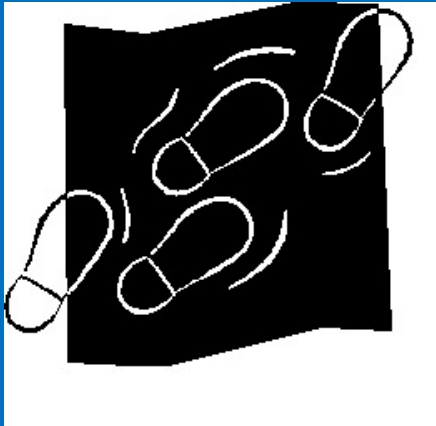


Water is Your Friend!



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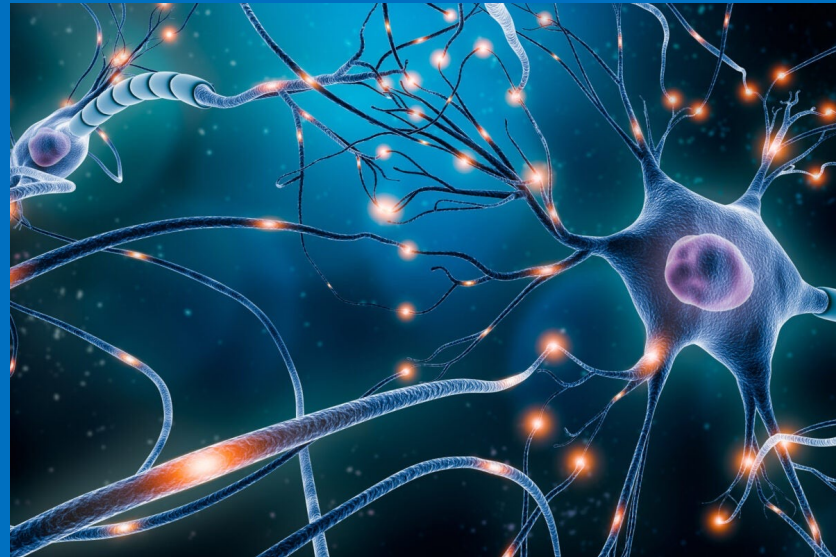
Case Study

A 75 year old male has a history of coronary artery disease (on metoprolol) and an enlarged prostate and advanced Parkinson's disease associated with imbalance and mild cognitive decline. Because of the need to urinate frequently as well as having experienced episodes of incontinence, he began restricting how much water he drank. His cognitive abilities deteriorated and he began to have hallucinations. He felt lightheaded whenever he stood up (his blood pressure dropped). He experienced fainting which led to a fall causing a fracture of his hip.



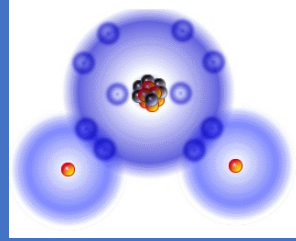
Outline

- I. Water is important for the functioning of all of our body's cells
- II. People with PD may have trouble both swallowing water and controlling their urination
- III. Inadequate hydration leads to many problems including exacerbation of orthostatic hypotension
- IV. There are treatments for swallowing and voiding problems
- V. There are treatments for orthostatic hypotension
- VI. Water is your friend!

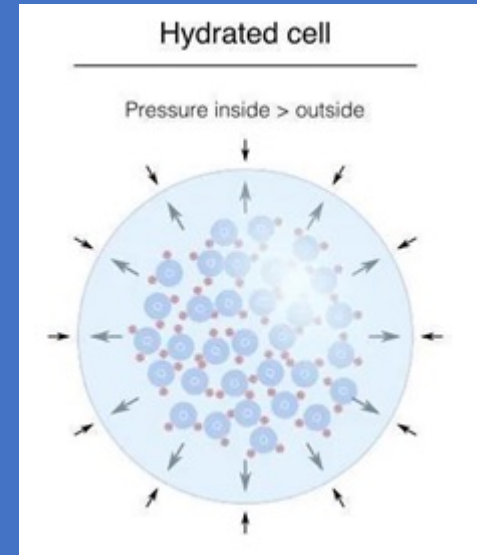




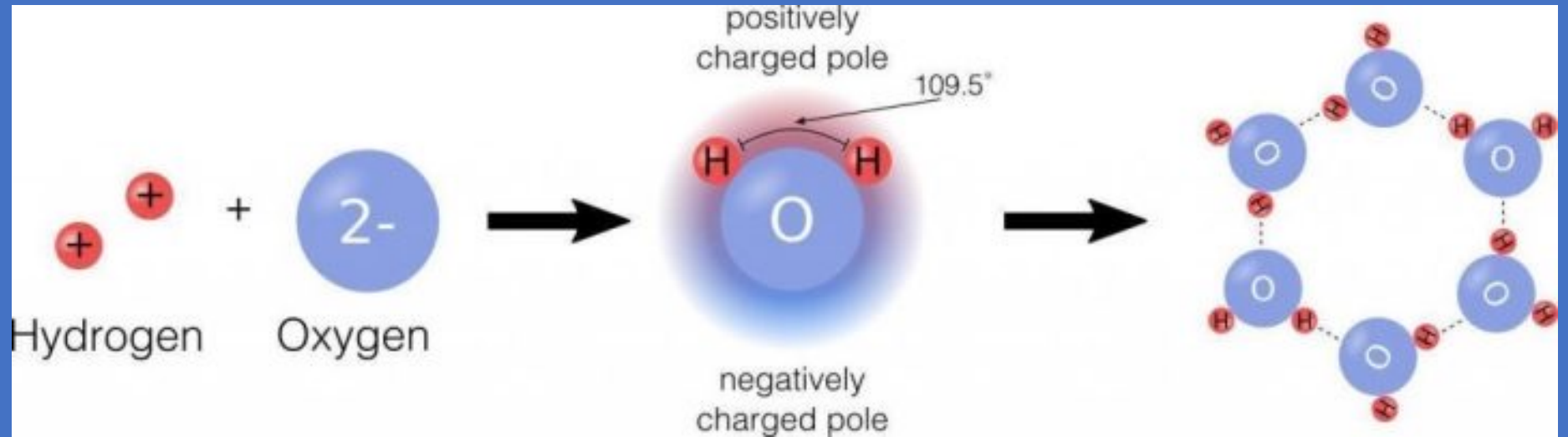
Water (H₂O)! “Water is the material cause of all things” Thales, 624-546 BCE



- A major component of all living things and is essential for life
- Water is a small “solvent” (able to dissolve other substances)
- It has a high boiling point so it exists as a liquid where life flourishes
- Makes up 60-75% of human body weight
- A loss of 4% leads to dehydration; a loss of 15% can be fatal



Water

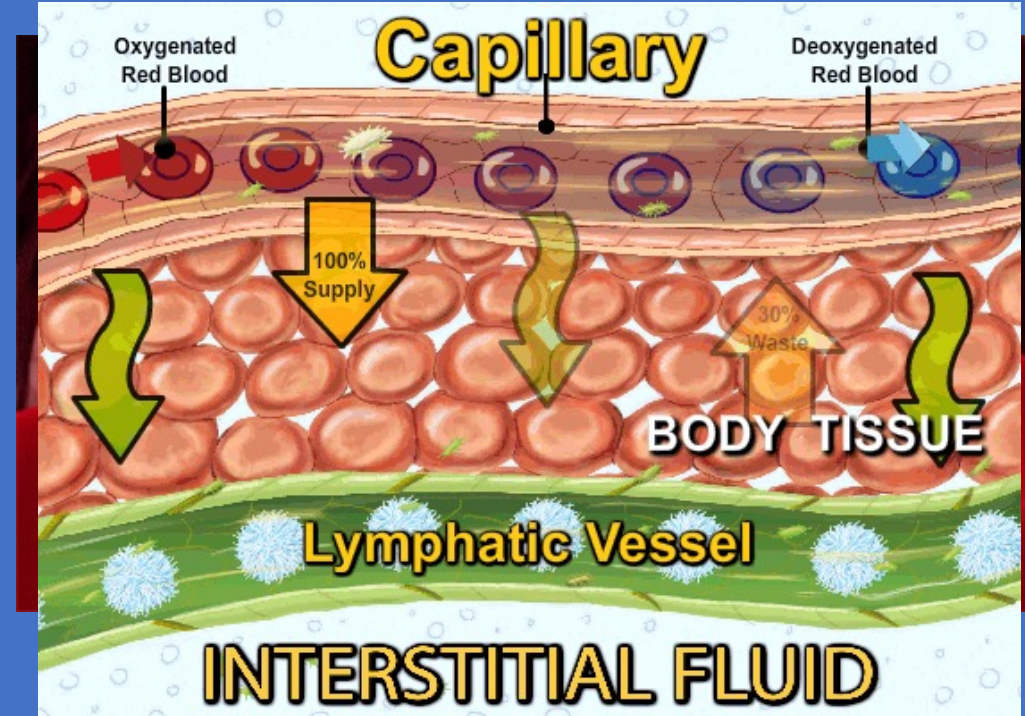


- Water is a simple molecule: two small hydrogen atoms (+), and one large oxygen atom (-)
- It is an *asymmetrical* molecule with a positive charge on one side, and a negative on the other; this accounts for its ability to act as a solvent and dissolve other molecules
- Chemical Reactions of Water: Water required for chemical reactions to take place. We would not have complex molecules (proteins, DNA, etc.) without it.



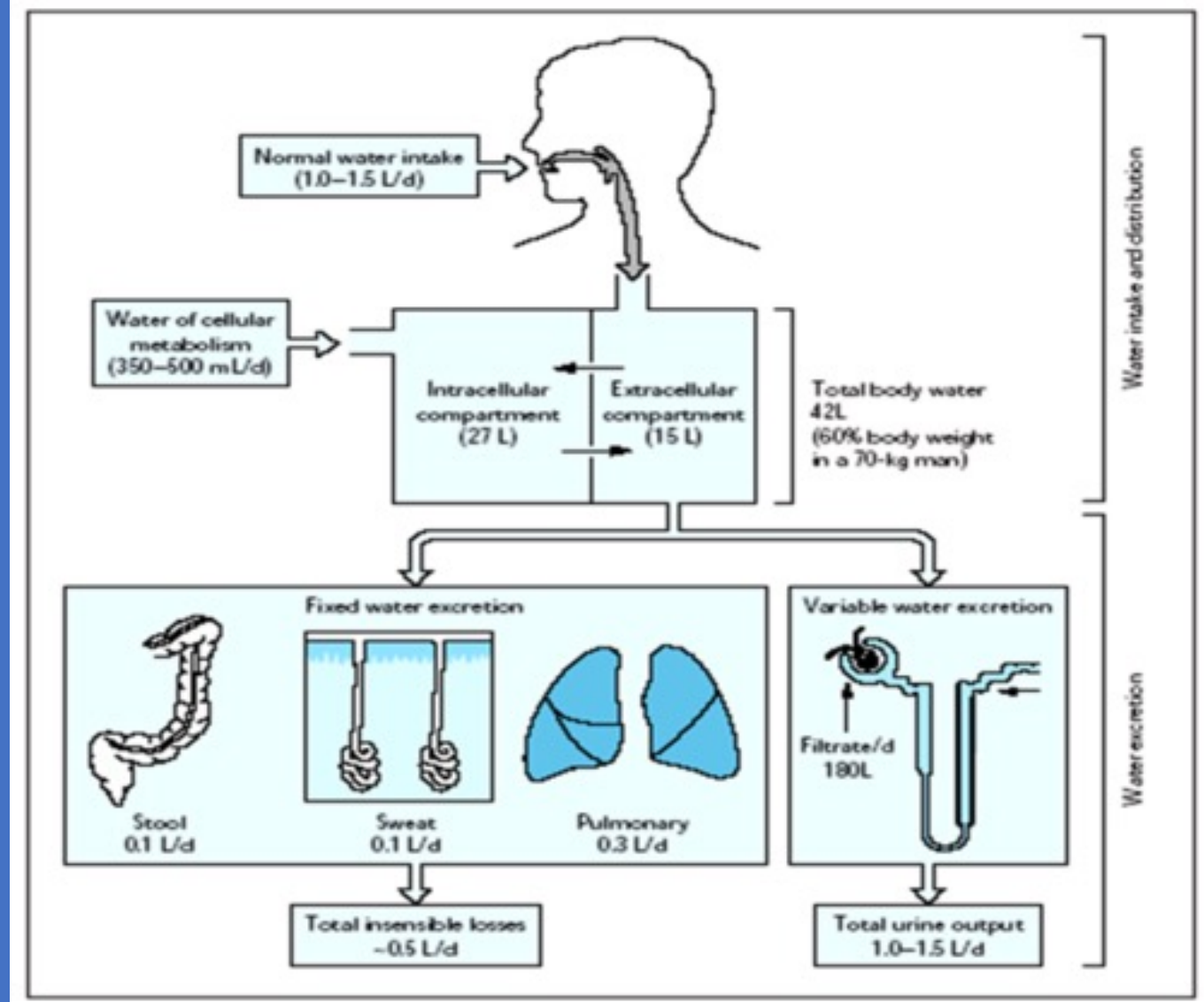
How Water Helps Us

- Blood, which is mostly water, carries nutrients and oxygen (and medications) to our body's cells
- It carries waste products away from cells to be excreted in the urine
- It lubricates joints, moistens tissues (eyes, nose, mouth)
- It helps regulate your body temperature
- For our bodies to function, we need enough water in our system through beverages and foods that contain water
- We need to be “well-hydrated”



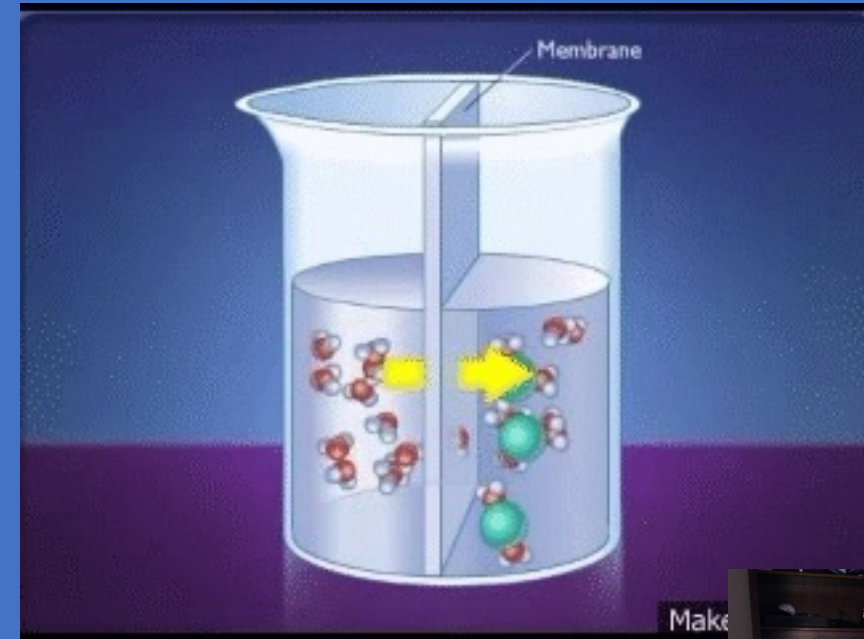
The Plumbing

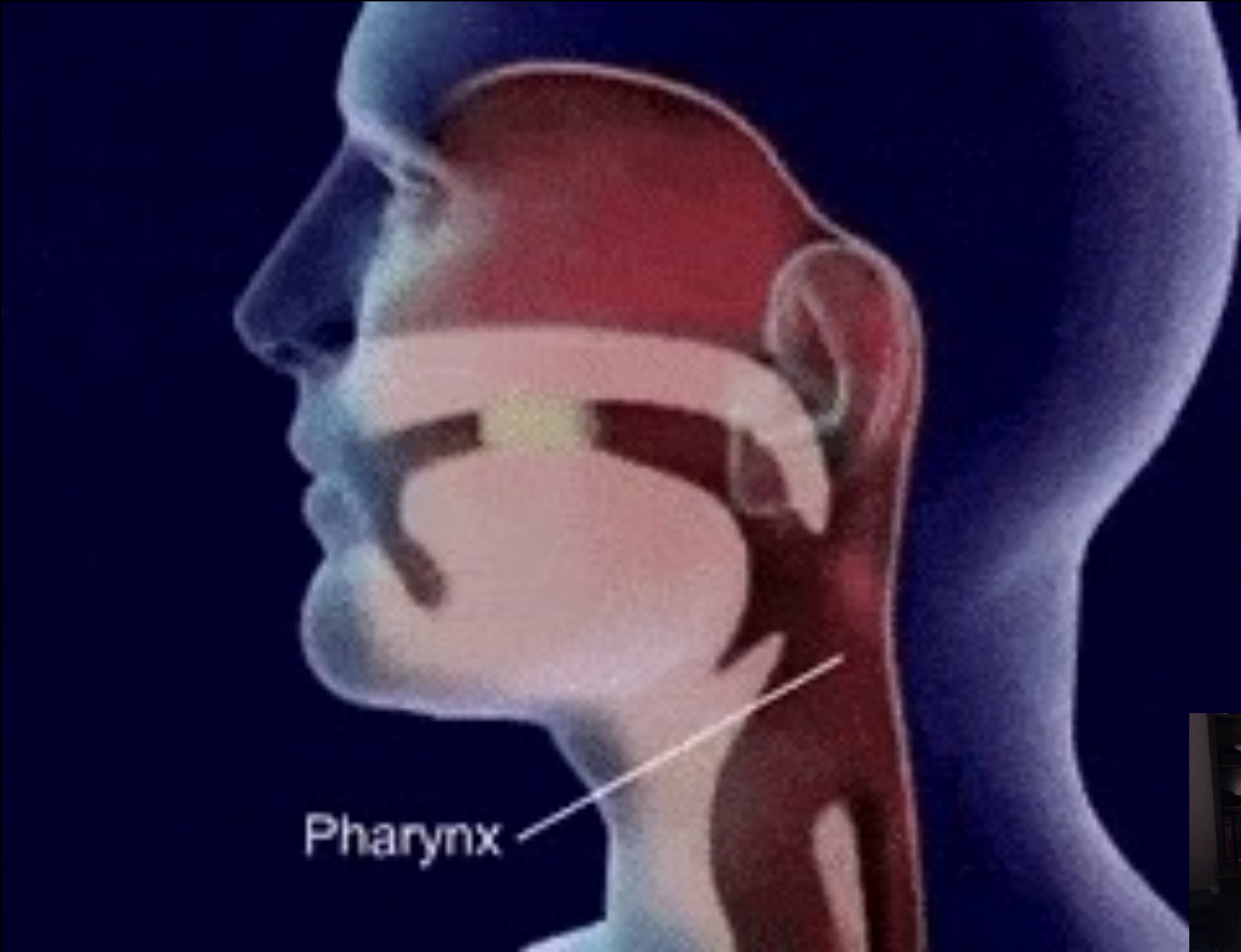
- We drink water
- We lose water through breathing, sweating and through our urine and bowel movements
- We lose more water when we are sick, vomiting or having diarrhea.
- When playing tennis on a hot day, we may lose 5 cups of water per hour by sweating

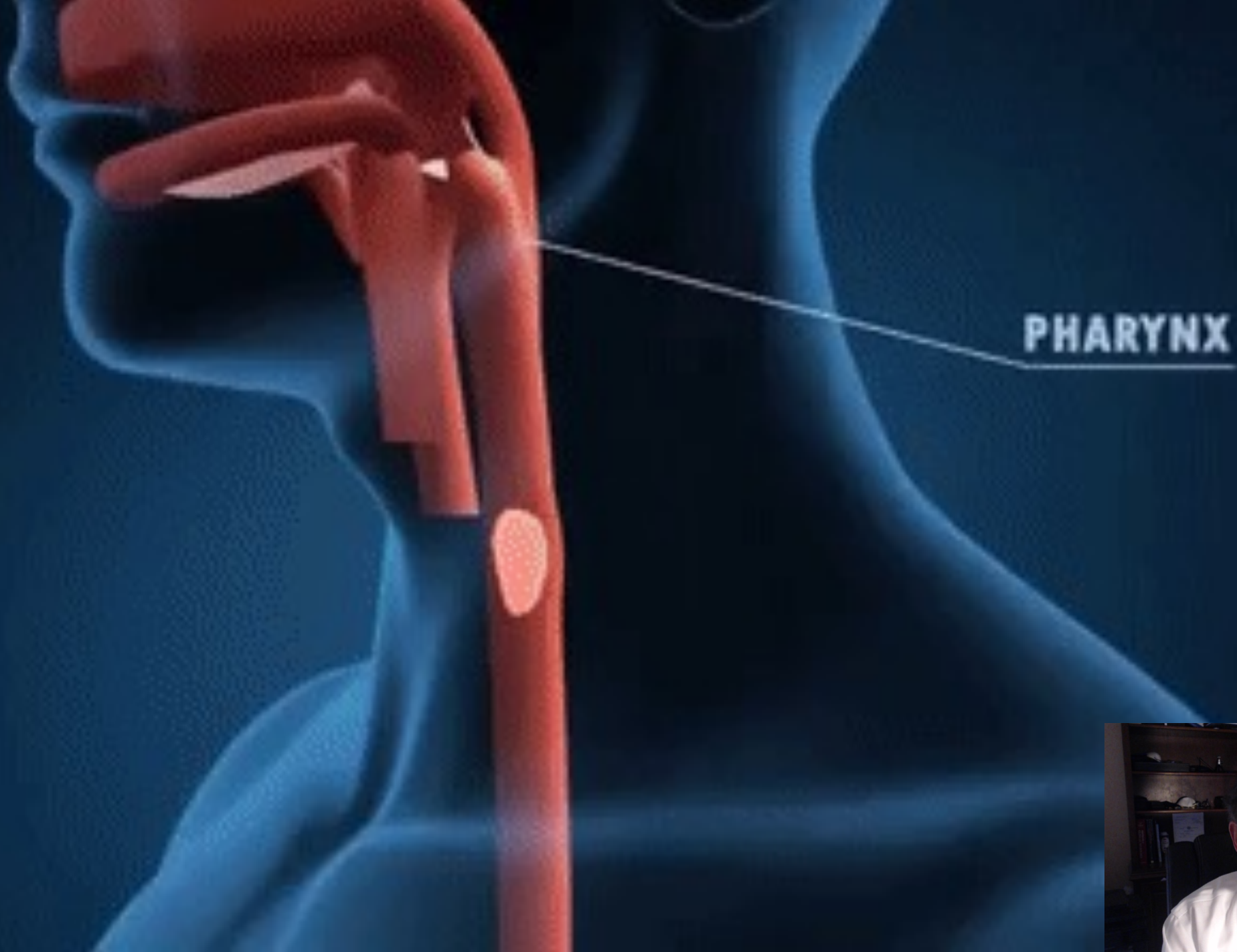


Absorption in the Small Intestine

- All nutrients are absorbed into the blood by the small intestine
- Water is mostly absorbed in the proximal small intestine by **osmosis**
- Osmosis: movement of a solvent across a semipermeable membrane towards a higher concentration of *solute*, tending to equalize the solute concentrations on both sides
- Sodium is transported along with glucose and amino acids. Water diffuses in response to the osmotic gradient caused by the sodium.







PHARYNX

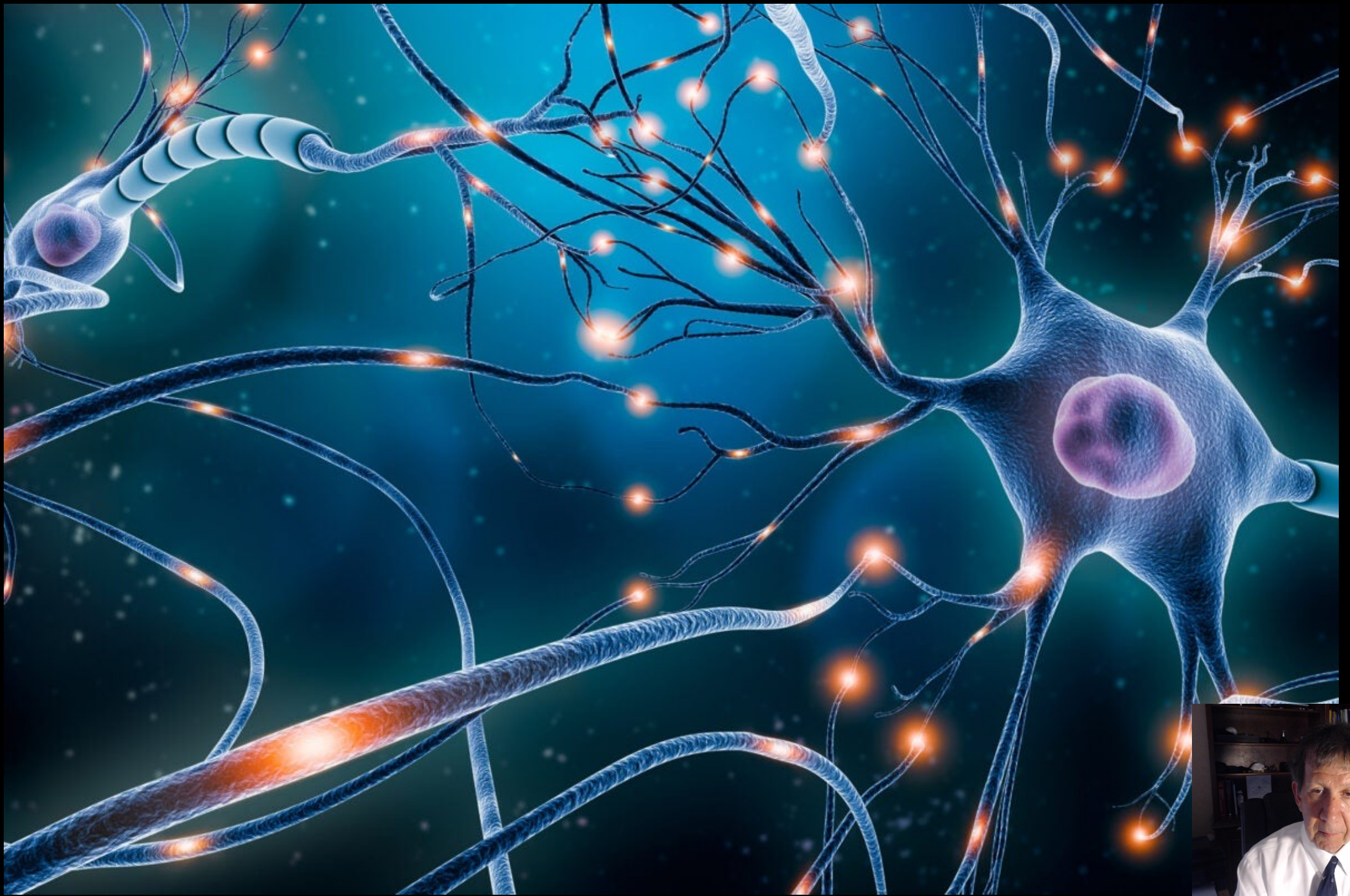


DUODENUM

An anatomical illustration of the human digestive system. The duodenum is highlighted in a bright blue color, and a white line points from the label 'DUODENUM' to it. Below the duodenum, the small intestine is shown in a reddish-pink color, with its characteristic coiled structure. The background is a dark blue silhouette of a human torso.

Water is absorbed
mainly in the small
intestine



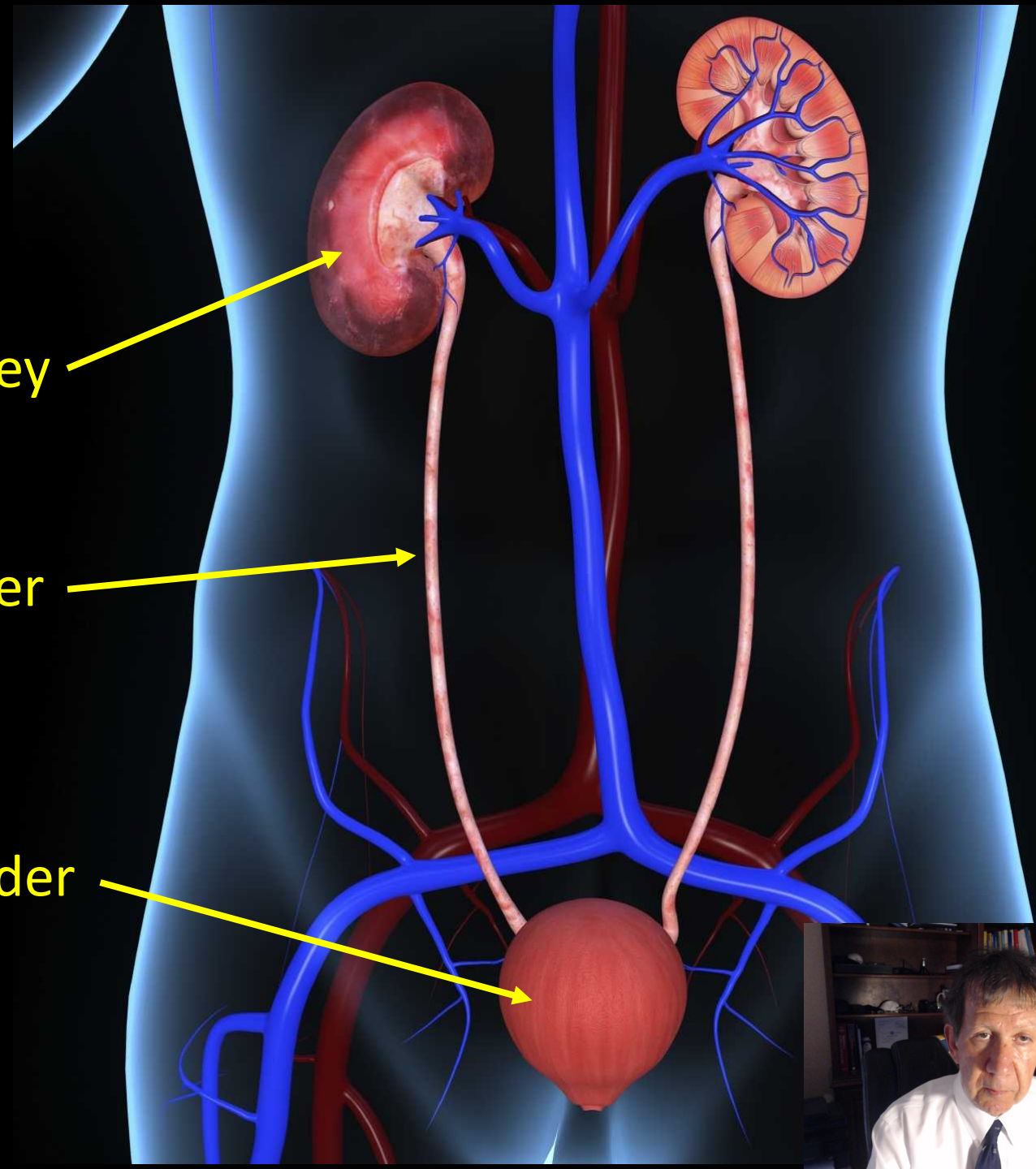


- The kidneys filter the blood to rid the body of excess fluid and waste products
- The urine passes through the ureters to the bladder
- Urine is then eliminated voluntarily

Kidney

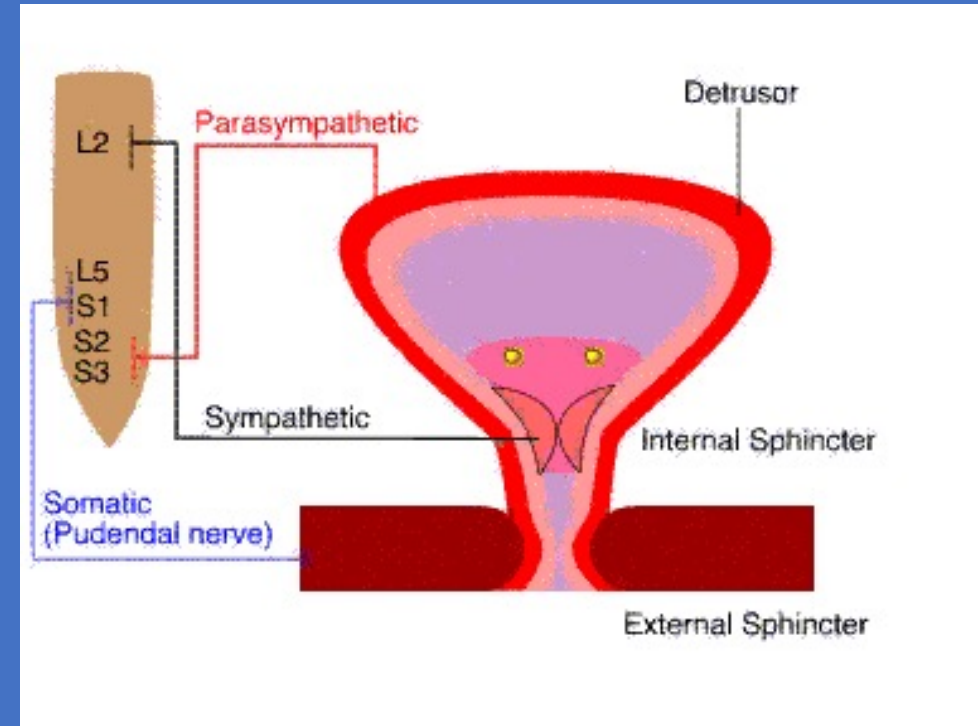
Ureter

Bladder



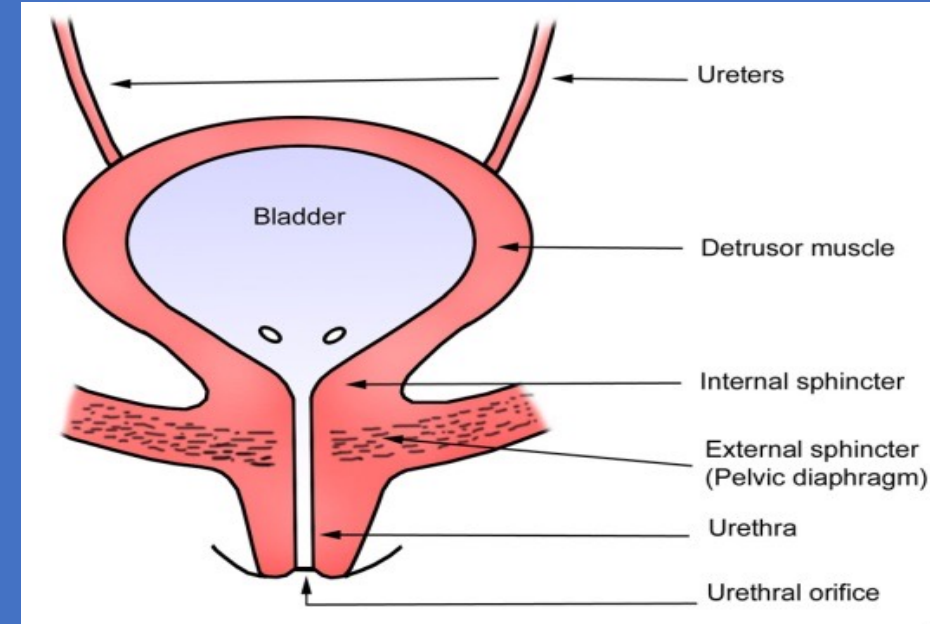
Urination

- The bladder stores urine and can contain 1 liter when full!
- During urination, the bladder walls (detrusor muscle) contract to compress the bladder, pushing the urine into the urethra.
- The bladder neck is closed by two rings of muscle: Internal and External Sphincter
- The External Sphincter is under voluntary control; it must relax during urination



Urinary Control

- Bladder problems are common in PD
 - > 50% of patients with advanced disease have severe problems
- Lower urinary tract has two functions: Storage and voiding
 - **Storage problems** – the most common. The main problem is that the detrusor muscle is activated at inappropriate times. Less commonly, there can be unintended relaxation of the external sphincter
 - **Voiding problems** – less common but 44% of men and 28% of women have trouble initiating urination. This can result from inability to relax the external sphincter



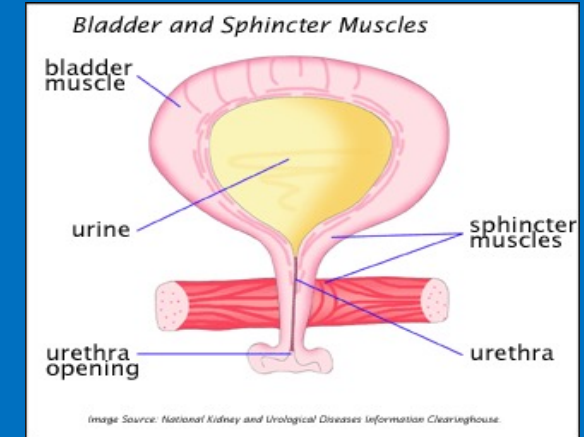
Bladder Symptoms

- Frequency – the need to urinate many times during the day in normal or less than normal volumes
- Urgency – sudden, strong need to urinate
- Incontinence – unintended release of urine
- Nocturia – frequent need to urinate at night. Disrupts sleep.
- A change can indicate a urinary infection
- Prostatic hypertrophy affects urination



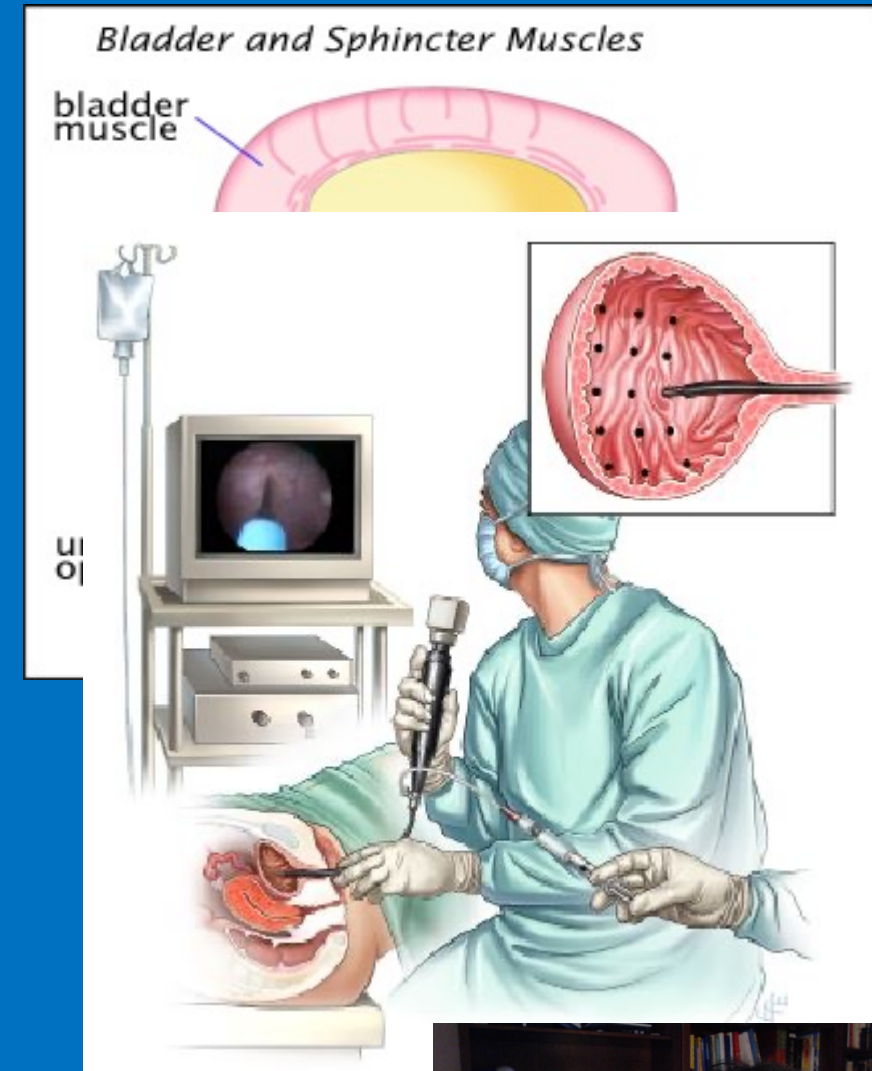
Management of Bladder Symptoms

- The solution is NOT to purposefully dehydrate
- Rule out a primary urological problems (prostatism, etc.)
- Review medications: diuretics, anti-cholinergics
- Simple things first
 - Regular trips to the bathroom
 - Minimize caffeine and reduce fluid before bedtime
 - If there is leg edema, elevate legs prior to bed time to “mobilize” the fluid
 - Protective pad/protective garment/condom catheter
 - Levodopa can exacerbate urgency and incontinence in some people so may withhold levodopa close to bedtime



Medical Management

- Anticholinergics reduces detrusor muscle overactivity, reducing spasms of bladder muscles. Side effects include dry mouth, constipation, exacerbation of cognitive problems (rivastigmine can help cognitive problems)
 - Tolterodine (Detrol®)
 - Oxybutynin (Ditropan®)
 - Darifenacin (Enablex®)
 - Botox® - targets detrusor muscle
- Beta-adrenergic agonist – target detrusor muscle
 - Mirabegron (Myrbetriq®)
- Alpha-adrenergic blocker relaxes muscles at bladder neck allowing easier urination.
 - Tamsulosin (Flomax®)
 - Terazosin
 - Alfuzosin
- Catheter (rarely necessary)
 - Intermittent
 - Chronic (a last resort)



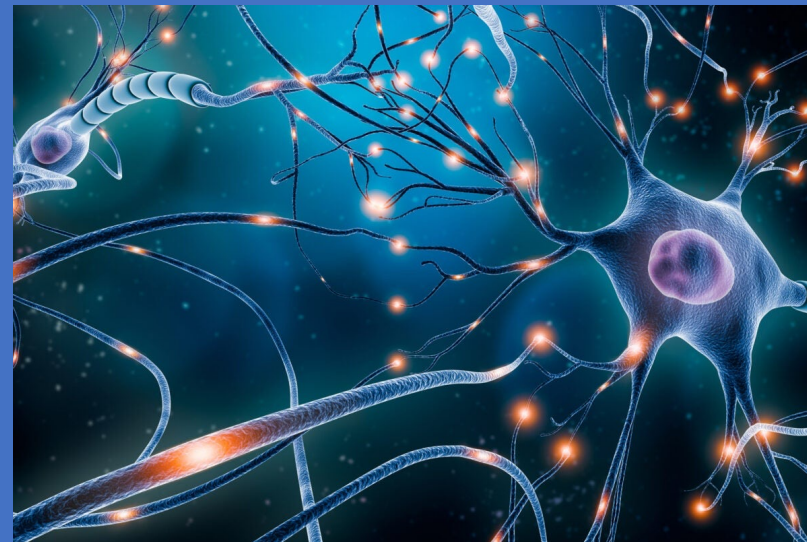
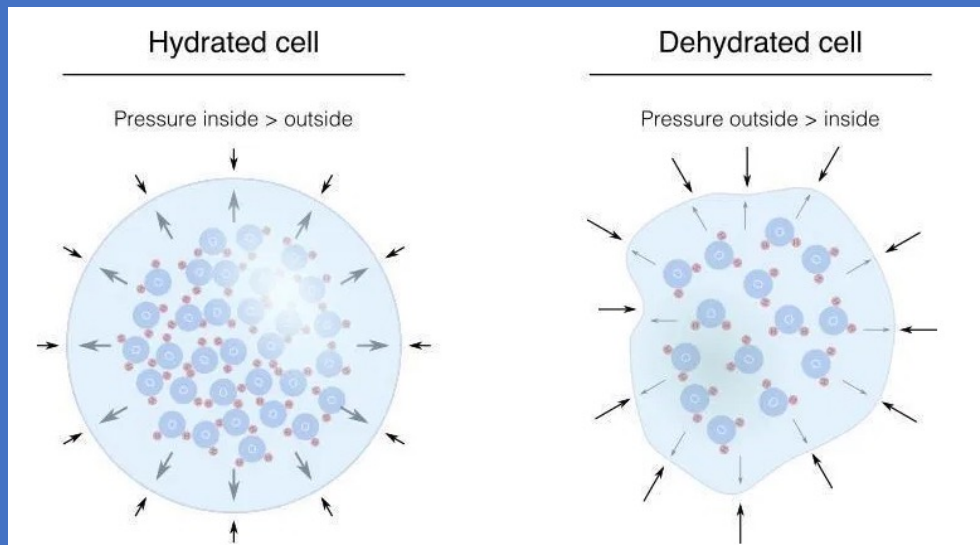
Reasons for Dehydration

- Sickness
 - Diarrhea
 - Vomiting
- Excessive sweating
 - Need to hydrate when exercising
- Inability or unwilling to drink enough H₂O



People with PD at Increased Risk for Dehydration and There Are Consequences

- Dysphagia (trouble swallowing)
- Bladder control may be impaired causing people to purposefully dehydrate



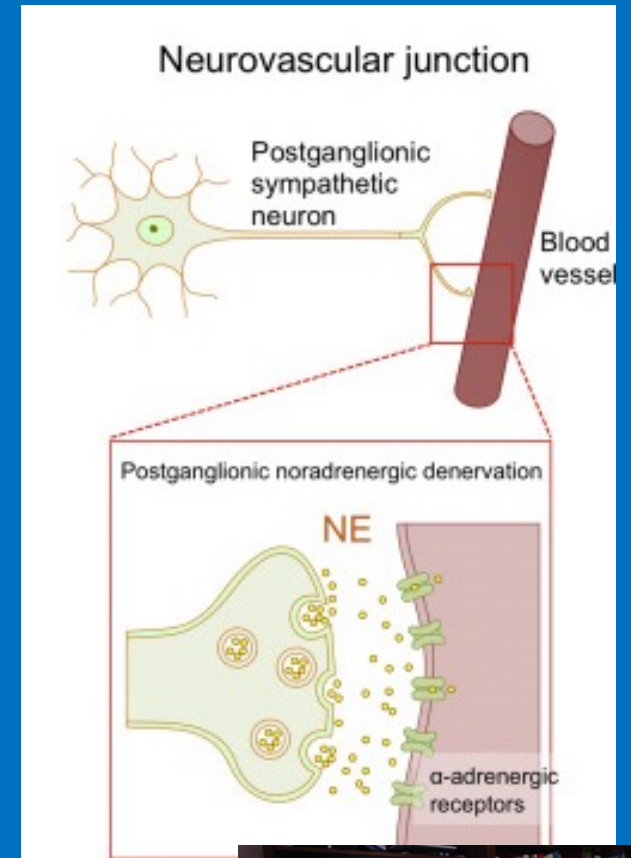
Signs of Dehydration (a downward spiral)

- Dry eyes (lack of tears), dry mouth, dry skin (reduced sweating)
- Decreased urinary output and darkened urine
- Weakness/tiredness
- Confusion
- Lightheadedness (low blood pressure) – exacerbates orthostatic hypotension. Can lead to fainting.



Orthostatic Hypotension

- Occurs in virtually all people with PD due to defective vasoconstriction
- Orthostatic hypotension: sustained fall in blood pressure > 20 mmHg systolic or 10 mmHg diastolic when moving from laying to standing
 - When symptomatic: lightheadedness, blurry vision and feeling faint are easily recognized
 - Less specific symptoms: tiredness, cognitive impairment, shortness of breath, neck/shoulder discomfort, headache or angina



Orthostatic Hypotension - Management

Simple Treatment:

- Review of medications: diuretics, vasodilators,
- Liberalize salt and water (osmosis)
- Refrain from laying flat – long term this helps
- Avoid sitting or standing quickly
- Increased physical activity – long terms helps
- Avoid large meals (post-prandial hypotension)
- Avoid hot baths or showers – dilates veins
- Avoid dehydration – drink 2 – 2 ½ liters per day
- Avoid straining at stool
- If symptomatic: sit or lay down, cross legs and contract muscles if standing; buttock clenching
- Avoid prolonged sitting or laying down
- Compression stockings; abdominal binders
- Prop head of bed up at night 30 degrees



Medical Treatment of Orthostatic Hypotension

- Medications

- **Fludrocortisone** (Florinef®) – a corticosteroid promoting increased absorption of sodium and water in the kidneys expanding intravascular volume
- **Proamatine** (Midodrine®) – a *vasopressor* causes blood vessels to constrict resulting in increased blood pressure
- **Droxidopa** (Northera®)– converted in the body to norepinephrine which results in constriction of blood vessels
- Others (atomoxetine, pyridostigmine)

- Important to avoid supine hypertension. Patients should not lay flat.



Summary

- **Water is your friend, not your foe**
- **Dehydration results in many problems including exacerbation of orthostatic hypotension**
- **Need to avoid dehydration**
- **If you have trouble swallowing water, we get help from speech/swallowing therapists**
- **If you have bladder problems causing you to restrict water intake, we can treat/manage that and can refer to urologists**

