

306 Thirst and Water Regulation

Behavior and Physiological Mechanisms for Regulating Water:

- Drink fluids while eating solids (foods)

- Eat foods high in H₂O content

- Avoid losing H₂O (esp. in desert animals)

 - very dry feces, very concentrated urine, nocturnal

 - decreased water lost from exhaled breath

Kidneys

Hormones:

- vasopressin = antidiuretic hormone (ADH)**

 - from posterior pituitary

- aldosterone**

 - from cortex of adrenal glands

body water supplies are found both **inside and outside of cells**

- “interstitial fluids”** refers to fluids (incl. water) outside of cells

- also called **“extracellular” fluids**

- if lose water from outside of cells ✂ **“hypovolemic” thirst**

- “intracellular” fluids** (water inside of cells)

- if lose water from inside of cells ✂ **“osmotic” thirst**

can lose water from both locations, and in each case you will feel “thirsty” as a result

Osmotic Thirst

Causes? What would put water out of cells into the extracellular location? What would cause the extracellular fluids to become “saltier”? Which would then cause intracellular fluids to leave inside of cells to again balance salts/water balance inside vs. outside of the cell...

What “problem” would the **kidneys** face?

Brain Mechanisms:

“**osmoreceptors**” (special neurons), located in the walls surrounding the 3rd ventricle
are not “protected” by the BBB (BBB is “leaky” there)
exposed to salts circulating in the bloodstream

these receptors are found mostly in the “organum vasculosum laminae terminalis” or vascular organ of the lamina terminalis (OVLT) of the **hypothalamus**

there are also osmoreceptors in the stomach and gut

the neural signals from these brain osmoreceptors (OVLT)

- ✂ signal to **supraoptic nucleus** and **paraventricular nucleus** (of the hypothalamus) ✂ which in turn send separate signals to
- (1) **posterior pituitary** ✂ secreted increased amounts of ADH ✂ decreased amounts of urine created
- (2) **lateral preoptic area** (hypothalamus) ✂ increased drinking

Hypovolemic Thirst

Causes? What would cause water suddenly to be lost from outside of cells? From extracellular fluid loss?

Note: if lose blood volume ✂ what happens to BP?

Normally if lose extracellular fluid, one loses both water and salts, so must replenish **both**

Brain Mechanisms:

Body can detect the loss of extracellular fluids (including blood volume) in two ways:
by response of “**baroreceptors**” in large veins and atria of heart
by response of “**baroreceptors**” in kidneys

The signal from these baroreceptors ✂ a chain of chemical events
Renin (released by kidneys) ✂ **Angiotensin I** (in bloodstream)
✂ **Angiotensin II** (in bloodstream) ✂ peripheral vasoconstriction
✂ what effects on BP?

Angiotensin II crosses the BBB into the brain ✂ stimulates the **subfornical organ** (and maybe the **OVL** too) ✂ signals the **lateral preoptic area** (hypothalamus) ✂ increased in drinking

Must also replace salts...

as Na^+ levels in body decrease ✂ adrenal gland cortex releases aldosterone ✂ kidneys start retaining more Na^+ and person starts craving salty foods (increased drinking/eating of salts)

aldosterone acts like of NT on the OVL to increase the intake of salty foods/liquids

as Na^+ levels drop ✂ also increases **angiotensin II** ✂ increase in cravings for salty foods/drinks

