

# **Exercise Induced Collapse: Hyponatremia**

See also Exercise Associated Hyponatremia (EAH)

## **Background**

1. Defined as plasma sodium <135 mmol
  - Usually only symptomatic when sodium <125 mmol
2. Incidence
  - Up to 10% of ultra distance athletes experience EIH
  - 2002 Boston Marathon, Almond et al found 13% of 488 runners hyponatremic
  - Female gender
  - >4 hr events

## **Pathophysiology**

1. Dehydration/salt depletion
2. Excess fluid intake
  - Usually due to excessive hypotonic rehydration (73%)
3. May also be due to hormonal (ADH/AVP) and renal abnormalities
  - AVP response-more sensitive to blood volume than sodium level
  - Blood volume protection is a survival mechanism
  - Water retention worsens hyponatremia
  - AVP typically suppressed when increased blood volume
    - Allows free water excretion via urine
4. During exercise, plasma AVP not maximally suppressed
5. Normal plasma AVP levels inappropriate in presence of hyponatremia

## **Diagnostics**

1. Symptoms usually occur when sodium <130 mmol
2. Rate of decrease also a factor
  - Rapid change in sodium
    - Increased influx of free water in CSF
    - Increased intra-cerebral pressure
3. Common symptoms:
  - Nausea
  - Vomiting
  - Headache
  - Irritability
  - Dizziness
4. More severe:
  - Seizures
  - Declining mental status
  - Coma
  - Death
5. Differentiate from heat stroke
  - Normal rectal temperature 35-40 °C (95-104 °F) excludes heatstroke

## Therapeutics

1. Oxygen administration
2. Rapid transport to medical facility
3. IVF
  - 100 mL of 3% NaCl over 10 minutes
4. If symptoms worsen:
  - Repeat hourly at 100 mL/h until patient regains consciousness
5. Monitor plasma sodium hourly until symptoms subside
6. If no hypertonic NaCl available, give hypertonic mannitol

## Prevention

1. American College of Sports Medicine
  - Before exercise
    - Drink generous amount of fluid 24 hours prior
    - Drink 400-600 mL 2-3 hours prior
  - During exercise
    - Drink to maintain fluid balance
    - Drink 150-350 mL q15-20 min
  - Post exercise
    - Drink to replace sweat losses
    - 450-675 mL for every pound of body weight lost
2. Include sodium in rehydration solution during exercise lasting >1 hour
  - Sodium: 0.5-0.7 g/L
3. Advise competitors against drinking copious amounts of water during event-include sodium
4. Ironman competition cycle aid stations every 20 km/ run stations every 2.5 km
5. Standard marathon foot race, placement of aid stations every 5 km
  - Often advise athletes on fluid overloading
6. 150-300 mL of fluid intake at 15-20 minute intervals (1 liter/hr)
7. Pre-race weights for all endurance athletes
8. Increased body weight in a collapsed athlete-suspect EAH
9. Onsite event analysis of serum or plasma Na<sup>+</sup>

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