Homeostasis and Elimination

Fluid Imbalances

What occurs during osmosis?

- Water moves from an area of lower solute concentration to an area of higher solute concentration.

Which hormones will the body use when there is too much fluid (fluid overload) or too little fluid (dehydration)? Select all that apply.

- Antidiuretic hormone
- Atrial natriuretic peptide
- Aldosterone

Hypovolemia: Blood is lost due to hemorrhage and poor fluid intake.

Maldistribution of fluid: Movement of fluid from one compartment to another without a loss of fluid

Hypervolemia: Too much fluid accumulates and/or organs in the body are unable to manage or excrete.

After being out at the beach for hours, an adult suffered from an extensive sunburn covering their back, arms, and legs. Which fluid imbalance is this person most likely experiencing?

- Hypovolemic fluid imbalance

You suspect someone may have hypervolemia. Which tests would most accurately support this?

- Daily weight

Electrolytes: Intravenous fluids used by healthcare professionals rely on sodium concentrations to treat conditio of fluid imbalance.

Blood pressure: Receptors throughout the body that send signals to the autonomic nervous system to constrict dilate blood vessels depending on the fluid imbalance it may sense.

Protein: Low levels can cause movement of fluid into interstitial areas, causing edema. For example, low levels can cause a water leak from the vascular area into the surrounding tissue, causing edema.

Hormones: Renin is converted to angiotensinogen to cause vasoconstriction. It also stimulates production of aldosterone by the adrenal gland, which helps to keep fluid in the vascular system.

Categorized conditions based on type of fluid imbalance:

ypovolemia:

- blood loss from external injury
- dehydration
- extensive burns

aldistribution:

- systemic inflammatory response syndrome
- anaphylactic reaction
- transfusion reaction

ypervolemia:

- heart failure
- liver failure (cirrhosis)
- renal failure

Which environmental factors directly affect fluid balance? Select all that apply.

Which risk factors make older adults and children more sensitive to fluid imbalances? Select all that apply.

Electrolyte Imbalances

Which statement is the best definition of electrolytes?

- Ions in bodily fluids that regulate metabolic processes

Which electrolytes have a positive charge? Select all that apply.

When dissolved in water or bodily fluids, electrolytes will **conduct** (not diffuse or suppress) electricity. **Cations** (not pions or avions), such as sodium (Na) and magnesium (Mg), are positively charged ions. **Anions** (not scions or
inions), such as bicarbonate (HCO_3) and chloride (Cl), are negatively charged ions.

An adult has lost water through sweating while mowing the yard in the middle of a hot summer day. Unfortunately, the person did not keep water nearby to replace what was being lost. Based on this history, which serum sodium
level would most likely be found if tested?

- 155 mEq per liter

Which individuals are at risk for hypocalcemia? Select all that apply.

- Someone experiencing an increase in serum pH
- An adolescent living with renal failure
- A person with decreased parathyroid hormone production

A person with a low magnesium level is most likely to experience which symptoms? Select all that apply.

- Tetany
- Tremors
- Seizures

Symbol	Chemical Compound	Function
K^+	Potassium chloride	Helps regulate heart rhythm
H^+	Hydrochloric acid	Digestion
Na^+	Sodium chloride	Regulates osmotic pressure
Ca^+	Calcium chloride	Important for bone regulation
Mg^+	Magnesium chloride	Works with muscle and nerves

Electrolyte	Laboratory Result	Imbalance
Sodium (Na^+)	132 mEq/L	hyponatremia
Potassium (K^+)	5.7 mEq/L	hyperkalemia
Chloride (Cl^-)	94 mEq/L	hypochloremia
Calcium (Ca^{2+})	8.0 mg/dL	hypocalcemia

Electrolyte & Abbreviation	Normal Value	Hyper	Hypo
Sodium (Na)	135-145 mEq/L	over 145 mEq/L	under 135 mEq/L
Potassium (K)	3.5-5.0 mEq/L	over 5.0 mEq/L	under 3.5 mEq/L
Chloride (Cl)	98-106 mEq/L	over 106 mEq/L	under 98 mEq/L
Calcium (Ca)	9.0-10.5 mg/dL	over 10.5 mg/dL	under 9.0 mg/dL
Magnesium (Mg)	1.3-2.1 mEq/dL	over 2.1 mEq/dL	under 1.3 mEq/
Phosphate (P)	3.0-4.5 mg/dL	over 4.5 mg/dL	under 3.0 mg/dL

Cues that provide information about the alteration in health include:

- muscle cramps, caused by loss of sodium in muscles
- confusion, caused by water shifting into brain cells
- headache, caused by altered nerve conduction
- continuing to drink water; water does not contain electrolytes to replace what the student has lost

Based on the cues provided, the student is most likely experiencing **hyponatremia**, which could be confirmed by **blood** test. While the blood test is not available to be done in the home, a serum sodium level of less than 135 milliequivalents per liter (mEq/L) confirms the suspected hyponatremia.

A high school student has been outside for marching band practice for four hours on a hot, humid afternoon. The have been drinking water to replace fluids lost through sweat. An hour after getting home, the student's caregiver finds them in bed with muscle cramps, lethargy, a headache, and confusion. The student continues to drink wate to replace fluid lost during band practice.

Which action by the student could have prevented them from becoming hyponatremic?

- Drank an isotonic sports drink instead of water

Which items should be included in the diet of a person who wants to increase their calcium intake? Select all that apply.

- Vitamin D supplement
- Almonds
- Milk and cheese