BIO 131 PAL

Week 2 – Problem Set 2

Part II—Too Little, Too Late

Meanwhile, elsewhere in Habersham County, Tom was feeling slightly nervous as he exited the staff lounge and entered the hustle and bustle of County Hospital's ER to begin his first shift as an RN. The first few hours of his shift passed slowly as Tom mostly checked vital signs and listened to patients complain about various aches, pains, coughs, and sniffles. He realized that the attending physician, Dr. Greene, who was rather "old school" in general about how he interacted with nursing staff, wanted to start him out slowly.

Tom knew, though, that the paramedics could bring in a trauma patient at any time. After his lunch break, Tom didn't have long to wait before the paramedics burst in through the swinging double-doors of the ambulance bay wheeling in a young man on a gurney. Edward, a veteran EMT, recited the vital signs to Tom and Dr. Greene as they helped push the gurney into the trauma room, "18-year-old male, GSW to the right abdomen, heart rate 98, respiratory rate 22, blood pressure 95/65, no loss of consciousness." A gunshot wound! Tom knew that gunshot wounds were sometimes the most difficult traumas to handle. Once inside the trauma room, Dr. Greene began his initial assessment of the patient while Tom got busy organizing the things he knew would be needed. He attached a pulse-ox monitor to the patient's index finger so Dr. Greene could keep an eye on the O2 levels in the patient's blood and he inserted a Foley catheter so the patient's urine output could be monitored.

After finishing his initial duties, Tom heard Dr. Greene saying, "It looks like the bullet missed the liver and kidney, but it may have severed an artery. That's probably why his BP is a bit low. Tom, grab a liter of saline and start a fast IV drip … we need to increase his blood volume." Tom grabbed one of the fluid-filled bags from the nearby shelf, attached a 12-gauge IV needle to the plastic tubing, and gently slipped the needle into the patient's antecubital vein. He then hung the plastic bag on the IV stand and let the fluid quickly start to flow down the tubing and into the patient's vein.

The reaction was quick and violent. The patient's heart rate began to skyrocket and Tom heard Dr. Greene shouting, "His O2 saturation is falling! Pulse is quickening! What is going on with this guy?!" Tom stood frozen in place by fear. He heard Dr. Greene continuing, "Flatline! We've lost a pulse … Tom, get the crash cart, we need to shock this guy to get his heart going again!" Tom broke free from his initial shock and did as Dr. Greene had ordered. He then started CPR as Dr. Greene readied the cardiac defibrillator to shock the patient. They continued to alternate between CPR and defibrillation for almost an hour, but to no avail. As Dr. Greene announced the time of death, Tom felt a sickening feeling in the pit of his stomach. He couldn't believe that he had lost his first trauma patient!

Then Tom noticed that the fluid in the Foley catheter bag was bright red. "Dr. Greene, there's hemoglobin in the Foley bag," he said. "How could that be?" responded Dr. Greene. Tom began to trace back over his steps in the trauma. His mounting fear turned to outright terror as he looked at the now empty bag on the IV stand. Its label didn't read "Saline," but rather "Distilled Water." He looked at Dr. Greene, his heart quickly sinking, and said, "I think I may have killed the patient."‘

Questions

1. In your own words, describe what blood pressure is (you might not have heard this in lecture yet, but do your best). Why was the patient's blood pressure low after being shot? How would giving isotonic saline correct this problem? What does "isotonic" mean?

2. What problem did the distilled water create in the patient's bloodstream? What happened to the patient's blood cells as a result? Why did the patient ultimately die?

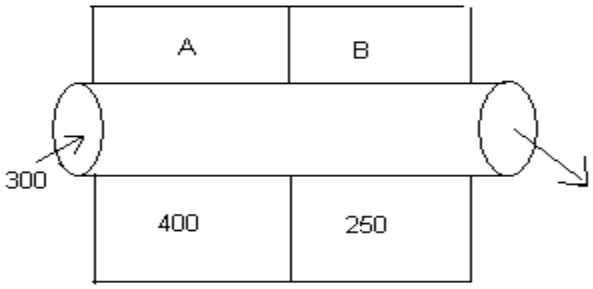
3. You have a patient, who lost a large amount of blood. Which of the following solutions would be a good choice for an IV? Justify your answer.

a) 300 mOsm solution of penetrating particles

b) iso-osmotic solution with a mix of penetrating and non-penetrating particles

c) 300 mOsm solution of non-penetrating particles

4. A tube made up of a membrane that is permeable to water but not to particles is run through a chamber (see picture, below). The solution inside of the tube as it enters has an osmolarity of 300 osm/L. As it travels from Compartment A to Compartment B, the composition of the surrounding solution changes, as indicated in the picture. Explain what water movement, if any, will occur in each compartment. To receive full credit, you must briefly explain why the movement is occurring in the space below the picture.



MEMBRANE COMPOSITION/TRANSPORT

1. The plasma membrane is composed of:

2. Create a concept map of transport across the cell membrane using the following terms: Active transport, Passive transport, Mediated transport, Non-mediated transport, Simple diffusion, Facilitated diffusion, Primary active transport, Secondary active transport