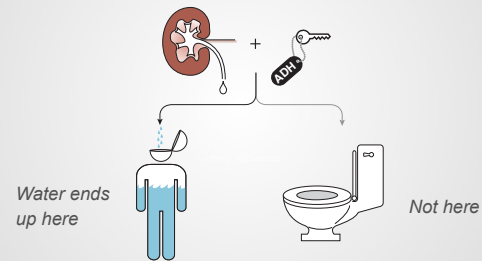




## Sodium

Tea and toast syndrome

### ADH decreases urine output



### True hyponatremia and ADH

No urine output with normal water intake



ADH irrelevant

Normal water intake with decreased urine output



ADH dependent

Compulsive water drinking with maximal but inadequate urine output



ADH suppressed

### determinants of urine volume

$$\frac{\text{vol}}{\text{conc}} \cdot \text{concentration} = \frac{\text{solute}}{\text{volume}} \cdot \text{vol}$$
$$\text{volume} = \frac{\text{solute}}{\text{concentration}}$$

### determinants of urine volume

$$\text{volume} = \frac{\text{solute}}{\text{concentration}}$$

solute in equals solute out

Solute intake is 10 mOsm per kg for adults.

Fat and carbohydrates are metabolised to water and CO<sub>2</sub>

### determinants of urine volume

$$\text{volume} = \frac{700 \text{ mOsm}}{\text{concentration}}$$

$$14 \text{ l} = \frac{700 \text{ mOsm}}{50 \text{ mOsm/kg H}_2\text{O}} \quad 0.583 \text{ l} = \frac{700 \text{ mOsm}}{1,200 \text{ mOsm/kg H}_2\text{O}}$$

*minimal ADH*                      *maximal ADH*

The human kidney can generate urine from 50-1,200 mOsm/kg H<sub>2</sub>O

### determinants of urine volume

$$\text{volume} = \frac{100 \text{ mOsm}}{\text{concentration}}$$

$$2 \text{ l} = \frac{100 \text{ mOsm}}{50 \text{ mOsm/kg H}_2\text{O}}$$

*minimal ADH*

The human kidney can generate urine from 50-1,200 mOsm/kg H<sub>2</sub>O

With 100 mosm of solute in the diet:



Maximum daily urine output is 2 liters

### tea and toast syndrome



carbohydrates are metabolised to  
water and carbon dioxide

### beer drinkers potomania



alcohol is metabolised to water and carbon dioxide

Tea and toast syndrome

Beer drinkers potomania

Compulsive water ingestion



**These are the *only* causes of hyponatremia with low ADH**

Specific gravity ranges from 1.005 to 1.030

Specific gravity is a proxy for urine osmolality

Found on dip stick U/A



**These are the *only* causes of hyponatremia with low specific gravity**



In hyponatremia, a urinalysis with a low specific gravity should stand out like a car crash

## Tea and toast syndrome

## Beer drinkers potomania

The disease is low solute intake

**Treatment:** give solute



One liter of saline is enough solute to make 6 liters of dilute urine



U/A Spec Gran 1.005



*erroneous*

**Conclusion: volume depletion induced hyponatremia**

"You were dehydrated,  
make sure you get  
plenty of fluids"



*erroneous*

**Conclusion: volume depletion induced hyponatremia**

Recognize that the low  
specific gravity is not  
consistent with volume  
depletion

A low solute diet limits urine  
volume, predisposing to  
hyponatremia

Recognize that the normal  
saline given to the patient  
corrects the low solute  
condition



Correct treatment: high solute diet



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