Contents

➢ Thirst
➢ Thirst, Hunger & Satiety
➢ How much water?
**Thirst**

- Double-depletion hypothesis of thirst

![Diagram showing water contents inside and outside cells]

- Water contents
  - ICF: 55~75%
  - ECF: 25~45%
  
  (IV:ExV=1:3)

**Fluid Homeostasis**

- Stimuli for thirst
  - Osmoreceptors
  - Vasopressin
  - Baroreceptor
    - Angiotensin II (AII)
    - Aldosterone

![Diagram showing fluid homeostasis and stimuli for thirst]

Johnson AK, MEDICINE & SCIENCE IN SPORTS & EXERCISE, 2007

**Plasma Osmolality & Thirst**

![Graph showing the relationship between plasma osmolality and thirst]

![Graph showing plasma AVP and osmotic threshold]

Johnson AK, MEDICINE & SCIENCE IN SPORTS & EXERCISE, 2007
The renin-angiotensin system

A Classic RAS

B Brain RAS

Thirst & Sodium appetite

Lick rate analysis of sodium taste-state combinations. Am J Physiol 1993; The sensory psychobiology of thirst and salt appetite

Water deprivation-partial rehydration protocol

De Luca Jr LA, Physiology & Behavior 2010;100:535-44.
Long-term effect of sodium deficiency and activation of the renin–angiotensin system

Physiol Behav. 2008;94:709-21.

- Mild dehydration in childhood
- Military service in young adult
- Cross-sensitization between extracellular dehydration and the effects of drugs of abuse

Thirst, Hunger & Satiety

Thirst-drinking, hunger-eating; tight coupling?


Thirst vs. hunger

- Hydration by energy-containing drinks
  - Beverages are highly palatable, inexpensive and convenient.
  - It is socially acceptable to drink in many social and professional settings

- In US adults
  - 19% of total daily fluid from foods
  - 81% of total water intake is derived from beverages
  - carbonated soft drinks (28.3%),
  - Beer (11.7%)
  - Milk (10.9%),
  - Fruit beverages (4.78%),
  - Sports drinks (2.3%)
  - Wine (1.2%), and distilled spirits (0.7%)

Thirst, Hunger & satiety

- Thirst sensations are high and stable over the day
- Thirst has higher inter-individual difference
- Beverages elicit weak compensatory dietary responses
- Drinking augments hunger

Thirst Interoception & diet

- The reduced reliability of sensory signal in high saturated fat & added sugar diet
- Greater base level of thirst
- Less sensitive thirst interoception
  - smaller changes in thirst after consuming salted chips
  - smaller unit changes in thirst per unit volume of water consumed
- Poorer predictability
  - the thirst rating obtained prior to drinking & the later volume of water drunk

Interoception & Behavior

- AT II
- Orexin neurons
  - Actual seeking & consumption of reward
- LHA stimulation can be modified by experience
  - Associative learning
  - Conditioned place preference paradigm
  - Craving rather than thirst or hunger
From Dehydration to energy Intake

Dehydration
RAS system↑
Sodium Appetite↑
Craving↑

How much water?

Urine osmolality & Fluid intake

Erica T. Perrier Dis Markers 2015.

ROC analysis curve for urine osmolality as an indicator of fluid intake
optimal cutoff 544 mOsm·kg⁻¹
Sensitivity 0.858, specificity 0.797

Strong correlations between each pair of variables; total daily fluid intake (TFI), 24 h Uvol, 24 h Uosm
Self-monitoring of Dehydration

ECO 2015 Symposium