

# FLUID AND ELECTROLYTES

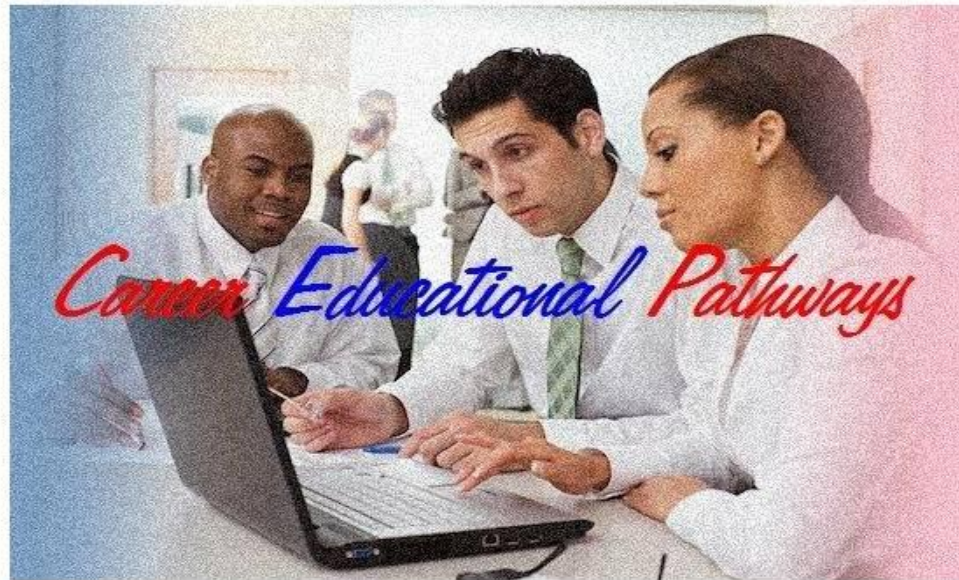
Developed by:

Dawn Johnson, RN, MSN, Ed

Doctoral Learner



Property of:



[www.careereducationalpathways.com](http://www.careereducationalpathways.com)

1-814-580-0913

# FLUID BALANCE

- FUNCTIONS OF FLUID IN THE BODY:

- Help regulate body temperature
- Transport nutrients and gases throughout the body
- Carry cellular waste products to excretion sites

- COMPONENTS OF BODY FLUID:

- Intracellular Fluid (ICF)
- Extracellular Fluid (ECF)
  - Interstitial Fluid (ISF)
  - Intravascular Fluid

# MAINTAINING FLUID BALANCE

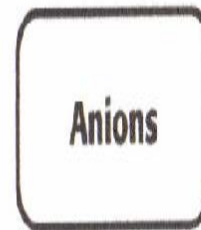
- Kidneys and various hormones and mechanisms work together to maintain fluid balance
- A problem in any one of these things can cause a fluid imbalance

# **PATIENTS AT RISK FOR DEVELOPING FLUID IMBALANCES:**

- BURNS
- CARDIOVASCULAR DISORDERS
- GASTROENTERITIS DISORDERS
- HORMONE DISTURBANCES
- RENAL DISORDERS
- AGE GROUPS
  - ELDERLY
  - INFANTS

# ELECTROLYTE BALANCE

- Electrolytes are a major component of body fluids
- Electrolytes are substances that, when in solution, separate into electrically charged particles called ions



- ◆ Bicarbonate
- ◆ Chloride
- ◆ Phosphorus



- ◆ Calcium
- ◆ Magnesium
- ◆ Potassium
- ◆ Sodium

# ELECTROLYTE BALANCE

- MAJOR  
INTRACELLULAR  
ELECTROLYTES:

- Potassium
- Phosphorus
- Magnesium

- MAJOR  
EXTRACELLULAR  
ELECTROLYTES:

- Sodium
- Chloride
- Calcium
- Bicarbonate

# ORGANS AND GLANDS IN ELECTROLYTE BALANCE

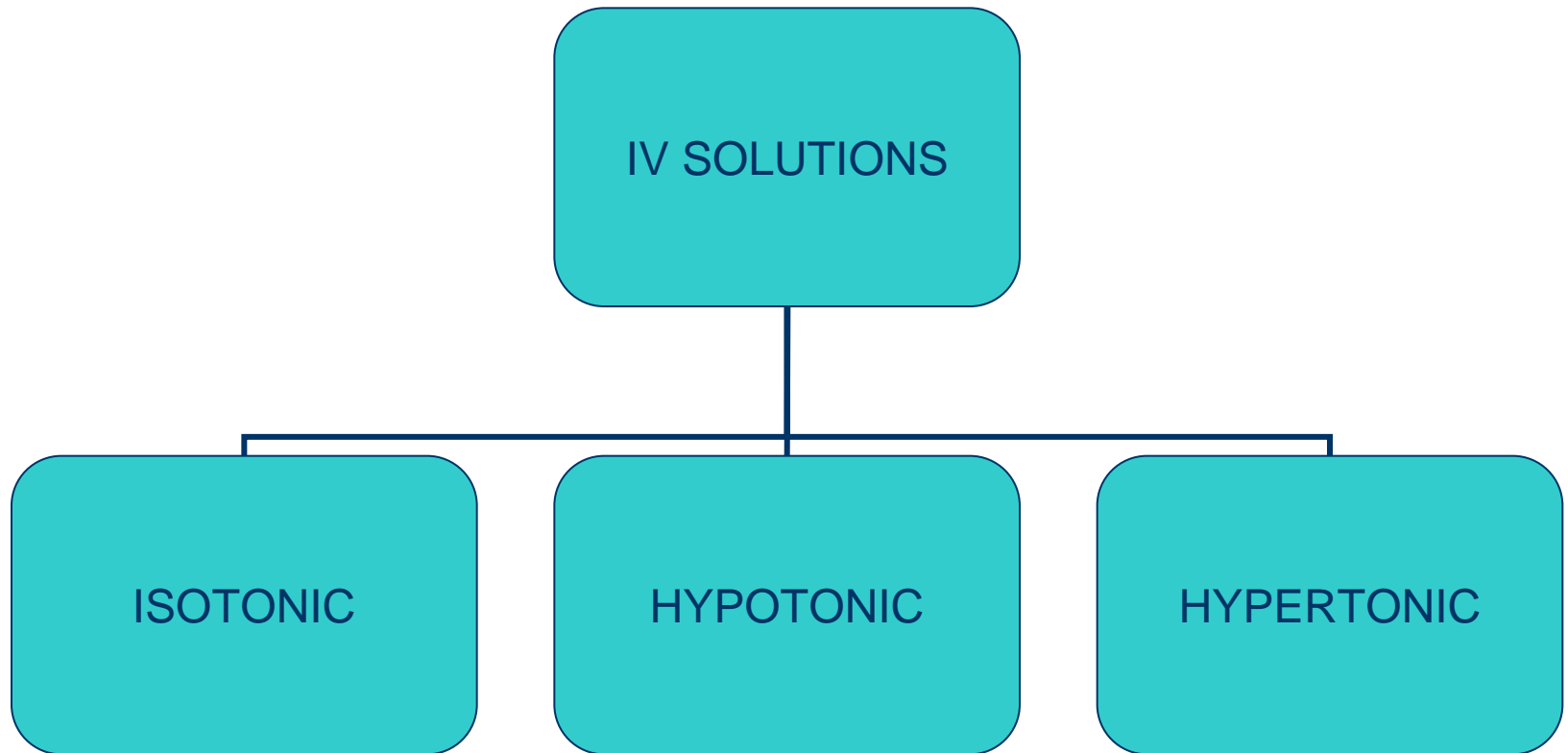
- LUNGS & LIVER
- HEART
- SWEAT GLANDS
- GI TRACT
- PARATHYROID GLANDS
- THYROID GLAND



# CRYSTALLOIDS vs. COLLOIDS

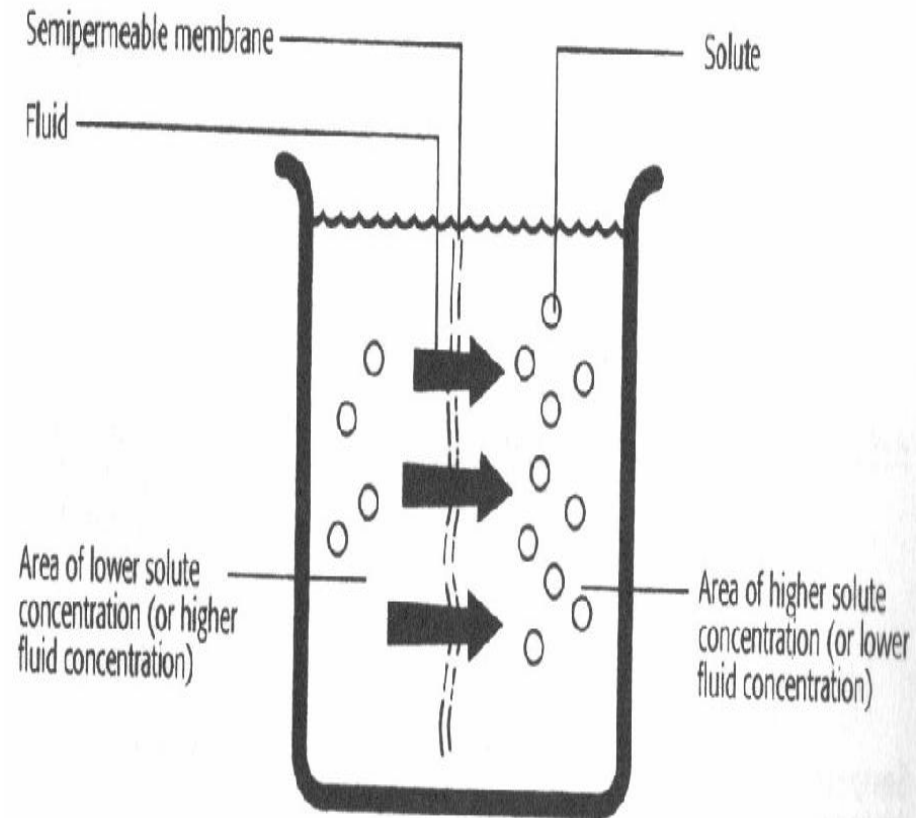
- CRYSTALLOIDS: solutions with small molecules that flow easily from the bloodstream into cells and tissues
  - May be
    - Isotonic
    - Hypertonic
    - Hypotonic
- COLLOIDS: Solutions with larger molecules used to expand plasma
  - Always hypertonic

# THREE BASIC TYPES OF IV SOLUTIONS



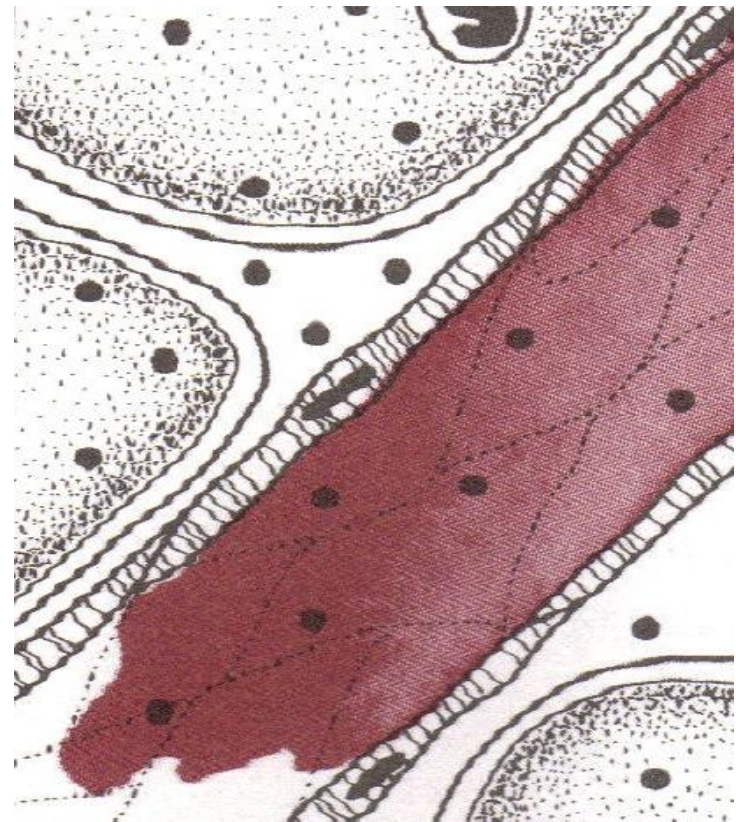
# REVIEW OF OSMOSIS:

- Diffusion of water across a selectively permeable membrane
- Fluids (particularly water) move by osmosis
- Movement is caused by existence of a concentration gradient
- Water flows passively across the membrane, from a area of higher water concentration to an area of lower water concentration
- Dilution stops when the solute concentrations on both sides of the membrane are equal



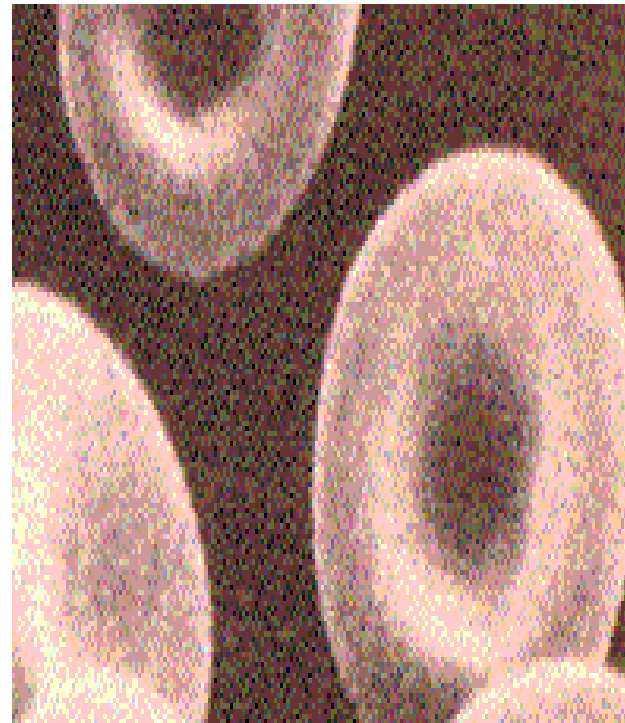
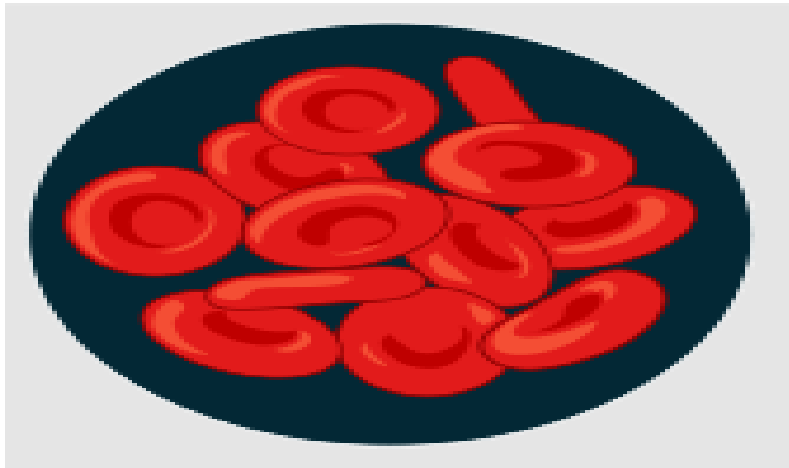
# ISOTONIC SOLUTIONS

- Solution has the same osmolarity as serum and other body fluids
- Solution doesn't alter serum osmolarity, so fluid stays inside the blood vessel (the intravascular compartment)
- Expands this compartment without pulling fluid from other compartments



# ISOTONIC SOLUTIONS

Isotonic



# ISOTONIC SOLUTIONS

- LACTATED RINGERS (LR)
- NORMAL SALINE (.9NS)
- DEXTROSE 5% IN WATER (D5W)

# INDICATIONS FOR ISOTONIC SOLUTIONS

- D5W

- Fluid loss & dehydration
- Hypernatremia
- NURSING  
CONSIDERATIONS:
  - Initially isotonic but hypotonic when dextrose is metabolized
  - Renal patients
  - Cardiac patients
  - Resuscitation purpose
  - Pt at risk for ICP
  - Not intended for long-term use

- LR

- Acute blood loss
- Burns
- Dehydration
- Hypovolemia caused by 3<sup>rd</sup> space shifting
- Lower GI tract fluid loss
- NURSING  
CONSIDERATIONS:
  - Renal patients
  - Liver disease patients
  - Pts whose blood pH exceeds 7.5

# INDICATIONS FOR ISOTONIC SOLUTIONS

- .9NS

- Blood transfusion
- Fluid challenge
- Fluid replacement w/ DKA
- Hypercalcemia
- Hyponatremia
- Metabolic alkalosis
- Resuscitation
- Shock

- NURSING

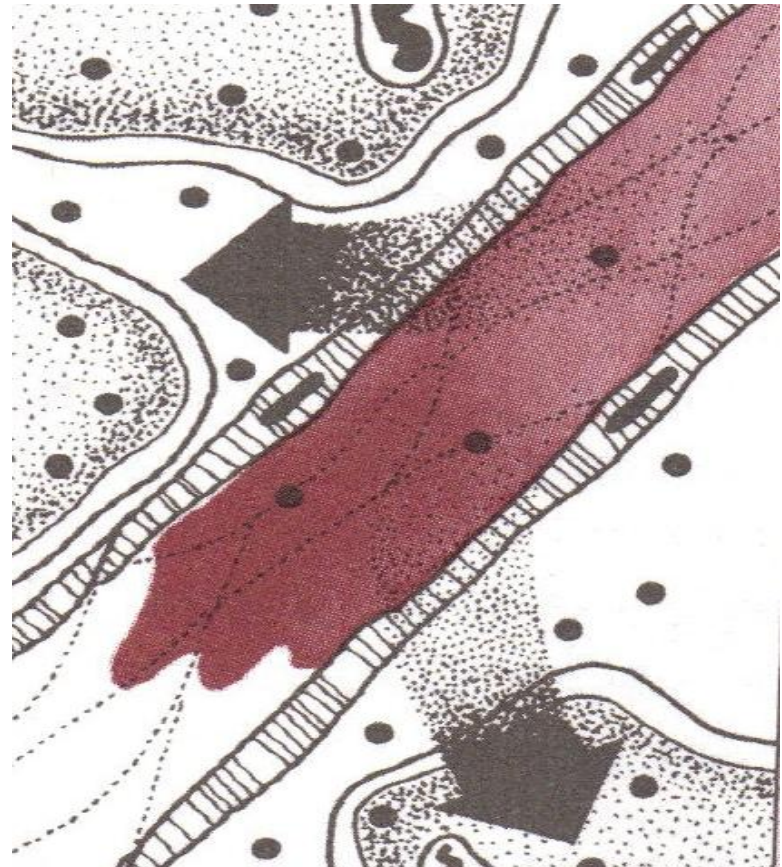
- CONSIDERATIONS:

- Replacement for extracellular fluid
- Heart failure
- Pts with edema
- hypernatremia



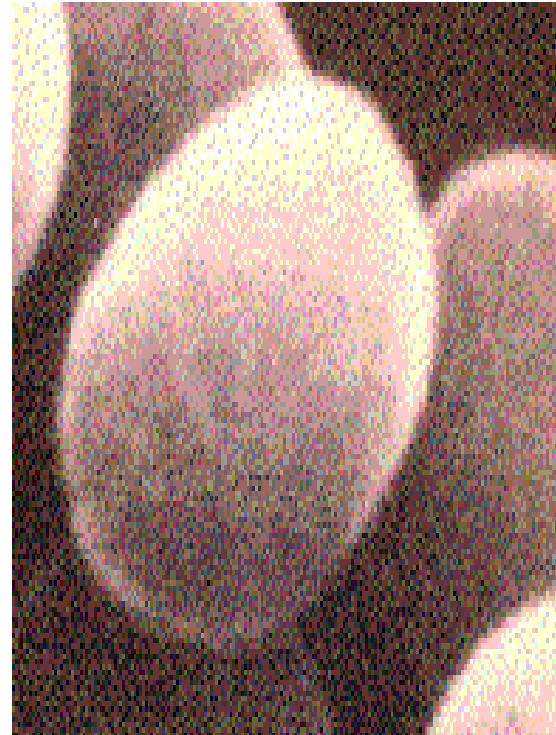
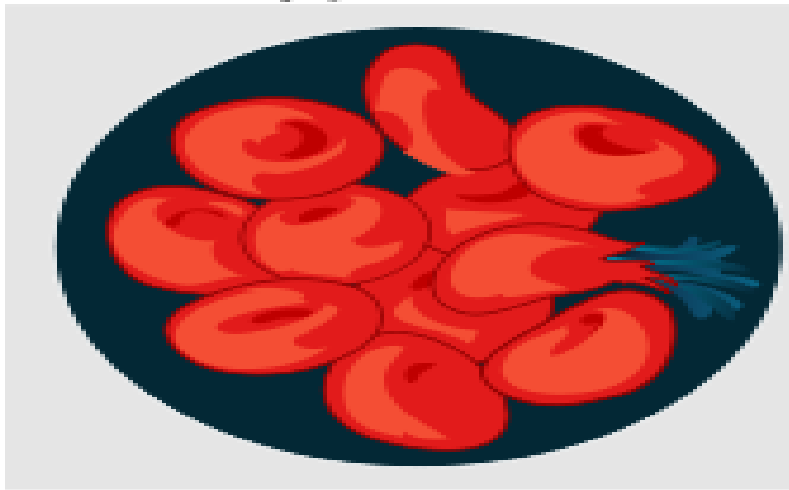
# HYPOTONIC SOLUTIONS

- SOLUTION THAT HAS AN OSMOLARITY LOWER THAN THAT OF SERUM. IT SHIFTS FLUID OUT OF THE INTRAVASCULAR COMPARTMENT, HYDRATING THE CELLS AND INTERSTITIAL COMPARTMENTS
- HYDRATES THE CELLS WHILE REDUCING FLUID IN THE CIRCULATING SYSTEM



# HYPOTONIC SOLUTIONS

Hypotonic



# TYPES OF HYPOTONIC SOLUTIONS

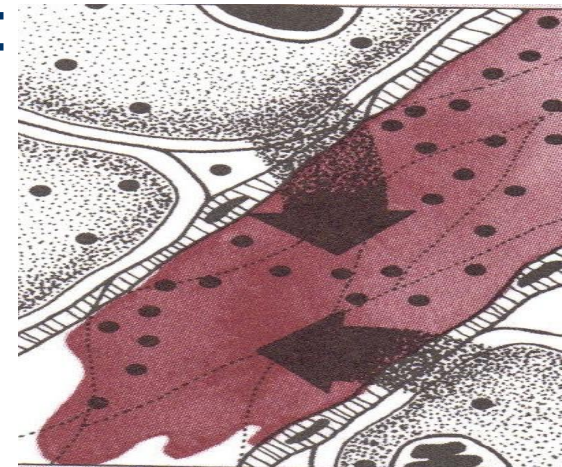
- Half normal saline (1/2NS or 45%NS)
- 0.33% sodium chloride
- Dextrose 2.5% in water (D2.5%W)
- Dextrose 2/5% (D2.5%)

# INDICATIONS OF HYPOTONIC SOLUTIONS

- .45 NS
  - DKA after .9NS
  - Gastric fluid loss from NG suctioning or vomiting
  - Hypertonic dehydration
  - Sodium and chloride depletion
  - Water replacement
- CONSIDERATIONS:
  - Use cautiously in general
  - Liver disease pts
  - Trauma pts
  - Burn pts
  - Pts at risk for ICP

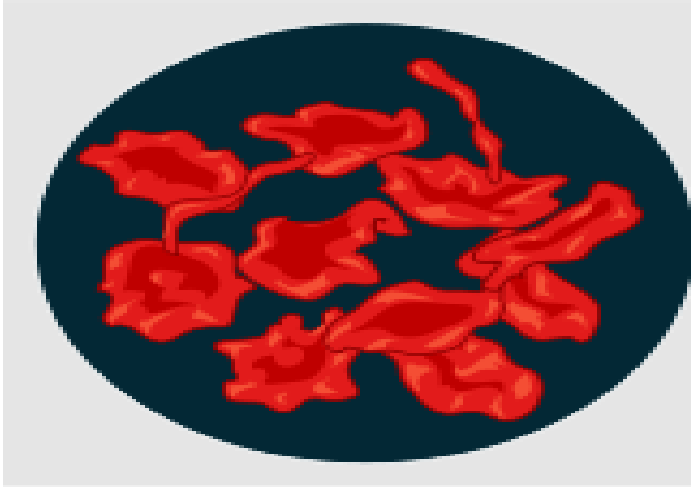
# HYPERTONIC SOLUTIONS

- Solution that has osmolarity higher than that of serum. It draws fluid INTO the intravascular compartment from the cells and the interstitial compartments
- Shift fluid into the blood vessels caused by a hypertonic solution has benefits:
  - Reduces risk of edema
  - Stabilizes blood pressure
  - Regulates urine output



# HYPERTONIC SOLUTIONS

Hypertonic



# TYPES OF HYPERTONIC SOLUTIONS

- Dextrose 5% in half-normal saline (D51/2NS)
- Dextrose 5% in normal saline (D5NS)
- Dextrose 5% in lactated ringers (D5LR)
- 3% sodium chloride
- 7.5% sodium chloride
- Dextrose 10% in water (D10W)

# INDICATIONS OF HYPERTONIC SOLUTIONS

- D5NS

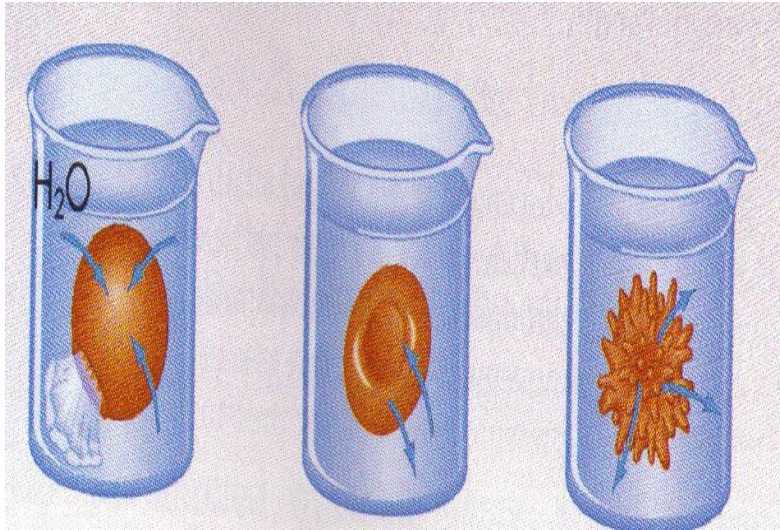
- Addison crisis
- Hypotonic dehydration
- Temporary tx of circulatory insufficiency & shock
- CONSIDERATIONS:
  - Cardiac pts
  - Renal pts

- D10W

- Conditions in which some nutrition w/ glucose is required
- Water therapy
- CONSIDERATIONS:
  - Monitor serum glucose therapy



# REVIEW TIME.....



- WHICH SOLUTION IS:
  - HYPERTONIC?
  - ISOTONIC?
  - HYPOTONIC?

# FLUID IMBALANCES

- FLUID DEFICIT
- FLUID OVERLOAD

# FLUID BALANCE: YOUR “NORMAL” FINDINGS ON ASSESSMENT

- SKIN:
  - Lips:
  - Membranes:
  - Turgor:
  - Temp:
- URINE OUTPUT:
  - Amount:
  - Color:
- INTAKE:
- VITALS:

# FLUID DEFICIT

- BODY LOSES FLUID
- BLOOD SOLUTE CONCENTRATION (OSMOLALITY) INCREASES
- SERUM SODIUM LEVEL RISES
- WATER MOLECULES SHIFT OUT OF CELLS INTO MORE CONCENTRATED BLOOD
- WATER INTAKE AND RETENTION ARE NOT SUFFICIENT TO RESTORE FLUID VOLUME
- CELLS SHRINK AS MORE FLUID SHIFTS OUT OF THEM
- PT DEVELOPES MENTAL STATUS CHANGES, WHICH MAY LEAD TO SEIZURES AND COMA

# FLUID DEFICIT

- SIGNS & SYMPTOMS:

- Decrease in body weight
- Elevated temp
- Pulse weak, rapid, thready
- Respirations rapid/shallow
- BP is generally low
- Skin: warm, dry, flushed, poor turgor
- Lips: dry & chapped
- Tongue: dry coated
- Mucous Membranes: dry

- SIGNS & SYMPTOMS (cont):

- Eyes: sunken
- Difficult to feel pulses
- Fatigued
- Elevated h/h
- c/o thirst & constipation
- UO decreased, dark urine with strong smell
- Weak, sleepy, disoriented, irritable
- May lead to seizures, coma, death

# FLUID OVERLOAD

- EXCESS SODIUM OR FLUID IS CONSUMED OR RETAINED
- FLUID MOVES OUT OF BLOOD VESSELS INTO THE INTERSTITIAL SPACE
- EXTRACELLULAR FLUID ACCUMULATES IN THE INTERSTITIAL OR INTRAVASCULAR COMPARTMENT
- EDEMA DEVELOPS IN THE LUNGS OR OTHER TISSUES

# FLUID OVERLOAD

- SIGNS & SYMPTOMS:

- Increase in weight
- Normal temp
- Pulse full/bounding
- Resp moist/labored
- Elevated bp
- Skin: cool, moist, pale
- Edema of ankles, lower legs, sacral area
- Membranes: moist
- Neck veins distended when sitting
- Low h/h

- SIGNS & SYMPTOMS (cont):

- Moist lung sounds
- Frequent moist bowel mvmts
- Intake greater than output
- Urine light colored, odorless
- Tense, unable to sleep
- May experience seizures, coma, can lead to death

# PLASMA EXPANDERS

- Also called volume expanders
- Example of colloid
- Two types:
  - Biologic
  - Synthetic



**THE END!!!!!!!**

