

## **Hyponatremia**

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Low sodium is usually due to an excess of free water due to an inability to excrete ingested water. Usually this is due to too much ADH either appropriate or inappropriate. The first element of decision-making should be to assess clinical volume status to ascertain if low sodium due to hypovolemia (dehydration, shock), euvolemia (SIADH, pseudohyponatremia), or volume overload (CHF, decompensated cirrhosis, renal failure)

### **Diagnosis of etiology of hyponatremia:**

#### **Three key labs:**

1. **Plasma osmolality**- low in most causes because sodium is the major osmole. Rarely can be normal due to hyperlipidemia or paraproteins – which alter the plasma water fraction (reduce it actually- the sodium concentration in the plasma water is normal, but the total plasma concentration becomes low) – this usually doesn't matter in modern labs except in extreme cases. Sometimes it is high due to hyperglycemia or mannitol – both of which are osmoles and result in moving water out of cells into plasma and thus dilute serum sodium measurement – however total osmolality is not low, so no treatment is needed.
2. **Urine osmolality** – use to distinguish between impaired water excretion (the usual case) and some other causes of hyponatremia (polydipsia, beer drinkers potomania, reset osmostat).  
Usually the normal response to a low sodium is to suppress ADH resulting in a maximally dilute urine with an osmolarity below 100 and sg less than 1.003.  
However, as a starting point in assessing volume status, urine specific gravity is usually more readily available than urine osmolality.
3. **Urine Sodium** –in absence of adrenal insufficiency or hypothyroidism, the two major causes of hypoosmolar, hyponatremia with an inappropriately concentrated urine are either effective volume depletion or SIADH. You can tell them apart by measuring urine sodium which is usually below 20 in hypovolemia and above 40 in SIADH (\*exception of course is if a patient is on diuretics which can make interpretation of urine sodium difficult\*)

### **Causes of Hyponatremia-**

#### **High ADH**

\*Effective volume depletion (CHF, Cirrhosis, Thiazides, True vol depletion due to vomiting, diarrhea, bleeding, urinary losses – usually NOT sweat loss → as this is free H<sub>2</sub>O loss unless you only replace with free water)  
SIADH – multiple causes

## **Hormonal states**

Adrenal Insufficiency

Hypothyroidism

Pregnancy (HCG may reset osmostat down)

## **Low ADH (appropriate)**

Renal failure (advanced stage only as you lose diluting ability)

Polydypsia (must drink >10L day to get sodium real low)

Beer drinkers potomania (chronic poor intake that limits ability to excrete free water – i.e. they take in a solute load of 250 mosm (vs 600 for normal person) and despite dilute urine of say 75 mosm they can only excrete 3.5L (250/75) of urine – thus if they take in more than this amount of fluid (beer-which is nearly non-osmolar) they will become hyponatremic)

## **Pseudo Hyponatremia**

-high plasma osm (hyperglycemia, mannitol – no rx needed as serum osm is not low)

-normal Posm (hyperlipidemia, hyperparaproteinemia → alteration of plasma water fraction – again no need to treat as plasma water sodium conc and osm ok)

## **Treatment**

Careful: because of risk of osmotic demyelination ---due to hyponatremia (hyposmolarity) causing cerebral edema and then the brain correcting by losing osms....then if you correct too fast you're in trouble. (more so with more chronic hyponatremia)

General rule: no more than 12 meq increase in sodium in first 24 hours

Exceptions: Acute hyponatremia with CNS manifestations (seizure,etc) – can correct the first 10-12 meq quickly (over 4-6 hours say) then go slow after that (but again probably no more than 12 meq the 1<sup>st</sup> 24 hours.

How to treat?

1. Water restrict – for edematous states (chf, cirrhosis), SIADH, polydypsia, and renal failure
2. Normal Saline – in true vol depletion or adrenal insufficiency (avoid in SIADH as you may make things worse unless you replace with fluid that has a osm greater than Urine)
3. Hypertonic saline – if you need to correct rapidly in SIADH or other conditions- careful as you may correct too quickly.
4. Lasix – works by wiping out some of the concentrating gradient- can lower Uosm and thus help eliminate free water more effectively in states such as SIADH