



بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ



یا ابا عبد اللہ الحسین (ع)

Diabetes insipidus

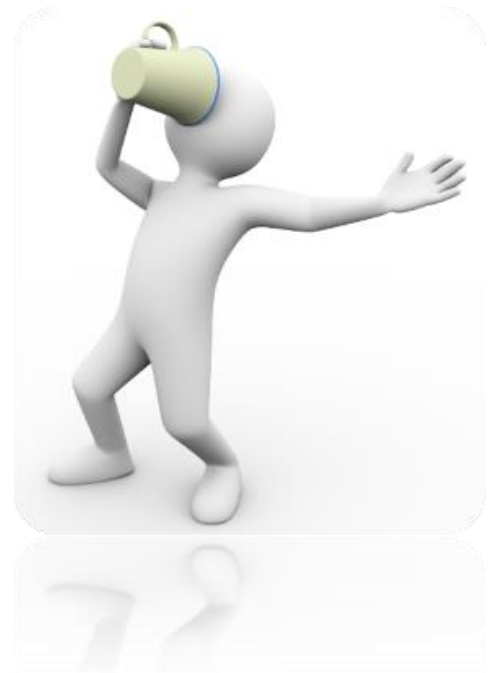
Dr. Kashi

Professor of Endocrinology

1401



I'm thirsty

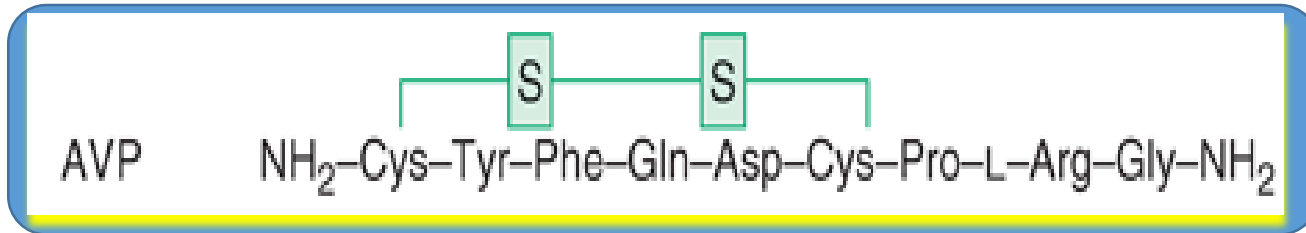


agenda

- *Physiology*
- *Diabetes Insipidus definition*
- *Diabetes Insipidus causes*
- *Diagnosis*
- *Treatment*
- *Post pituitary surgery diabetes insipidus*
- *Transient diabetes insipidus in pregnancy*

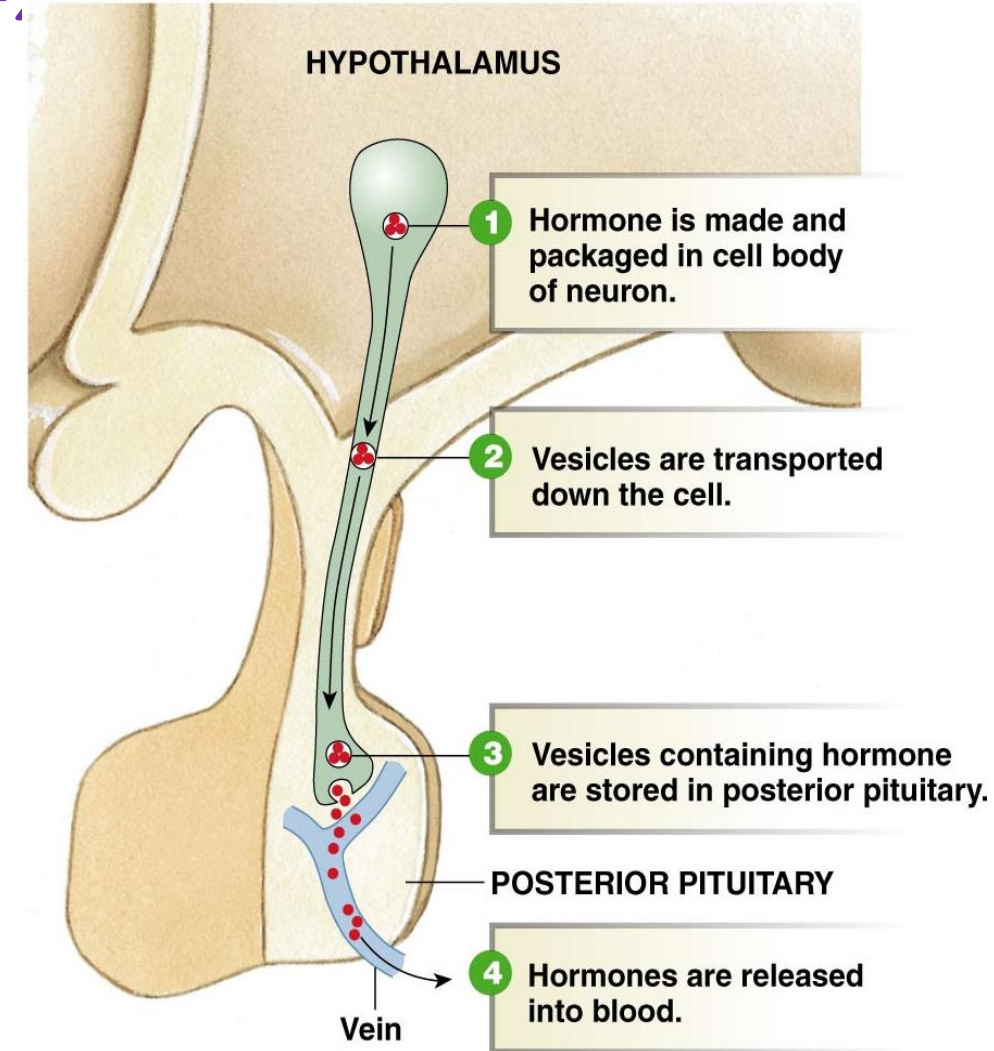
Anti - Diuretic Hormone (ADH)

□ ADH or vasopressin is a **nanopeptide**



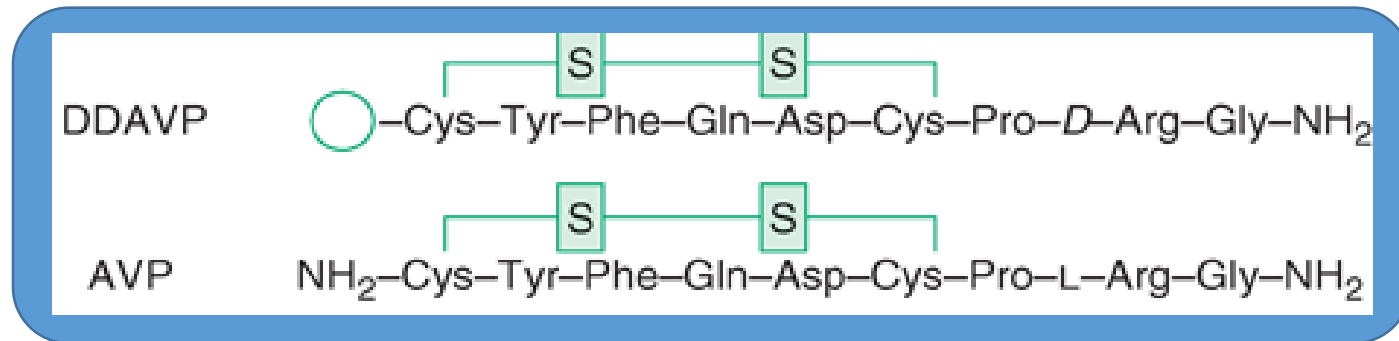
□ is synthesized in the **supraoptic** and **paraventricular** hypothalamic nuclei

□ is secreted into the blood through **the posterior pituitary**

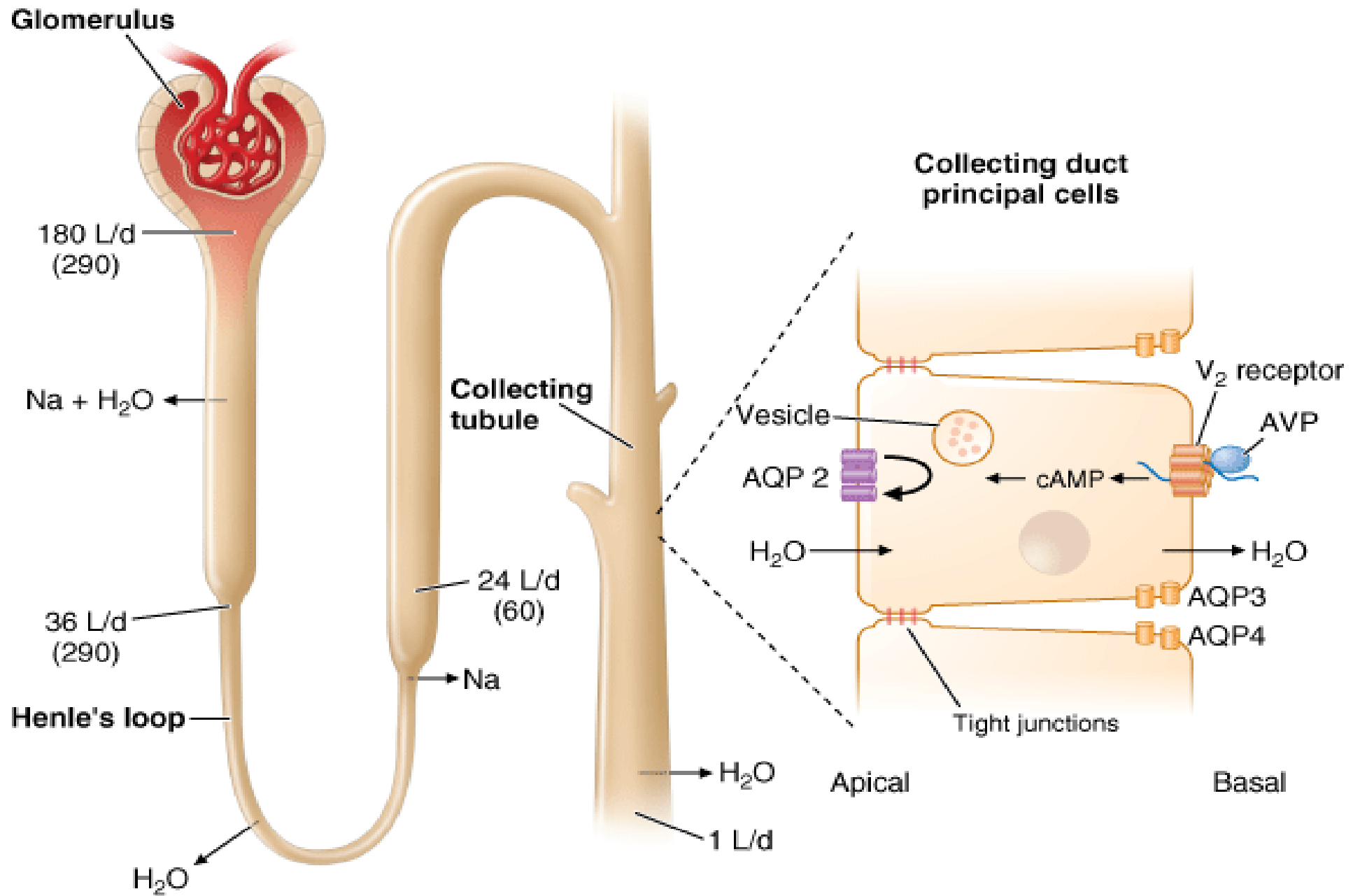


Anti - Diuretic Hormone (ADH)

- ❑ Its main effect is to **prevent the excretion of water** from the kidney
- ❑ Its half-life is a **few minutes**



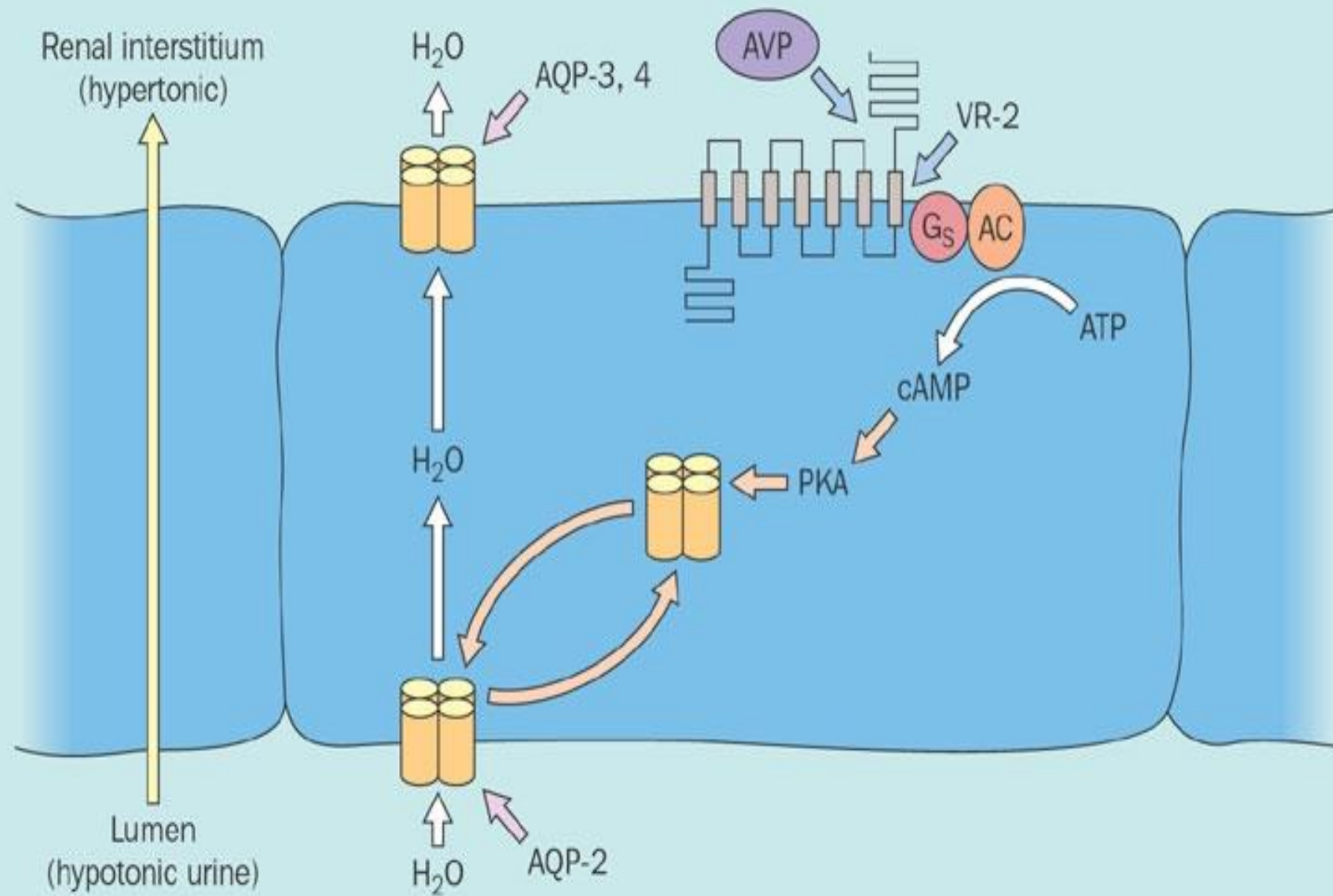
- ❑ Its clearance increases during pregnancy due to **placental vasopressinase**



Source: Fauci AS, Kasper DL, Braunwald E, Hauser SL, Longo DL, Jameson JL, Loscalzo J: *Harrison's Principles of Internal Medicine*, 17th Edition: <http://www.accessmedicine.com>

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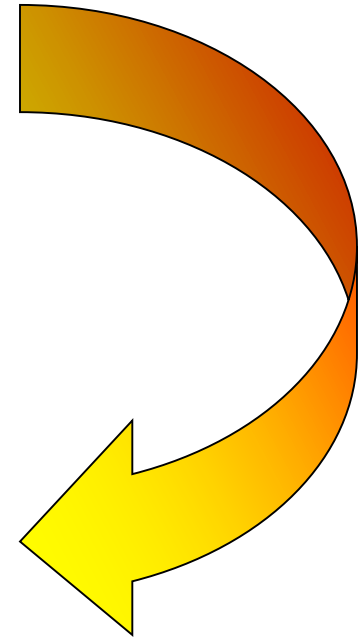
Schematic diagram of the distal tubular cell of the nephron



Other effects of ADH

✦ In high concentration, it causes a strong **contraction of the smooth muscles of the arteriole wall** of the body and as a result increases the arterial blood pressure

✦ Stimulation of **ACTH secretion**



Control of ADH secretion

Osmotic Pressure	Blood Volume
Osmoreceptors mediated Osmoreceptors in hypothalamus	Baroreceptors mediated (vagus nerve) Baroreceptors in carotid artery, aortic arch and left atrium
increase osmotic pressure → increase ADH secretion	high blood pressure → decrease ADH secretion
Low osmotic pressure → decrease ADH secretion	Decrease in blood pressure → increases ADH secretion
Direct relationship	Inverse relationship

Serum osmolality measurement formula:

$$OSM = 2 * [Na^{+} + k^{+}] + \frac{Gl\ mg/dl}{18} + \frac{BUN(mg/dl)}{2.8}$$

Normal 275-295 mosm/kg



Diabetes Insipidus

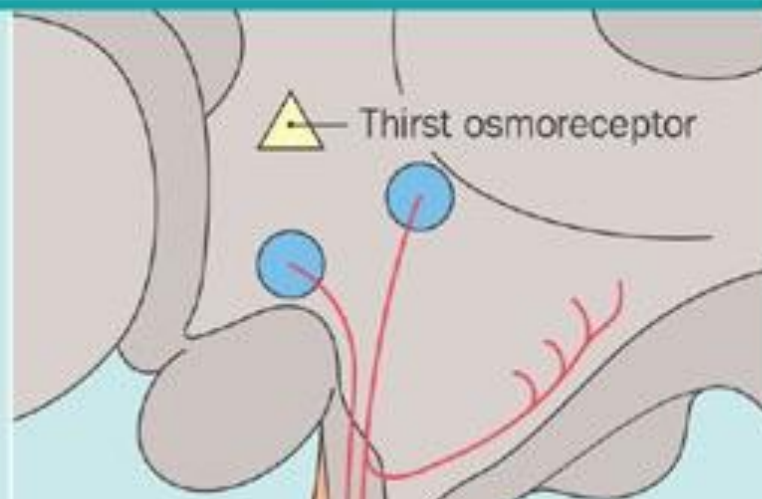
❑ **Polyuria** :Urine output exceeding 3 L/day (>40 cc/kg/d)

❑ **Dilute urine**: Urine osmolality usually below 300 mosmol/kg

Causes of polyuria and polydipsia

Hypothalamus

Primary stimulation of thirst osmoreceptor (primary polydipsia)



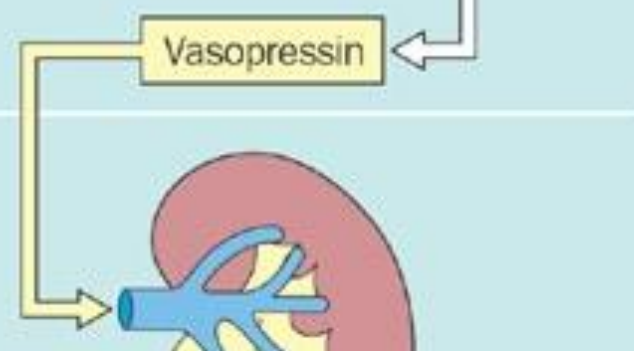
Pituitary

Lack of vasopressin (cranial diabetes insipidus)



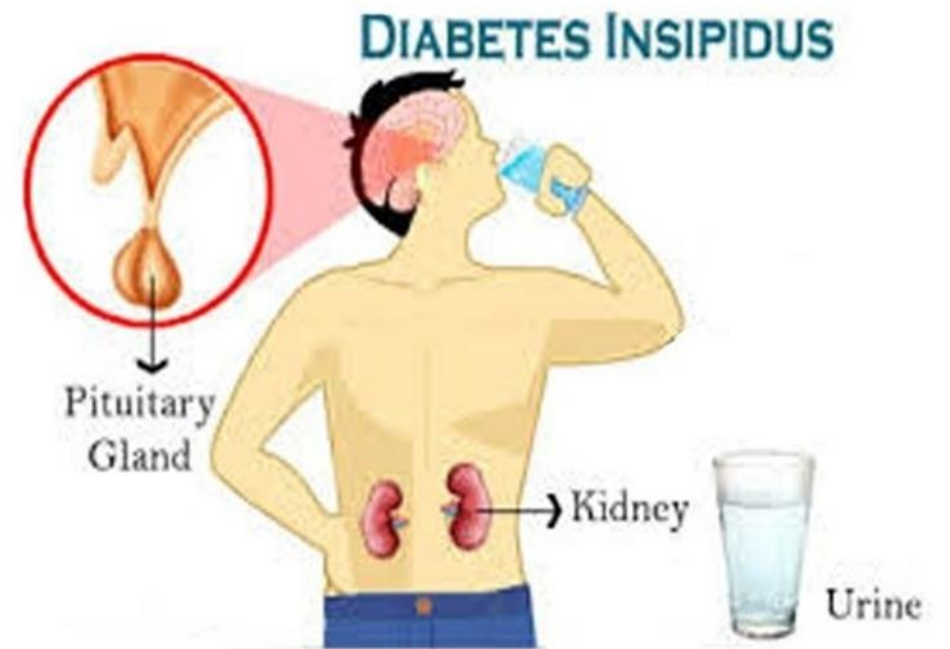
Kidney

Resistance to vasopressin (nephrogenic diabetes insipidus)



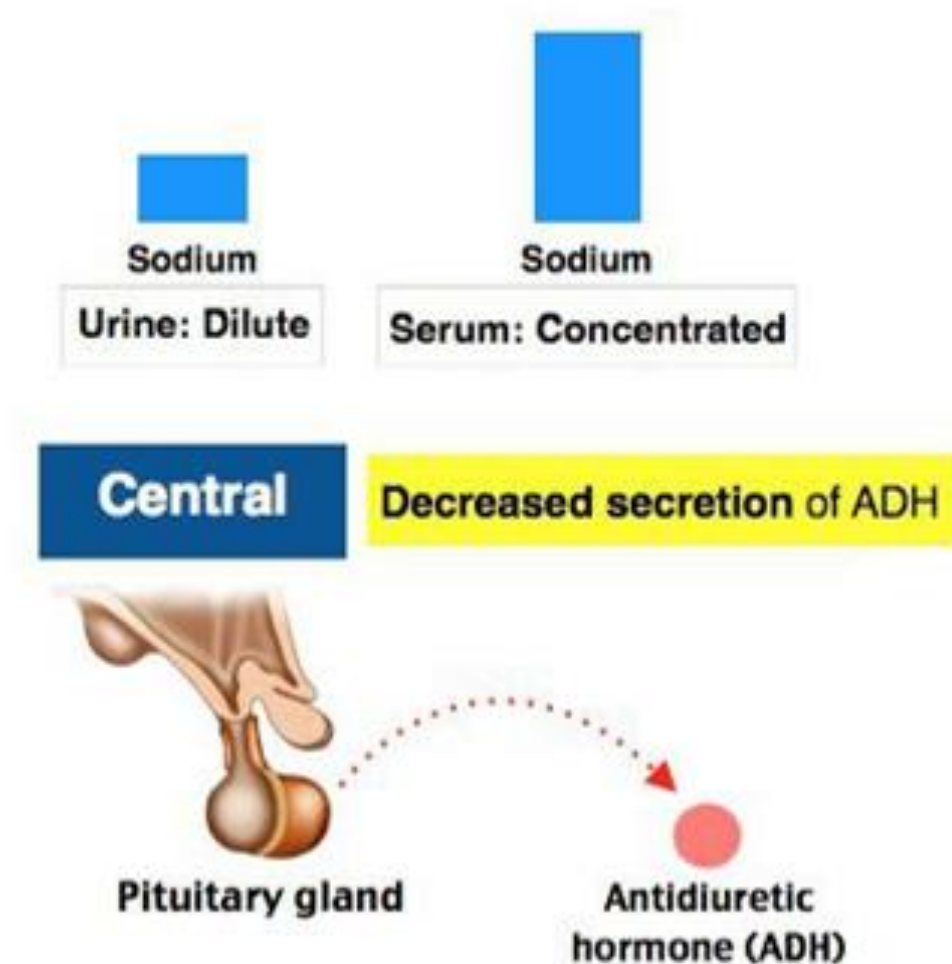
Causes of diabetes Insipidus

- ❖ **Primary polydipsia**
- ❖ **ADH secretion (central)**
- ❖ **ADH effect (renal)**



Causes of decreased ADH secretion (Central DI)

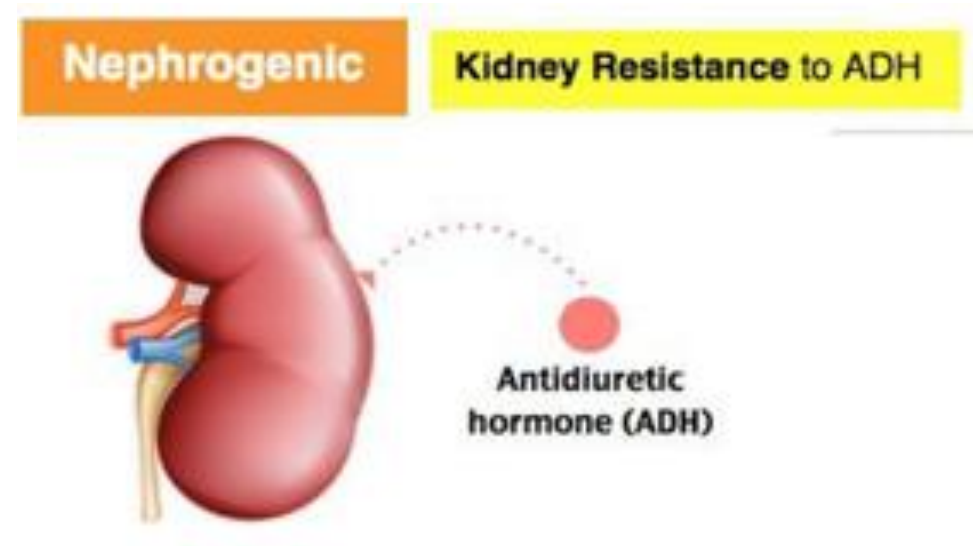
- ↔ Head trauma
- ↔ Neoplasm (craniopharyngioma, pituitary adenoma)
- ↔ Infection
- ↔ Inflammation
- ↔ Granulomatous diseases
- ↔ Vascular disorders
- ↔ Genetic
- ↔ idiopathic



Causes of ADH reduction

(Nephrogenic diabetes insipidus)

- ❖ Hypercalcemia
- ❖ Hypokalemia
- ❖ Lithium-demeclocycline
- ❖ Alcohol
- ❖ E2 prostaglandin
- ❖ Genetic disorders





1. The first step → Prove polyuria
2. The second step → prove dilute urine
3. The third step is to prove the cause

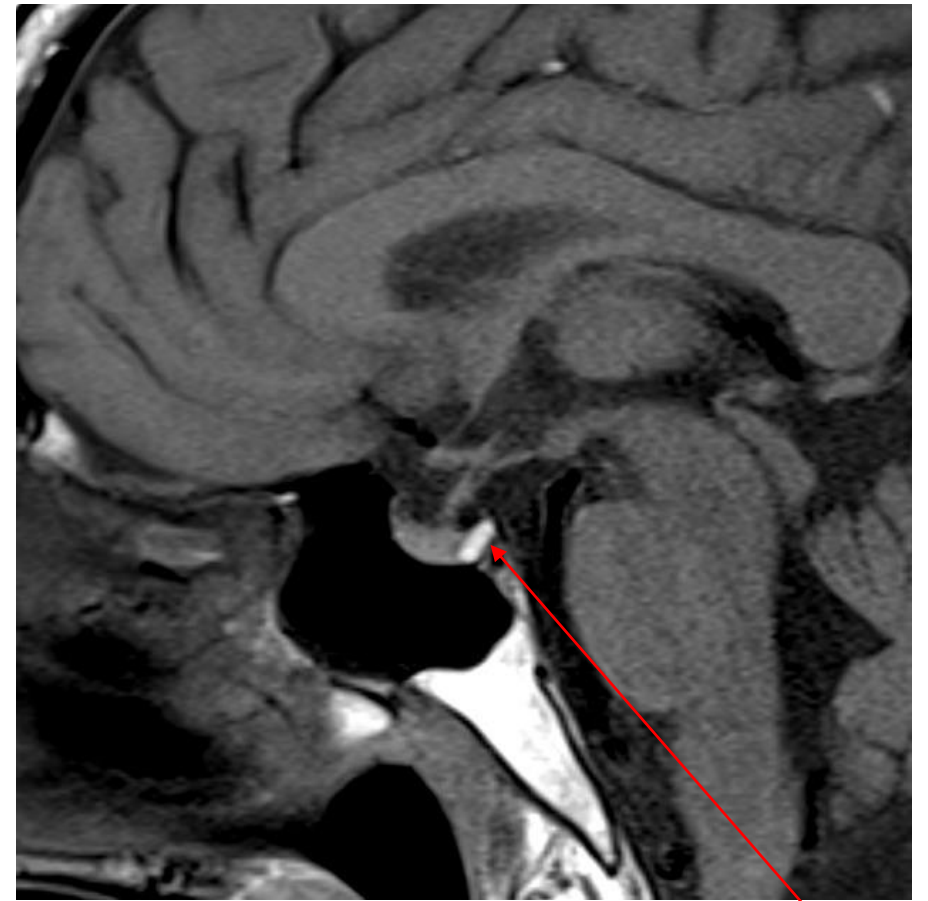
Important points:

➤ low serum sodium Favor of → **Primary Polydipsia**

➤ High serum sodium Favor of → **Diabetes Insipidus**

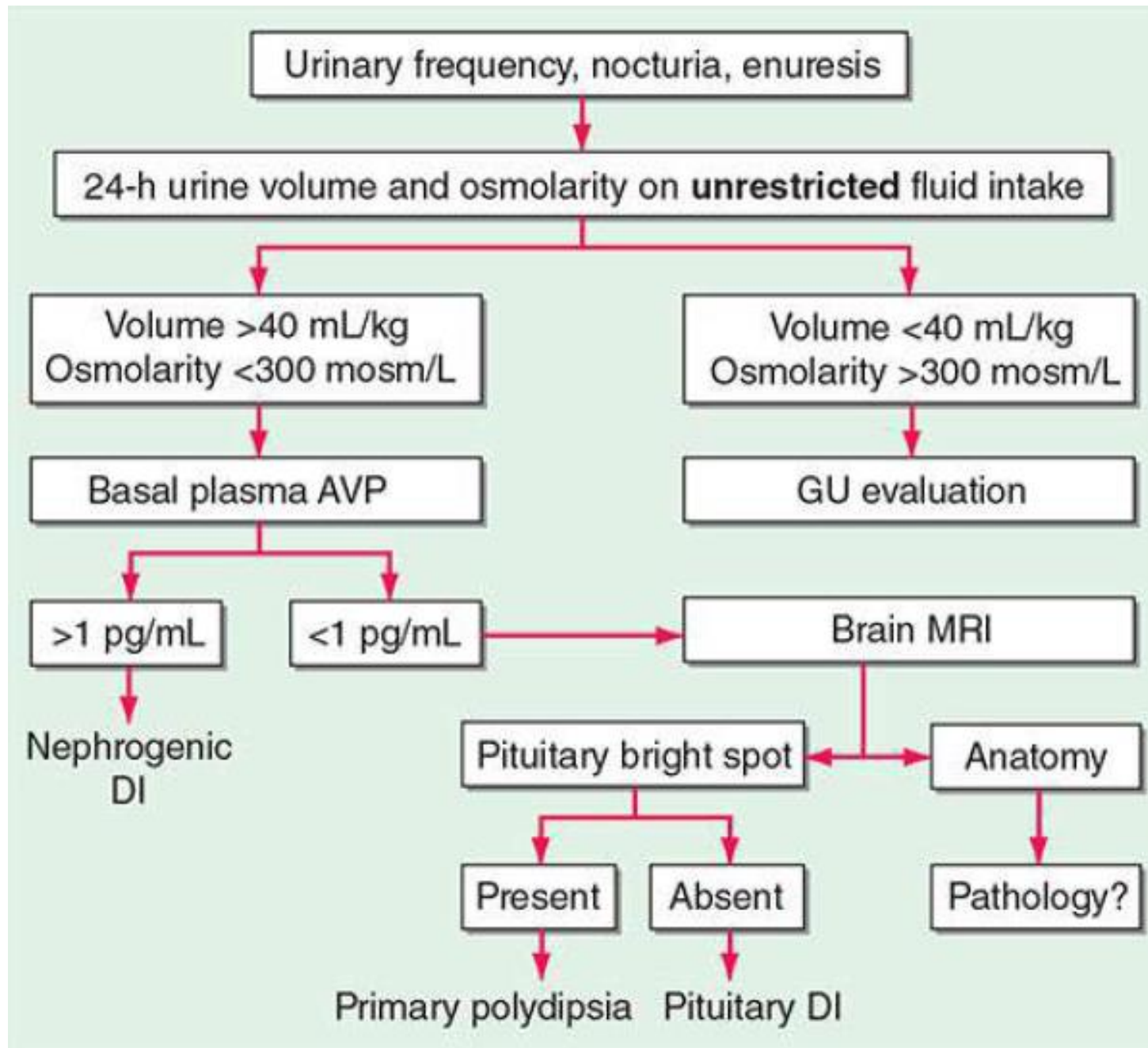
➤ pituitary bright spot → **AVP storage**

➤ In central diabetes mellitus: **symptoms usually start suddenly**
and **patients tend to drink cold water even in winter**



pituitary bright spot





Considering that ADH is not always available, should :

Evaluate response to vasopressin

- **Important note:** it is necessary for the test to give a correct result, the plasma sodium must be above 145
- If plasma sodium > 145 , the next step is to evaluate the **response to vasopressin**
- If plasma sodium or plasma osmolality is not high \longrightarrow **the water deprivation test** for rising the Na >145 \longrightarrow evaluate the **response to vasopressin**

Hours of projected water restriction

=

$\text{Weight (kg)} \times (0.03) \times 1000 \text{ (mL)} \div \text{Measured urine volume/hour (mL/hour)}$

Water deprivation test

Urine osmolarity >600



Primary polydipsia

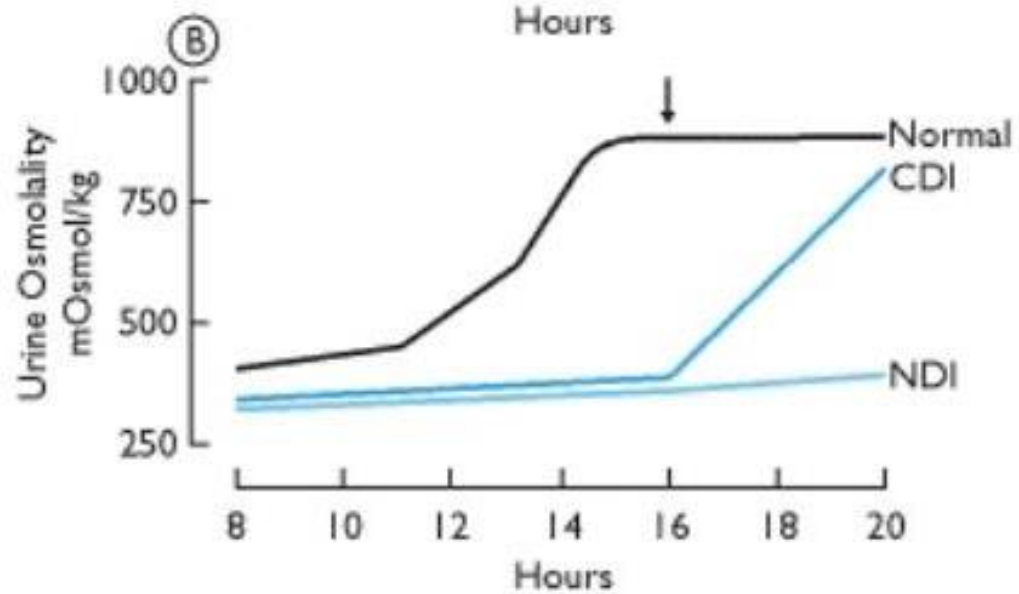
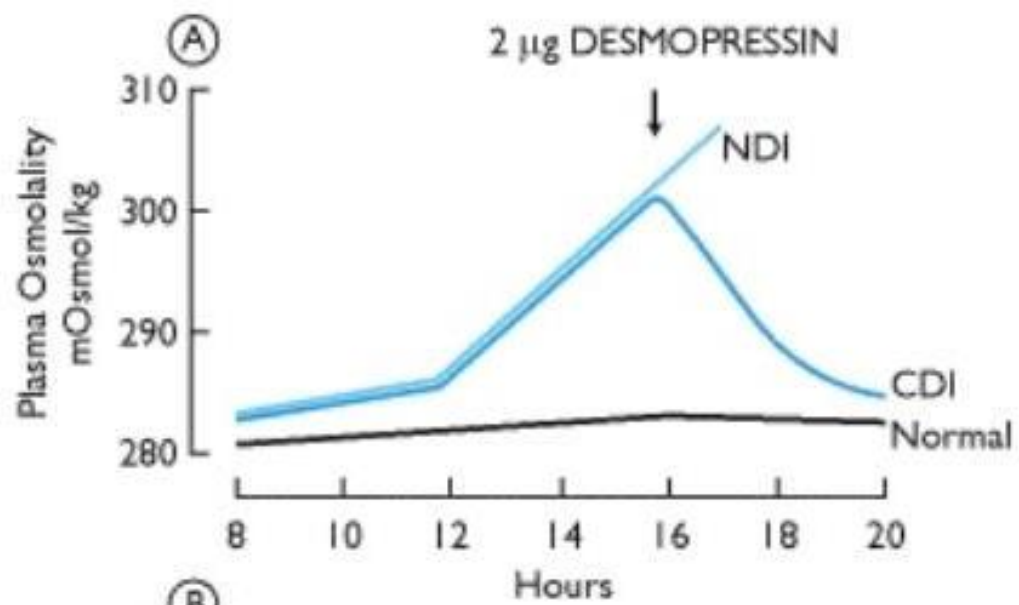
Urine osmolarity <600



Evaluate the response rate to DDAVP

Response to DDAVP

- No elevation in urine osmolality (<15 percent) and the urine osmolality is <300 mosmol/kg
✓ *Complete nephrogenic DI*
- A rise in urine osmolality of more than 50 percent and the urine osmolality is >300 mosmol/kg
✓ *Complete central DI*
- A small (up to 45 percent) elevation in urine osmolality to a level that remains <300mosmol/kg
✓ *Partial nephrogenic DI*
- An increase in urine osmolality of 15 to 50 percent and the urine osmolality is >300 mosmol/kg
✓ *Partial central DI*





Central DI treatment

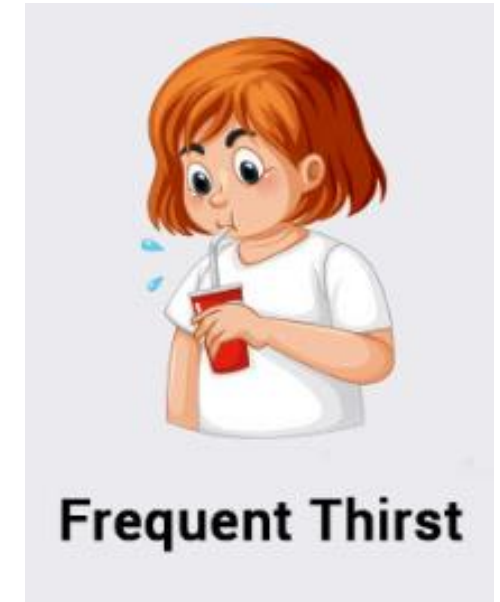
➤ Low salt diet

➤ Desmopressin

- nasal spray(5 mcg, 5-20)
- Tab (0.1mg , 0.05-0.8)
- Sc,IV(4mcg)

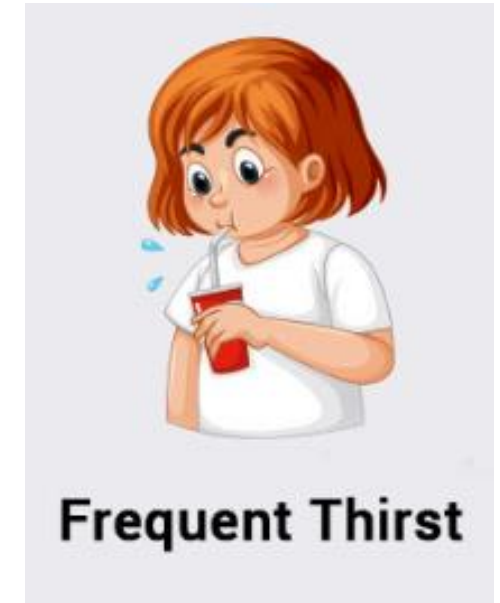
➤ Other drug

- Chlorpropamide, clofibrate, carbamazepine

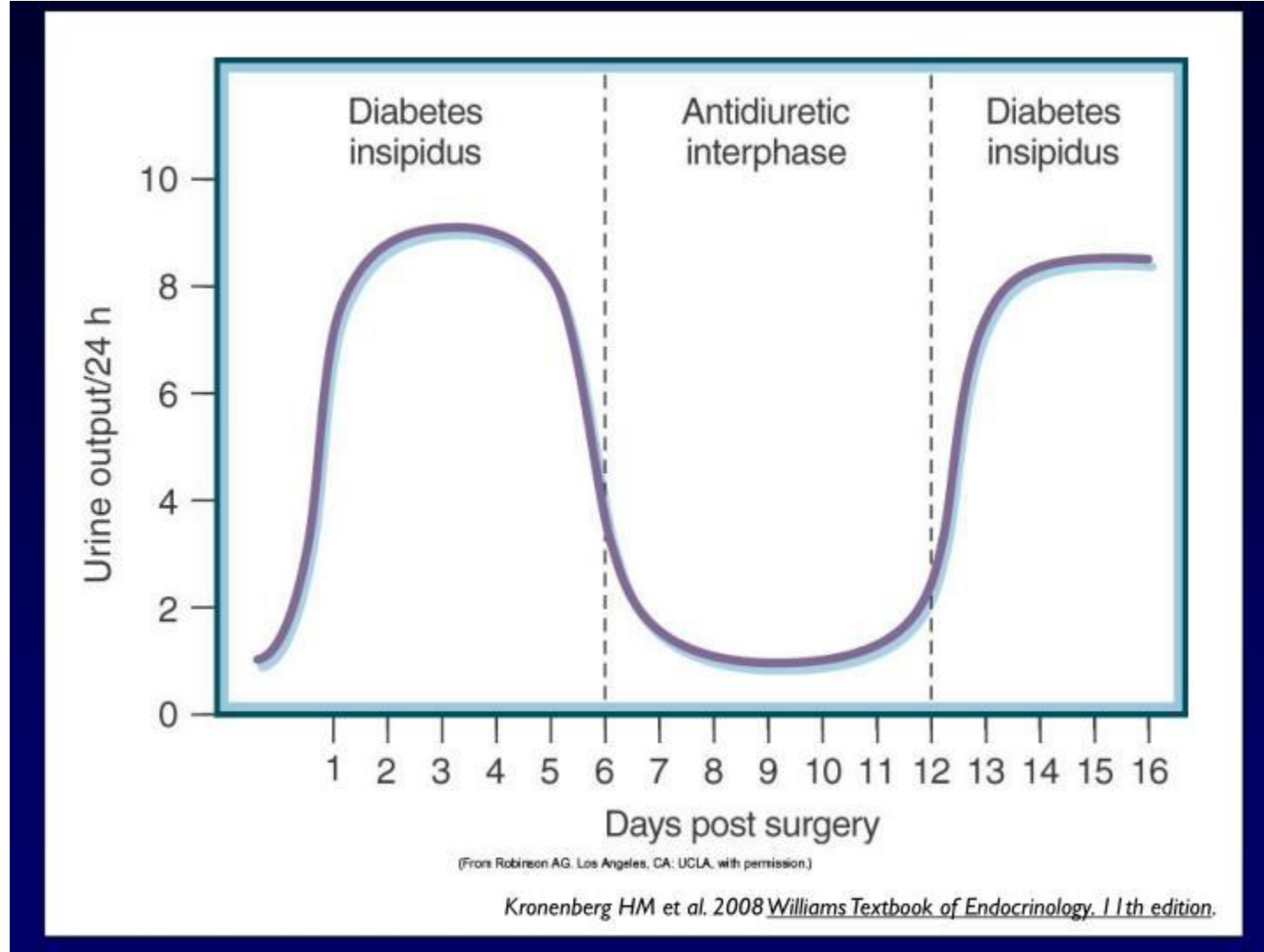


Nephrogenic DI treatment

- Correcting underlying disorder
- Low salt diet and low protein diet
- Double –voiding
- Drug
 1. Thiazide
 2. Amiloride
 3. Indomethacin
 4. Desmopressin



Post pituitary surgery diabetes insipidus



Permanent diabetes is high in patients with serum sodium >145 mEq/L in the first five days after surgery

DI after pituitary surgery

□ Signs and symptoms:

- Polyuria, polydipsia, thirst, typically occurring within 24-48 h of surgery/h
- Usual urine output 4-18 L/day of diluted urine (>40-50 mL/kg/24h; >2.5mL/kg/h; or >250mL/h x 2 consecutive hours)
- Significant hypovolemia (rare in alert situation and with a preserved thirst mechanism)

□ Laboratory data

- ✓ Normal or increased plasma sodium and serum osmolality
- ✓ Urinary osmolality < 100 or lower than plasma osmolality

Treatment of DI after pituitary surgery

- Serum electrolyte and urinary osmolality should be test twice daily

❖ *Drug treatment*

Indications:

- ✓ patient unable to maintain oral fluid intake
- ✓ Urine output higher than fluid intake
- ✓ hypernatremia

Subcutaneous or intravenous desmopressin: Starting dose, 0/25-1 mcg

Repeat the dose when urine output is between 200 and 250 mL/h for 2 h with osmolality < 200 mOsm/kg or urinary specific gravity < 1005

□ *Monitoring of resolution of transient DI*

✓ *Check for the disappearance of polyuria and the normalization of plasma osmolality and serum electrolyte levels*

✓ A positive water balance > 2 L suggests inappropriate antidiuresis

□ If this occurs, in addition to **discontinuing desmopressin**, **water intake should be restricted** to maintain serum sodium at normal levels

Transient DI of Pregnancy

- ❑ *4/100000 pregnancy*
- ❑ *Between 8th week and midpregnancy the clearance of ADH increase 4-6fold because of placenta vasopressinase*
- ❑ *Treating with desmopressin*
- ❑ *Resolves postpartum*

summary

- *Diabetes Insipidus definition (polyuria + dilute urine)*
- *Diabetes Insipidus causes (Primary polydipsia-Central DI-Nephrogenic DI)*
- *Diagnosis (water deprivation test - response to vasopressin)*
- *Treatment (DDAVP-thiazide,...)*
- *Post pituitary surgery diabetes insipidus (triphasic)*
- *Transient diabetes insipidus in pregnancy (vasopressinase)*



ایسی طرح

Enlakh