

Podcast (Video Recorded Lecture Series):
Osmotic Diarrhea for the USMLE Step One Exam



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12DaysinMarch

Tutorial Services
(check website for details)

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LACTOSE INTOLERANCE

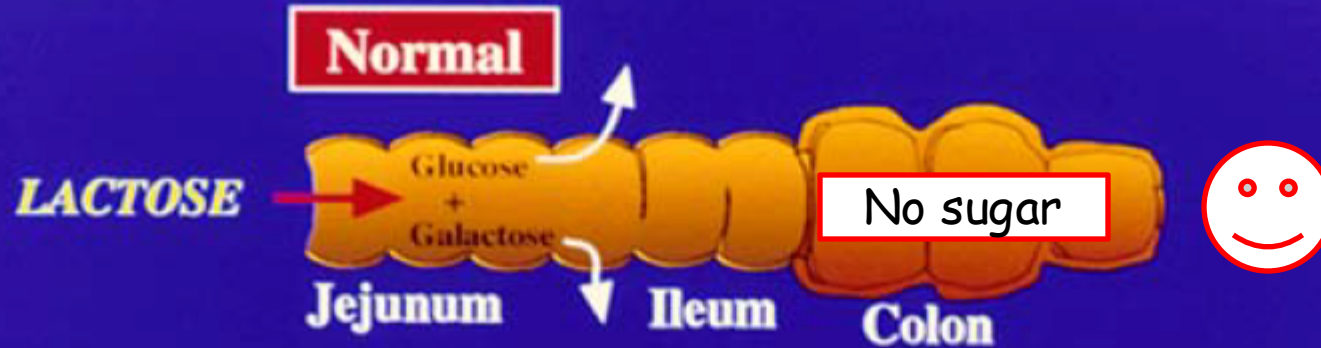


And STAY
OUT!!

We don't want
your kind!

Cohen

Under normal circumstances, glucose would rise



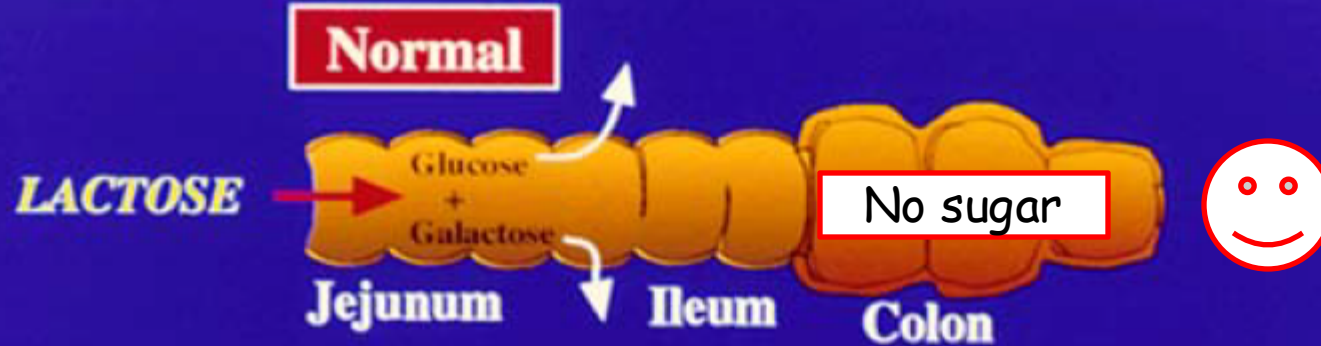
This is your intestine on lactase
(brush border enzyme or disaccharidase).

What would happen to your blood **glucose** if I gave
a large bolus of **lactose**?

Test of Lactose Intolerance:

Lactose Tolerance Test

Lower glucose than expected after lactose load



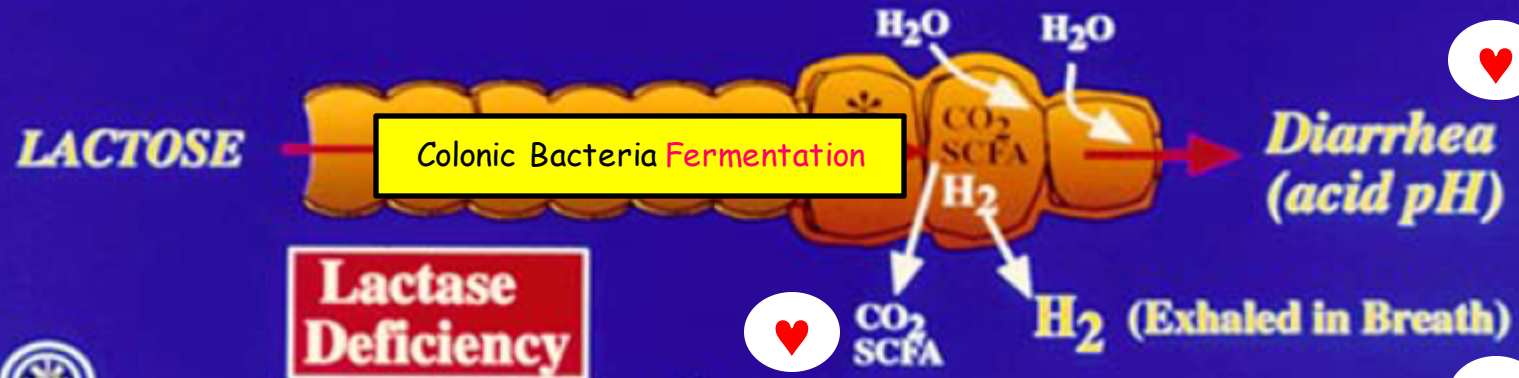
This is your intestine on lactase
(brush border enzyme or disaccharidase).

If lactase deficient, glucose absorption impaired.

This is your intestine lactase (brush border/disaccharidase) deficient.

Fermentation should be your mental image

Sugar → Colonic Bacteria → H_2 , CO_2 , SCFA

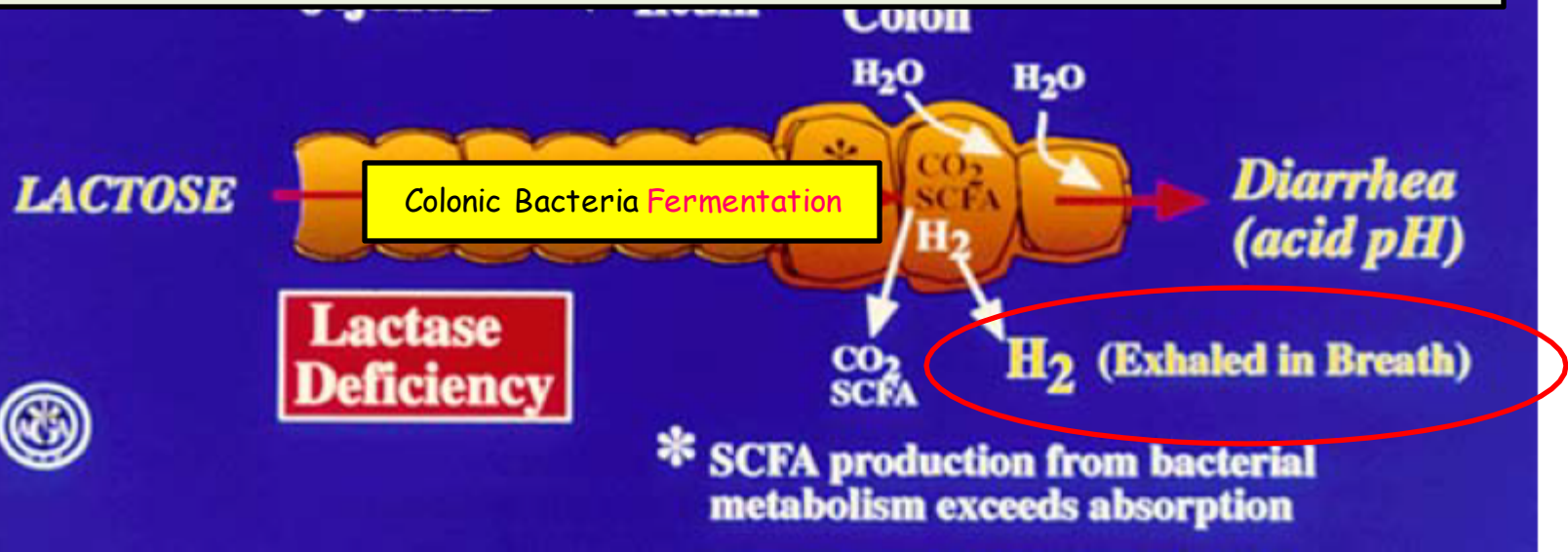


* SCFA production from bacterial metabolism exceeds absorption

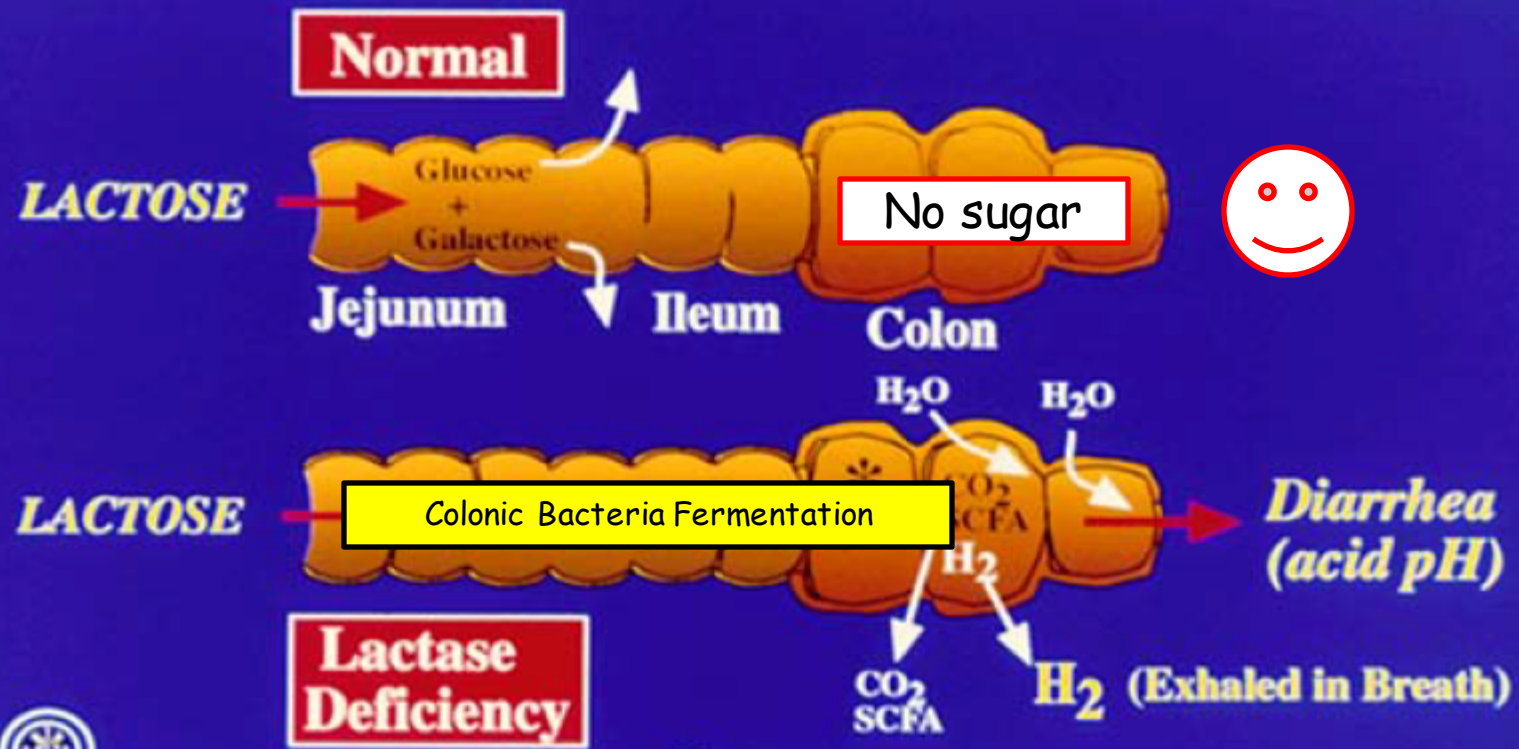
Lactose Hydrogen Breath Test:
↑ Hydrogen in expired air after lactose load.

This is your intestine lactase (brush border/disaccharidase) deficient.

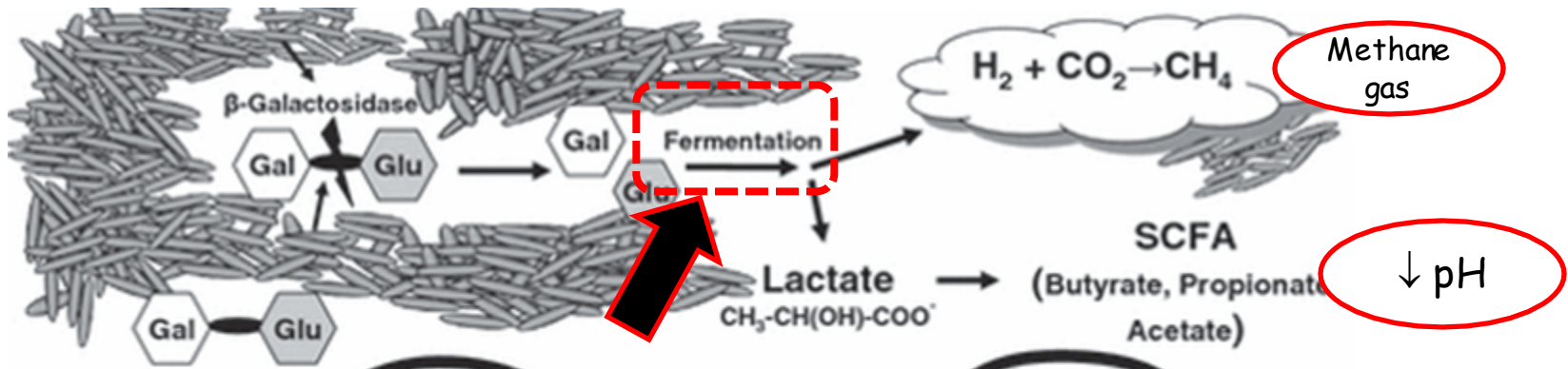
What would happen to his breath hydrogen content if I gave this chap lactose?



In lactase deficiency, hydrogen production by colonic bacteria is increased after lactose feeding

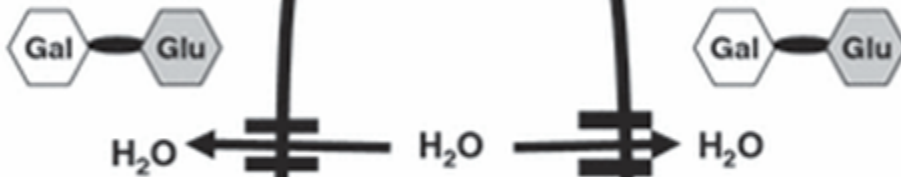


* SCFA production from bacterial metabolism exceeds absorption



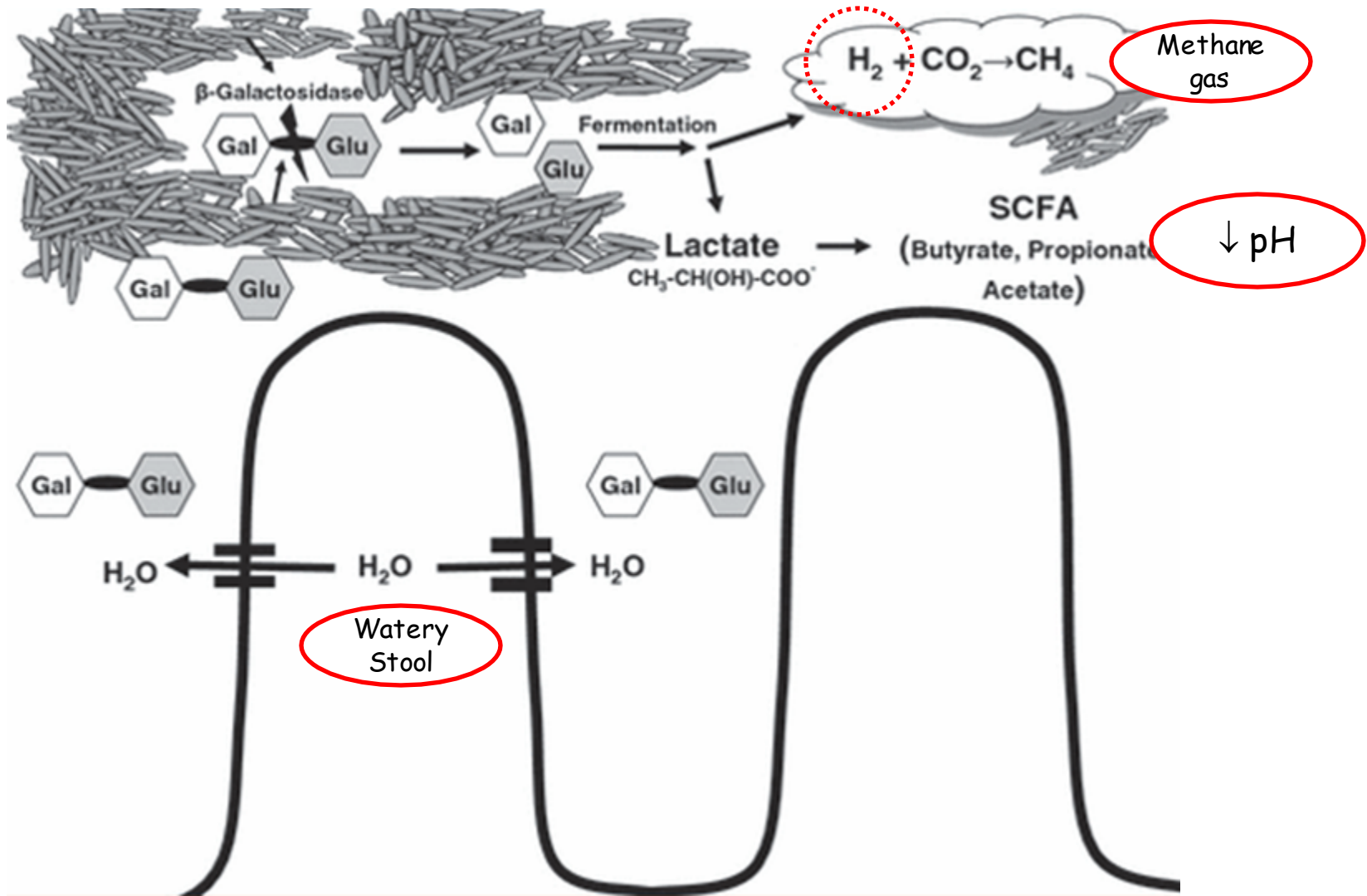
Lactose

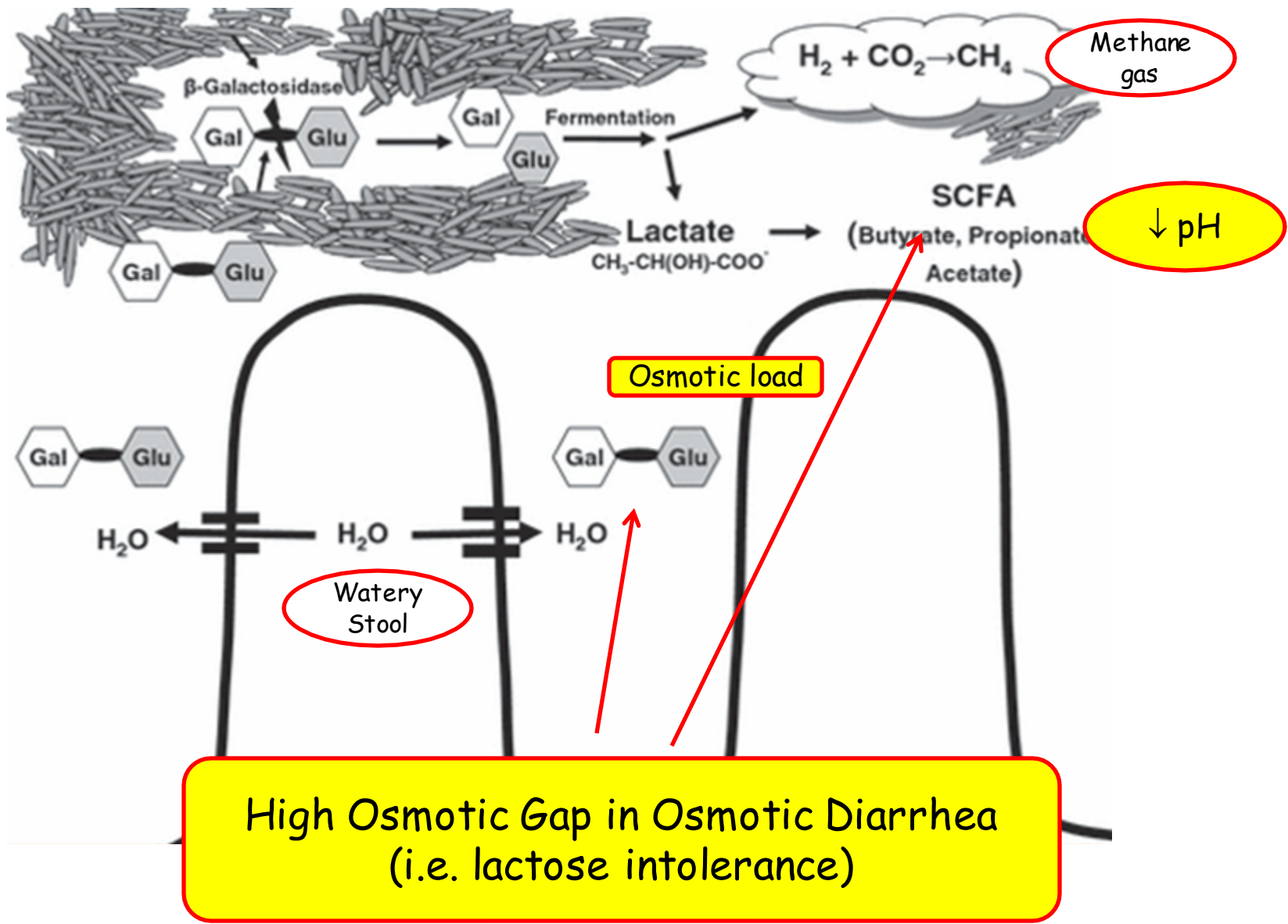
Osmotic Diarrhea

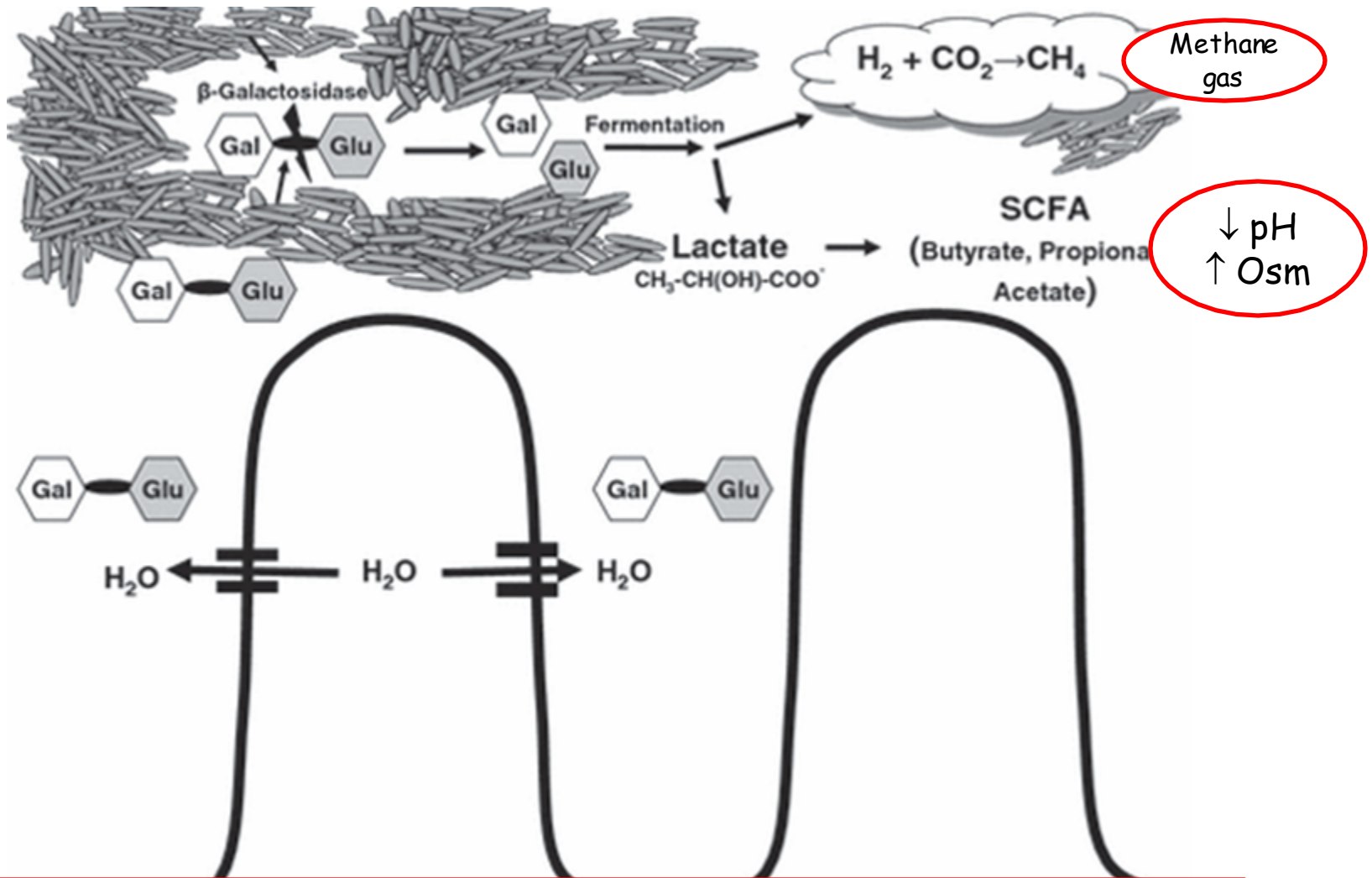


Watery Stool

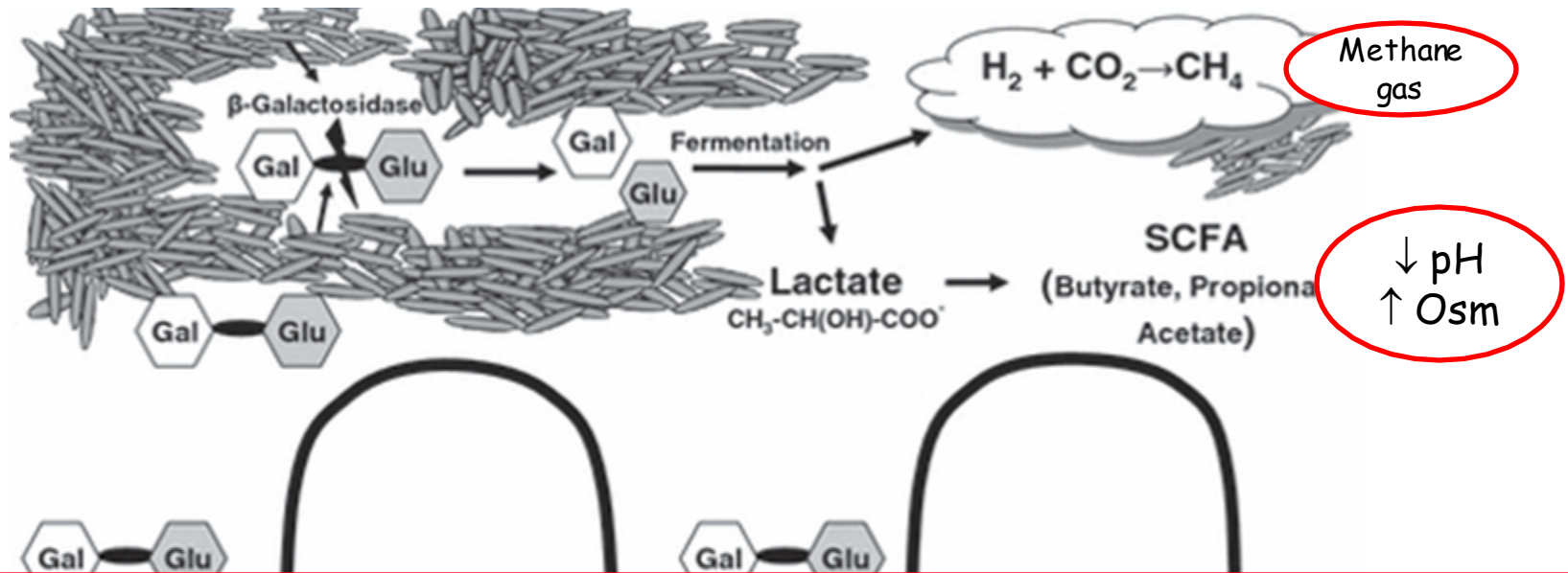
Hydrogen Breath Test







Light microscopy of an intestinal biopsy would reveal...???



Bonus Question:

Can you describe an instance where lowering the gut pH would be advantageous?

Hint:

Lowering pH favors conversion of NH_3 (absorbable) \rightarrow NH_4^+ (nonabsorbable)

Language: flatulence, pain, explosive diarrhea;
Stool: decreased pH/hi osmotic gap; increased breath H+



Another example of using fermentation for good instead of evil...

Bonus Question:

Can you describe an instance where lowering the gut pH would be advantageous?

Hint:

Lowering pH favors conversion of NH_3 (absorbable) \rightarrow NH_4^+ (nonabsorbable)

Lactulose (galactosidofructose): there is no disaccharidase

Stool osmotic gap measures changes in stool osmolality

- Osmotic gap calculation:

$$290 - 2(\text{Na level} + \text{K level})$$

Lactose

VIP

- Where does **290** come from?
 - Stool osmolality in distal intestine estimated at 290 mOsm/kg because equilibrates with plasma osmolality
- Why multiply sum of Na + K by factor of 2?
 - Account for associated anions

Osmotic gap differentiates osmotic and secretory diarrhea

- Osmotic diarrhea
 - Osmotic gap should be large >125
 - **Unmeasured nonelectrolytes** account for most of stool osmolality
- Secretory Diarrhea
 - Osmotic gap should be small <50
 - Electrolytes account for most of stool osmolality

Lactose

Sugar and SCFA

NaCl/K

VIP

Summary: Lactose Intolerance/Osmotic Diarrhea

- Background
 - Failure of **brush border enzyme** (lactase), also referred to as **disaccharidase deficiency**
- Clinical Presentation
 - Diarrhea, bloating, gaseous
- Diagnostic Features
 1. Lactose tolerance test: measure glucose after lactose (glucose + galactose)
 2. Hydrogen breath test: measure breath H_2 after a lactose load
 3. Stool osmotic gap: increased; undigested lactose + SCFA
 4. Stool pH: decreased; H_2 + SCFA
- Special Note
 - **Lactulose** given to cirrhotics on principle that H_2 generated will bind gut NH_3 (absorbed) $\rightarrow NH_4^+$ (not absorbed)
 - Favorite Question: What would light microscopy show? \rightarrow Normal result

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