

# Laboratory evaluation of gastrointestinal conditions

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# Gastric disorders

- Best assessed by imaging and endoscopy
- Fasting s-[Gastrin] in persistent, recurrent or multiple peptic ulceration
- ↑s-[Gastrin]: Z-E syndrome, antral G-cell hyperplasia, hypochlorhydria, vagotomy without antrectomy, atrophic gastritis, PA, antacids, H<sub>2</sub> blockers, PPI's
- Stop H<sub>2</sub> blockers for 3d, PPI's for 14d
- ↓s-[Gastrin]: antrectomy with vagotomy, hypothyroidism

# Gastric disorders (cntd.)

- Most Z-E pts have s-[Gastrin] > 500 ng/L
- 40% have s-[Gastrin] 100-500 ng/L
- Secretin/Ca infusion to stimulate gastrin
- 20% of Z-E pts also have parathyroid and pituitary adenomas (MEN I)
- Sham test to assess completeness of vagotomy

# Coeliac disease

- Sensitivity to gliadin contained in gluten in wheat and other cereals
- Inflammation of small intestine with malabsorption
- Testing recommended in pts with:
  - GIT sx. such as chronic diarrhoea, malabsorption, weight loss, abdominal distension.
  - Unexplained persistent elevation in AST/ALT, Fe-deficiency anaemia
  - High-risk symptomatic individuals: 1<sup>st</sup> and 2<sup>nd</sup> degree relatives, type 1 DM, other autoimmune endocrinopathies, dermatitis herpetiformis, Turner's sd, Down's sd.

# Coeliac disease (cntd)

- Serology while on gluten-containing diet
- Antibodies:
  - IgA endomysial antibody (IgA EMA)
  - IgA tissue transglutaminase antibody (IgA tTG)
  - Anti-gliadin antibodies no longer advised
- In selective IgA deficiency, do IgG tTG or EMA
- At least 3 duodenal biopsies to confirm diagnosis
- >99 % of pts with celiac disease have HLA DQ2 and/or DQ8

# Diarrhoea and malabsorption

- Acute diarrhoea = production of loose stools +/- increased stool frequency for <2 weeks (chronic if >4 weeks)
- In mild, acute diarrhoea lab evaluation is unnecessary
- Lab evaluation is indicated for severe diarrhoea with fever, dysentery or if diarrheal illness is prolonged (>14 days)
- Tests may include UEC, FBC, stool M,C+S and investigation for parasites

# Lab tests for chronic diarrhoea

- FBC, ESR, UEC,  $\text{Ca}^{2+}$ , Mg,  $\text{PO}_4$ , albumin, TP
- Folate, vit B12, iron, LFT's
- Stool analysis
  - Faecal MC+S for ova/parasites/leucocytes
  - Faecal occult blood  
Positive result suggests IBD, or neoplasm
  - Faecal fat  
Excessive fat excretion suggests malabsorption/maldigestion

# Lab tests for chronic diarrhoea

- Faecal  $\text{Na}^+$ ,  $\text{K}^+$  to calculate osmotic gap
$$\text{OG} = 290 - 2([\text{Na}^+] + [\text{K}^+])$$
  - >125 suggests osmotic diarrhoea
  - <50 suggests secretory diarrhoea
- Faecal pH
  - <5.6 suggests carbohydrate malabsorption
- Faecal laxative screening
  - Magnesium, phenolphthalein



# Evaluation of chronic diarrhoea

- Further evaluation of chronic secretory diarrhoea
  - Exclude bacterial/parasitic infection
  - Gastrin, VIP, 5HIAA, metanephrine, histamine, TSH
  - Test for bacterial overgrowth only in selected patients
  
- Further evaluation of chronic osmotic diarrhoea
  - Most osmotic diarrhoea without steatorrhoea is due to poorly absorbable CHO or Mg salts
  - In suspected **lactose intolerance** do hydrogen breath test or measure lactase in a mucosal biopsy
  - Investigate possibility of sorbitol or fructose ingestion

# Case - phaeochromocytoma

- 46-yr-old non-hypertensive woman with watery diarrhoea for several years and (R) adrenal mass on US

Plasma	
Potassium (3.3 – 5.3)	3.1 mmol/L ↓
Glucose (Fasting) (<5.6)	9.9 mmol/L ↑
Vasoactive intestinal polypeptide (<100)	225 pg/mL ↑
24h urinary catecholamines ng/day	
Epinephrine (1-29)	4890 ↑
Norepinephrine (26-230)	920 ↑
Dopamine (310-1140)	209000 ↑

- Verner-Morrison Sd = ‘Watery Diarrhoea, Hypokalaemia, Achlorhydria’ due to the effects of VIP:
- Stimulates intestinal water and electrolyte secretion
  - Inhibits gastric acid secretion
  - Promotes hepatic glycogenolysis and hyperglycaemia
  - Dilates peripheral blood vessels

# Case – carcinoid syndrome

- 46-yr-old man with watery diarrhoea for 6/12 and 'hot flushes'

S-Na (132-144)	142 mmol/L
S-K (3.2-4.8)	2.4 mmol/L ↓
S-Cl (98-108)	110 mmol/L ↑
S-Total CO <sub>2</sub> (23-33)	18 mmol/L ↓
S-Total Bilirubin (<20)	13 µmol/L
S-ALP (30-120)	600 IU/L ↑
S-GGT (< 40)	240 IU/L ↑
S-ALT (<40)	60 IU/L ↑
Faecal Na	76 mmol/L
Faecal K	75 mmol/L
Faecal OG = 290 – 2(Na+K)	-12

- Secretory diarrhoea due to carcinoid tumour with liver metastases
- U-5-hydroxy indoleacetic acid excretion = 720 µmol/day (RR < 60)

# Case – short bowel syndrome

- 36-yr-old woman with extensive small bowel resection for mesenteric thrombosis, who experiences diarrhoea after ingesting carbohydrates

<b>Faecal pH</b>	<b>3.2</b>
<b>Faecal Na</b>	<b>32 mmol/L</b>
<b>Faecal K</b>	<b>48 mmol/L</b>
<b>Faecal OG = <math>290 - 2(\text{Na} + \text{K})</math></b>	<b>130 mmol/L</b>

- Osmotic diarrhoea due to CHO malabsorption
- CHO released to large gut where bacterial action produces osmotically active organic acids

# Evaluation of chronic diarrhoea

- Further evaluation of chronic inflammatory diarrhoea
  - Small bowel follow-through and sigmoidoscopy/ colonoscopy with biopsies for evaluation of IBD
  - Stool culture to identify infectious causes of inflammation
  
- Further evaluation of chronic fatty diarrhoea
  - Assess pancreatic exocrine function by faecal elastase
  - Small bowel biopsy and aspirate of contents for culture

# Special tests – CHO malabsorption

## ➤ Hydrogen breath tests

- Bacterial overgrowth, CHO malabsorption
- Hydrogen measured in exhaled air in fasting pt
- Hydrogen measured in exhaled air after giving test sugar

## ➤ D-Xylose Absorption Test

- Xylose is a five-C sugar that is absorbed in the small intestine and does not require intraluminal digestion
- Used to differentiate between mucosal disease (in which absorption will be decreased) and pancreatic disease

# Special tests – fat malabsorption cntd

## ➤ Faecal elastase

- Random stool sample
- No need to discontinue enzymes
- Good sensitivity for moderate/severe pancreatic insufficiency

## ➤ Faecal fat measurement

- Diet containing 50-150g fat per day for 3d prior to and during collection of stool for 72h into weighed container
- Sample homogenised, fats extracted and measured

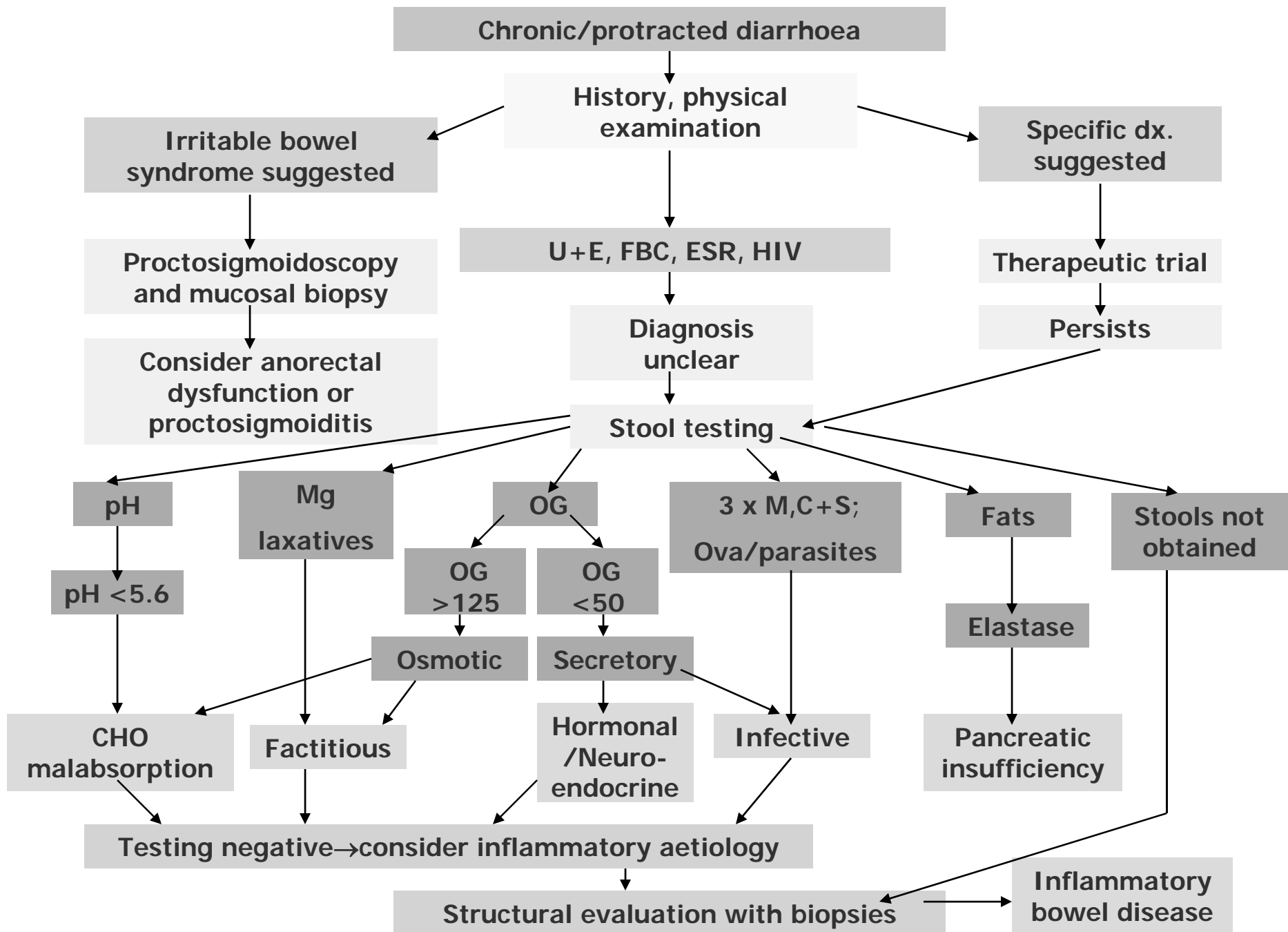
# Case – small bowel disease

- 71-yr-old man with anaemia, weight loss and passage of bulky, pale, 'foul smelling' motions. On examination he had hepatosplenomegaly with enlarged axillary and inguinal lymph nodes.

<b>S-Total protein (62-82)</b>	<b>52 g/L</b>	<b>↓</b>
<b>S-Albumin (30-60)</b>	<b>25 g/L</b>	<b>↓</b>
<b>S-Total Ca (2.20-2.55)</b>	<b>1.86 mmol/L</b>	
<b>S-PO<sub>4</sub> (0.65-1.25)</b>	<b>0.55 mmol/L</b>	<b>↓</b>
<b>S-Total Bilirubin (&lt;20)</b>	<b>13 µmol/L</b>	
<b>S-ALP (30-120)</b>	<b>300 IU/L</b>	<b>↑</b>
<b>S-GGT (&lt; 40)</b>	<b>36 IU/L</b>	
<b>S-ALT (&lt;40)</b>	<b>30 IU/L</b>	
<b>5-g oral xylose absorption test</b>		
<b>U-xylose excretion (&gt;1.15 g)</b>	<b>0.6 g</b>	<b>↓</b>

- Fat malabsorption due to infiltration of small bowel wall and mesenteric lymph nodes by lymphosarcoma.





# References

- 'Diarrhoea'; 'Steatorrhoea' in: Cases in Chemical Pathology – a diagnostic approach, 4<sup>th</sup> Edition. Walmsley RN, Watkinson LR, Cain HJ (eds.) World Scientific, Singapore, 2006 (reprint), p 252-6; 268-72.
- Ikuta S et al. Watery diarrhoea, hypokalemia and achlorhydria syndrome due to an adrenal pheochromocytoma. World J Gastroenterol Sept 14 2007; 13(34):4649-52.