

D- Xylose Absorption Test

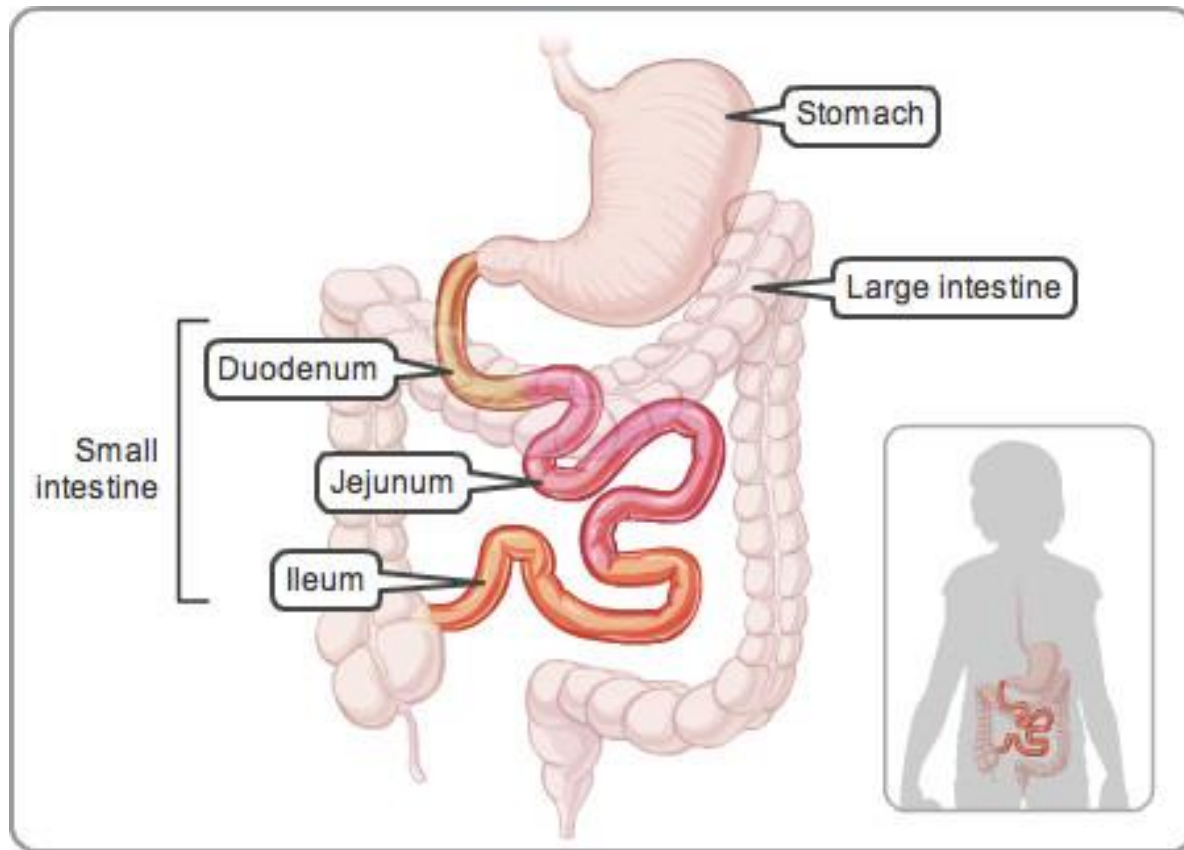
- Objectives

- a) To test the function of the upper small intestine.
- b) To learn the technique of D-xylose estimation

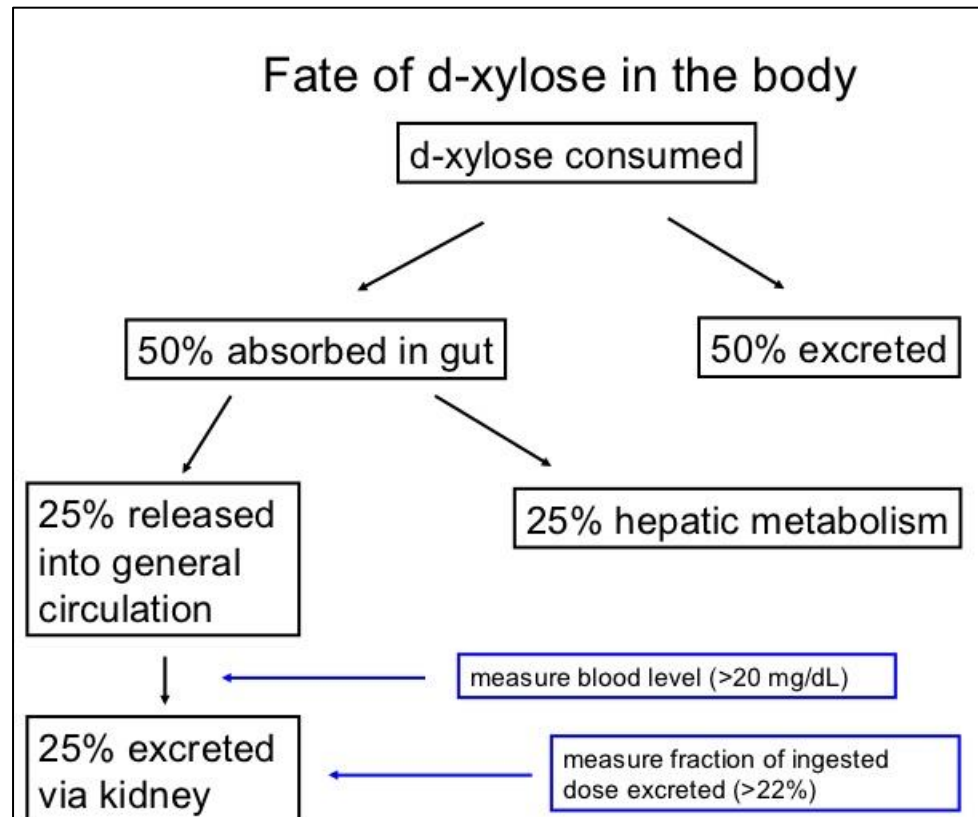
- Introduction:

- The small intestine can be studied in **two parts** ,the upper small intestine and the lower small intestine.
- **Vitamin B12 absorption** is the best test for the lower small bowl, while **D- xylose absorption test** is considered the best test for the upper small intestinal function.

Small intestine



- **Impaired absorption of D- xylose** occurs in conditions where there is flattening of the intestinal villi and this results in abnormally low urinary excretion of the test dose of D-xylose.



➤ **In adults**, the standard oral dose is **25 g** after which the urinary output during the next five hours is 5.8 g (about **25%** of the dose) in normal subjects.

➤ **In children**, a **5g dose of D- xylose**, and the normal output in the urine is 25 % of the dose.

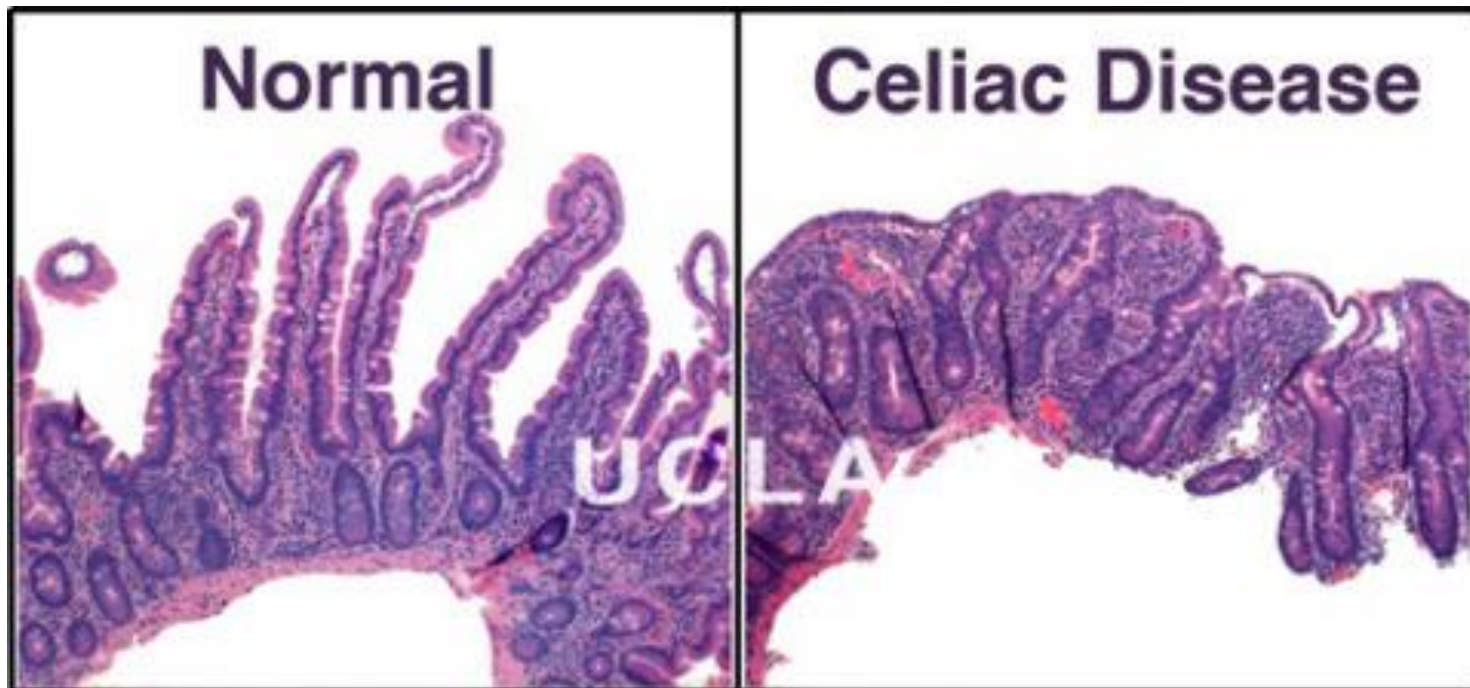
➤ **Using the 25g dose** , 5 hours excretion of less than 2.5g occurs in patients with:

1- **Gluten sensitive enteropathy (coeliac or celiac disease).**

2- **Non-gluten sensitive enteropathies** (idiopathic steatorrhea)

3- **Tropical sprue .**

Intestinal villi



Tropical sprue

- Tropical sprue is a disorder of unknown cause (infection..) affecting people living in tropical areas who develop abnormalities of the small intestine structure (**destruction of the villi**), leading to malabsorption and deficiencies of many nutrients.

- The test is a **diagnostic value** since **in children** the test is most useful **in the differential diagnosis** of **coeliac disease and cystic fibrosis**.
- Treatment of coeliac disease with a **gluten free diet improves D-xylose absorption** **but it remains low normal**.
- **In case of impaired renal function** the D-xylose level in a 5- hours urine sample **is low** ,which can lead to **false diagnosis of coeliac disease**.

- What happens to the D-xylose?

- When D- xylose is given orally most of D-xylose will be absorbed in the small intestine (duodenum and jejunum).
- The rest will be subsequently excreted by **the kidneys**.
- The amount of D-xylose detected in urine or blood in a specified time interval after administration of a measured dose of D-xylose, is used to evaluate Intestinal Absorption Ability.
- **Low Absorption of D-Xylose** is observed in [Intestinal Mal absorption](#).
- When there is a problem in the small intestine that prevent absorption, D-xylose (ingested orally) is not absorbed by the intestine, and **its level in blood and urine will be low**.

- Principle

- ❖ **D- xylose is a pentose** which produces a **brown color** with o-toluidine in the presence of acetic acid and heat.
- ❖ A brown complex will be formed with **a maximum absorption at 475 nm** which is used for the **estimation of xylose**.

- METHOD:

- The patient/volunteer should keep **an over night fast**, in the morning empties the bladder and discards the urine.
- **Before breaking the fast, 25g of D-xylose in 250ml water is taken by mouth.**
- The patient /volunteer should then drink water at one and two hours after drinking the D-xylose solution .
- All urine passed during the next five hours is collected .
- **Normal value:** 5.8-10 gm
- **Abnormal value:** less than 2.5 gm

- Estimation of D-xylose in urine:

	Urine	Standard	dH2O	O-toluidine reagent
Sample (A)Test (1)	0.1	—	—	7 ml
Sample (A)Test (2)	0.1	—	—	7 ml
Sample (B) Test (3)	0.1	—	—	7 ml
Sample (B) Test (4)	0.1	—	—	7 ml
Standard (1)	—	0.1	—	7 ml
Standard (2)	—	0.1	—	7 ml
Blank	—	—	0.1	7 ml

Cover tubes by aluminum foil → Mix the contents of each tube
↓
Boiling water bath for 5 minutes
↓
cool the tubes for 1-3 min
↓
Read absorbance at 475 nm

- Result:

Tubes	Absorbance at 475
Test (1)	
Test (2)	
Test (3)	
Test (4)	
Standard (1)	
Standard (2)	

- Calculations:

- **Conc. Of Std.**= 0.01 g/ml

Dilution factor= 10

- **Total volume sample 1**= 5 ml

- **Total volume sample 2**= 5 ml

- **Conc. Of urine D-xylose (Sample 1)**= $\frac{\text{Mean abs of test 1}}{\text{Mean abs of std.}} \times 0.01 \times 10 = \text{g/ml}$

- **Conc. Of urine D-xylose (Sample 2)**= $\frac{\text{Mean abs of test 2}}{\text{Mean abs of std.}} \times 0.01 \times 10 = \text{g/ml}$

- Example:

- Abs. sample 1= 0.843

Abs. std.= 0.558

- Abs. sample 2= 0.234

Dilution factor= 10

- Conc. Of urine D-xylose (Sample 1)= $\frac{0.843}{0.558} \times 0.01 \times 10 = 0.151 \text{ g}/0.1 \text{ ml}$

- Conc. Of urine D-xylose (Sample 1)= $0.151 \text{ g} \longrightarrow 0.1 \text{ ml}$
 $\quad \quad \quad ? \longrightarrow 1 \text{ ml}$
 $\quad \quad \quad = 1.51 \text{ g/ml}$
 $\quad \quad \quad 1.51 \text{ g} \longrightarrow 1 \text{ ml}$
 $\quad \quad \quad ? \longrightarrow 5 \text{ ml}$

- Conc. Of urine D-xylose (Sample 1)= 7.6 gm/5 ml

Normal

- **Conc. Of urine D-xylose (Sample 2)**= $\frac{0.235}{0.558} \times 0.01 \times 10 = \mathbf{0.04 \text{ g/0.1 ml}}$

- **Conc. Of urine D-xylose (Sample 2)**= $0.04 \text{ g} \longrightarrow 0.1 \text{ ml}$
 $\quad \quad \quad ? \longrightarrow 1 \text{ ml}$
= 0.42g/ml

$0.42 \text{ g} \longrightarrow 1 \text{ ml}$
 $\quad \quad \quad ? \longrightarrow 5 \text{ ml}$

- **Conc. Of urine D-xylose (Sample 2)**= **2.1 gm/5ml** **Abnormal**

Thank you