Exertional Hyponatremia

- Daniel J. Van Durme, MD, FAAFP
- Professor and Chair, Department of Family Medicine and Rural Health
- FSU College of Medicine
- Medical Staff – Ironman Triathlon, Panama City
- Former Team Physician – Tampa Bay Lightning, Tampa Bay Storm, Tampa Bay Mutiny, USF Football and other sports
Background/Definition

- Normal serum sodium 135-145 mEq/L
  - Problem when < 130 mEq/L
  - Life-threatening when < 120 mEq/L

- Data hard to come by
  - Up to 30% of distance athletes
  - 0-2/1000 in marathon studies
  - Events lasting >4 hrs

- Females >> males
  - Lower total body water to start
  - Takes less fluid to dilute
Causes

- Water intoxication
  - Hypervolemic hyponatremia
  - Dilutional hyponatremia – too much hypotonic intake
  - More edema

- Hypovolemic hyponatremia
  - Sweat losses of sodium and water – absolute decrease in sodium levels
  - Dehydration
  - No edema
Physiology
why do the kidneys let this happen?

- Theoretic mechanisms
  - Kidney filtration is decreased in exercise (20-60%)
  - Some folks produce excess AVP (arginine vasopressin)
    - *Hormone that “suppresses” kidney filtration*
  - Non-steroidal anti-inflammatory drugs (NSAIDs) increase effect of AVP on kidney
    - *Ibuprofen, naproxen, aspirin, others*
    - *Fluid retention – common side effect*
Signs and Symptoms

- May present at conclusion of event or over hours
  - Over-drinking
  - Nausea/vomiting
  - Headache
  - Dizziness
  - Muscles twitching, extremities tingling
  - Peripheral edema
  - Disorientation and altered mental status
  - Pulmonary edema
  - Seizures
  - Cerebral edema → respiratory arrest → death
Handheld analyzers?

- Accurate handheld battery-powered devices exist
- Mass events (e.g., Ironman Triathlon)
  - When in doubt – ship them out
  - Need to watch closely, retest and treat to return sodium towards normal
Why do some folks get this but not others?

- Complex factors
  - Sweat volume/composition and rate
    - Rate varies 0.5 – 2.5L/hour
  - Fluid intake type and rate
  - Total body water
  - Pre-event sodium levels
  - Environmental heat and humidity
Treatment/Management

- Mild - normal total body water
  - Restrict fluids – eat salty foods (pretzels, crackers)
  - Drink concentrated salty drink 3-5 bouillon cubes in hot water

- Mental status changes
  - Ambulance transport
  - IV hypertonic saline (3-5%)
Prevention 1

- Individualize – different sports, sweat, body mass, environment, etc.

- Pre and post weights
  - Dropping 1% - 1.5% is OK
  - *150 lb athlete* – 1.5-2.25lbs
  - Do not drop more than 1.5%

- Start event well-hydrated
  - 16-20oz water or sports drink 2-3 hours prior to event
  - plus 8-10oz 10-20min prior

- Watch thirst (probably already down 2%) and urine color
Prevention 2

- Rehydrate with two 8oz glasses sports drink replacing 1 lb of water loss
  - Do not exceed pre-exercise weight

- Hydrate with “sports drinks”
  - Roughly 7-10oz every 10-20min
  - Do not over-hydrate

- Sodium containing foods
  - Soups (bouillon cubes or canned soups), crackers, pretzels
  - Early in season (during acclimatization)
  - Before and after exercise

- Limit use of NSAIDs
Salt Tablets? – No

- Not needed
- Trigger excess thirst
- GI upset – nausea, diarrhea, not well absorbed
- Risk of hypernatremia
Heat acclimatization

- 60-90min per day for 7-10 days
  - Build gradually
- Raises sweat rate (better cooling)
- Retains sodium – more dilute sweat
  - less hyponatremia
- Increases blood volume
- At the same workload:
  - Decreased core temperature
  - Decreased heart rate
High risk athletes

- Athletes
  - Excessive drinking
  - Weight gain during exercise
  - Females
  - Low body weight
  - Inexperienced and/or slow pace
  - Taking NSAIDs
High Risk Events

- Event
  - High availability of fluids
  - Longer events >4hrs
  - Unusually hot environment
  - Very cold
Return to play/compete

- Careful assessment of factors that led to episode
- Predictable? Preventable?
Sweat rate calculator

- Repeat as body acclimatizes and exercise/environment changes
- Sweat Rate = (PreWt – PostWt + Fluid intake – Urine output)/exercise time hrs
- Example (72.3kg – 70.9kg + 960ml – 110ml)/1hr = 2.25L/hr
  - To stay hydrated, he needs 2.25L/hr or 375ml (12 oz) every 10 min
Questions?
That's all Folks!