHY it is harder to breathe at higher altitudes.

It is harder for the gas exchange to occur in the lungs due to the decrease both in O2 concentration, and atmospheric pressure. Basically, the higher you are the lower the concentration of gasses (not just O2). Because of this, you need to breath more in to get the same effect as if you were at Sea Level. This is why it's not uncommon for people to seek supplemental O2 therapy when they're in mountainous regions.

13) The text reminds us that "gas transport is a movement of respiratory gases within the blood between the *alveoli* and the *capillaries*". (keep reading for hints). It makes sense that within the lungs, pressure differences, called Partial Pressure or PO2 (kind of like cell transport, right?) moves gases between the alveoli and blood and also between the systemic cells and the blood.

I do not understand the exact nature of the question here. But if I had to go off of what I am reading it's a "does this make sense and why?" Type.

The basic mechanism is the fact that O2 and CO2 are both very permeable to the cell membranes, which is why they are able to cross between cells with relative ease. Because of this, the laws of pressure allow for the exchange of gasses to take place within the capillaries in a manner that is most effectively described as simple diffusion.

14) Fig. 23.31. Bi carbonate acts as the blood's buffer because

Bicarbonate acts as the blood's buffer because of how efficiently it shifts from Basic to Acidic forms. When CO2 enters the blood, it is neutralized by the release of carbonic anhydrase into the blood which converts it to H+ and Bicarbonate. This is then transported to the lungs, where it is converted back into CO2. This prevents CO2 from accumulating in the body's tissues, and poisoning it. As well as keeping the body's ph in the (7.35-7.45) range that is necessary to sustain life.

15) Oxygen is released from hemoglobin in the systemic capillaries (see also image 23.18, 23.28)

See pages 940 and 941. Using this image, please explain what happens in term of Pressure and location in inhalation. I will start you out:

When inhaling, the pleural cavity and alveolar volume increase and intrapleural and intrapulmonary P decreases. This makes for a lower P of O in the blood, so this is where it moves to, from the alveoli.

16) Fig. 23.34 Percent saturation of Hemoglobin:

When we heat our body as in exercise, naturally more/less (choose one) O is *released* from hemoglobin!

Less oxygen is stored due to the heat sensitivity of Hemoglobin.

Please define hyperpnea:

Hyperpnea is the act of taking in deeper breaths than normal, proportionately increasing the amount of air that is in the lungs

17) Using Table 23.2, list two clinical examples. Give the cause (system, from this Table) and the physiologic consequences.

Drug Use: Decrease in the ability to stimulate the muscles of breathing; Often a result of over sedation of the respiratory center.

Slowed blood flow from immobilization: Can cause a blockage in the pulmonary artery, and consequentially the blood does not reach the lung capillaries for gas exchange. This often leads to a pulmonary embolism.