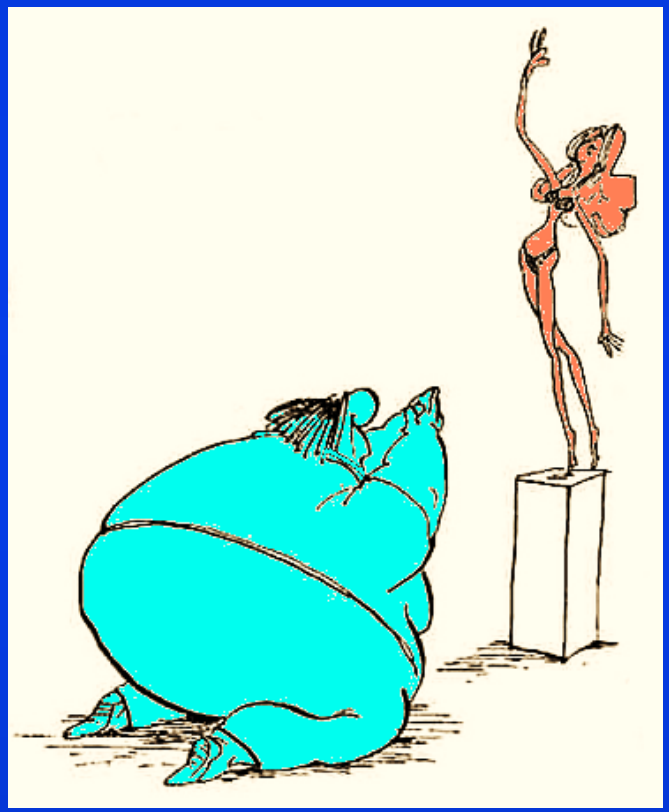
MALABSORPTION SYNDROME
LABORATORY DIAGNOSIS



MUDr.Petr Kocna CSc.
http://gweb.zde.cz

ÚLBLD VFN a 1.LF UK

1.LF UK tutorial, July 2024

MALABSORPTION-MALDIGESCE-MALASIMILATION

GIT FUNCTIONS

EXAMINATION METHODS

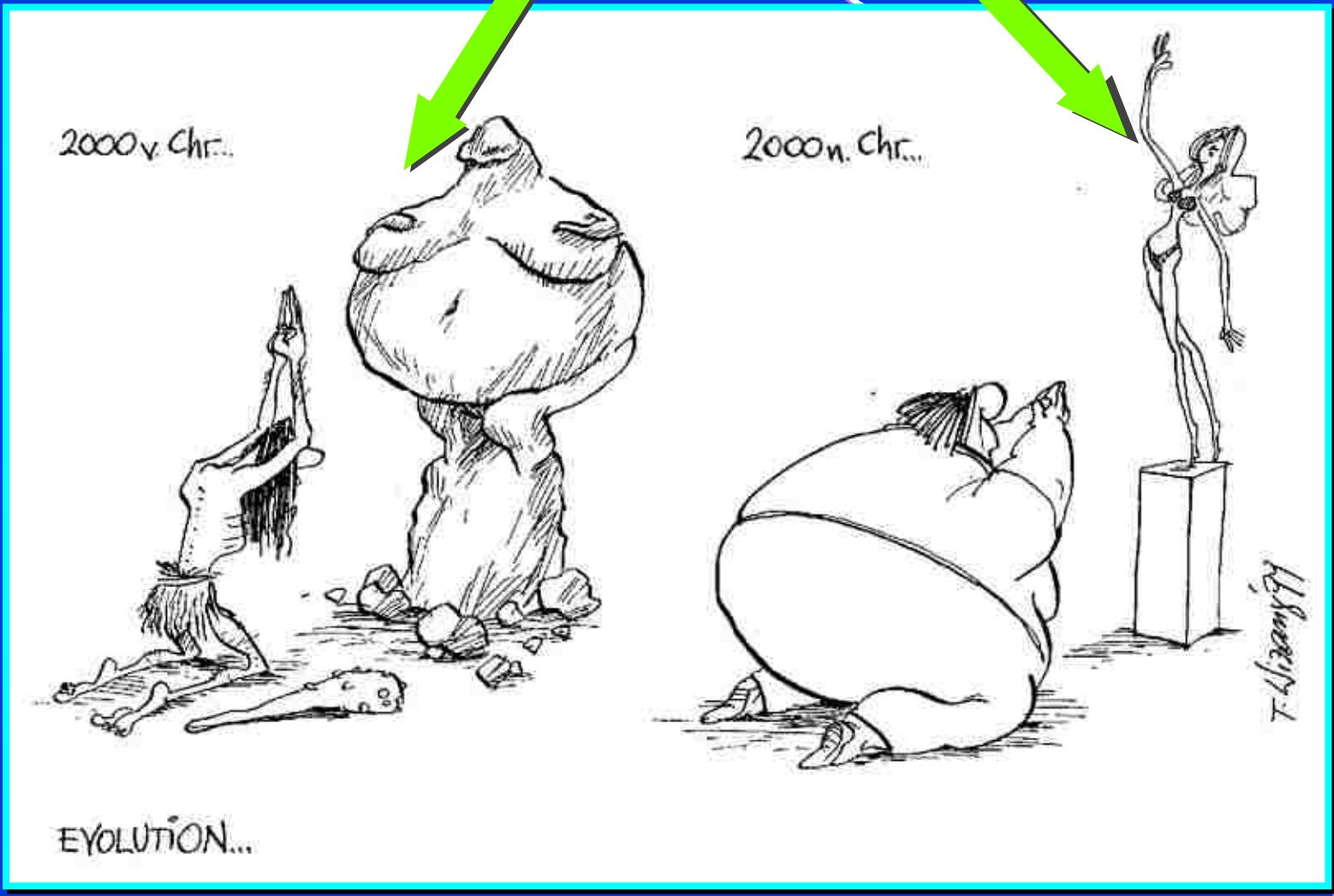
COELIAC DISEASE - GLUTEN ENTEROPATHY

LACTOSE INTOLERANCE

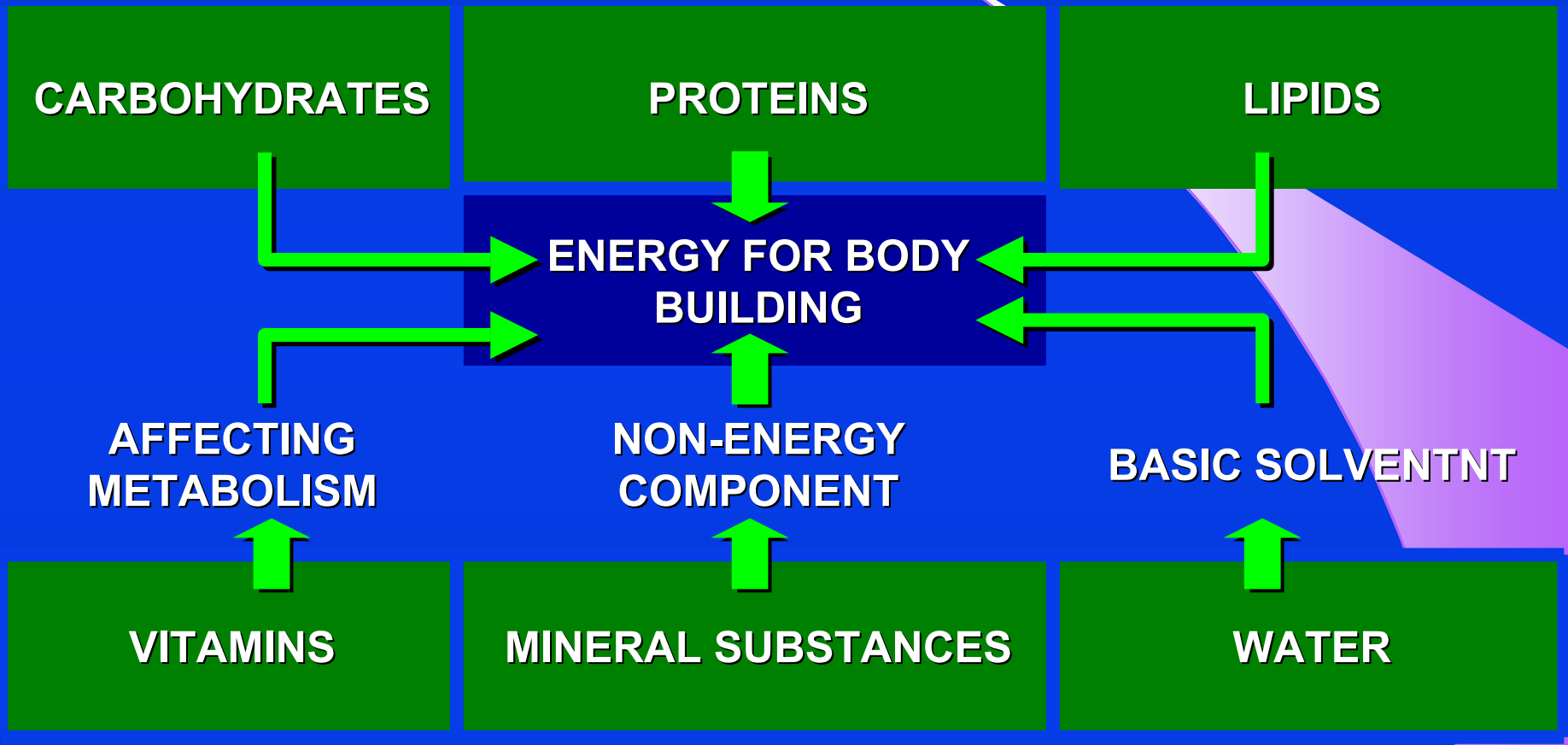
PANCREATIC INSUFFICIENCY

SMALL INTESTINAL BACTERIAL OVERGROWTH

MALABSORBTION



BASIC COMPONENTS OF NUTRITION



MALABSORPTION, MALDIGESTION, MALASIMILATION

- **MALABSORPTION**
  CONDITIONS IN WHICH THE ABSORPTION AND, IN A BROADER CONCEPT, THE DIGESTION OF FOOD IN THE DIGESTIVE TRACT ARE DISRUPTED
- **MALDIGESCE**
  DISORDER OF DIGESTION CAUSED BY FAILURE OF VARIOUS ORGANS OF THE DIGESTIVE TRACT (STOMACH, PANCREAS, LIVER, INTESTINES), INCLUDING. DEFICIENCY OF DIGESTIVE ENZYMES OR BILE. MALDIGESTION ALONG WITH MALABSORPTION IS SOMETIMES REFERRED TO AS MALASIMILATION.
- **MALASIMILATION**
  DISORDER OF NUTRIENT UTILIZATION (ASSIMILATION), INCLUDES MALDIGESTION AND MALABSORPTION. SINCE DIGESTION IS A CONDITION FOR NUTRIENT ABSORPTION, MALDIGESTION RESULTS IN MALABSORPTION, WHICH OVERLAPS TO A SIGNIFICANT DEGREE WITH MALASIMILLATION

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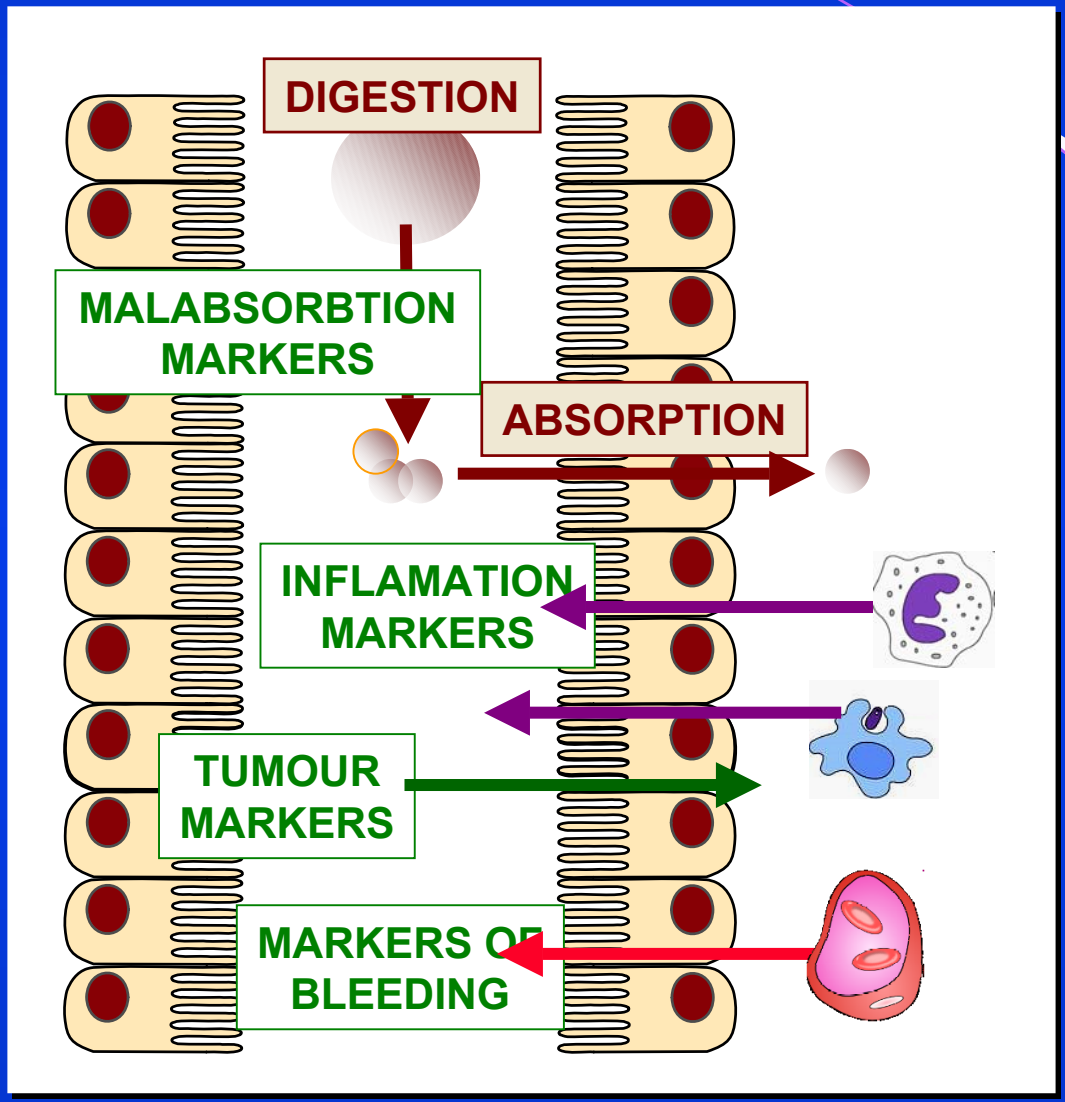


α_1-antitrypsin
Pancreatic elastase

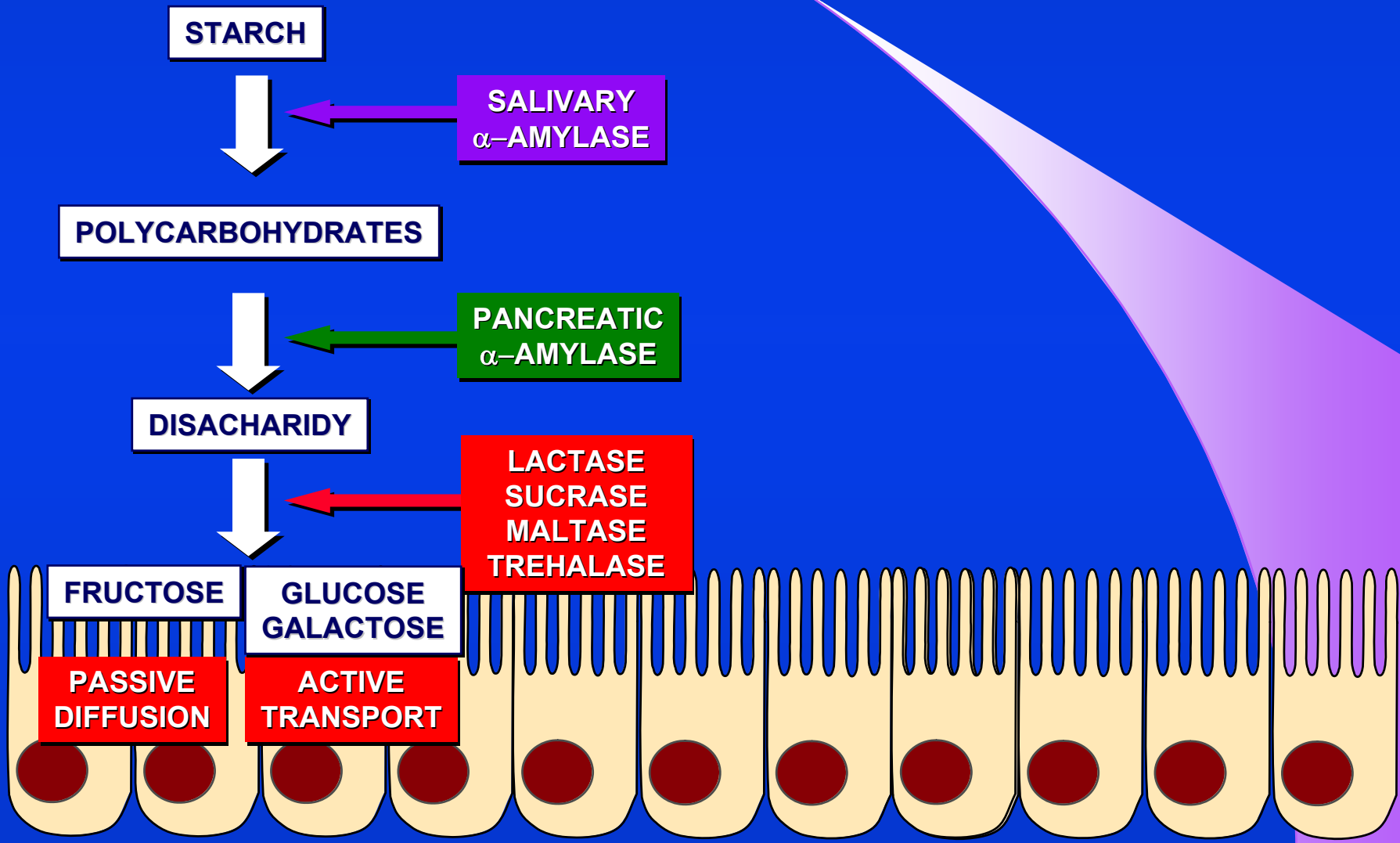
PMN elastase
β-defensin
Zonulin

Calprotectin
Calgranulin
Lactoferin
Neopterin

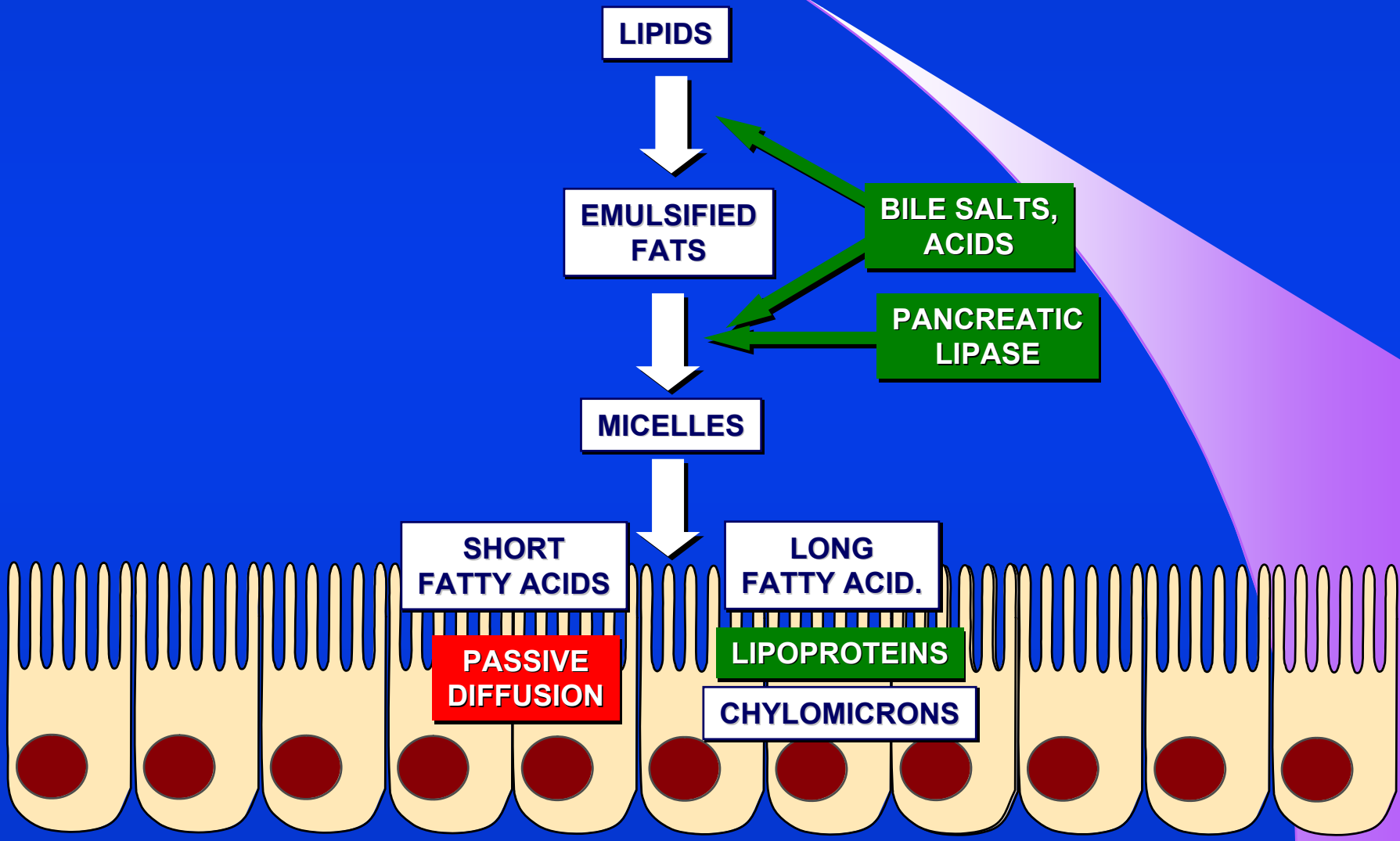
M2-protein kinase
DNA markers

Haemoglobin
Haptoglobin
Transferrin

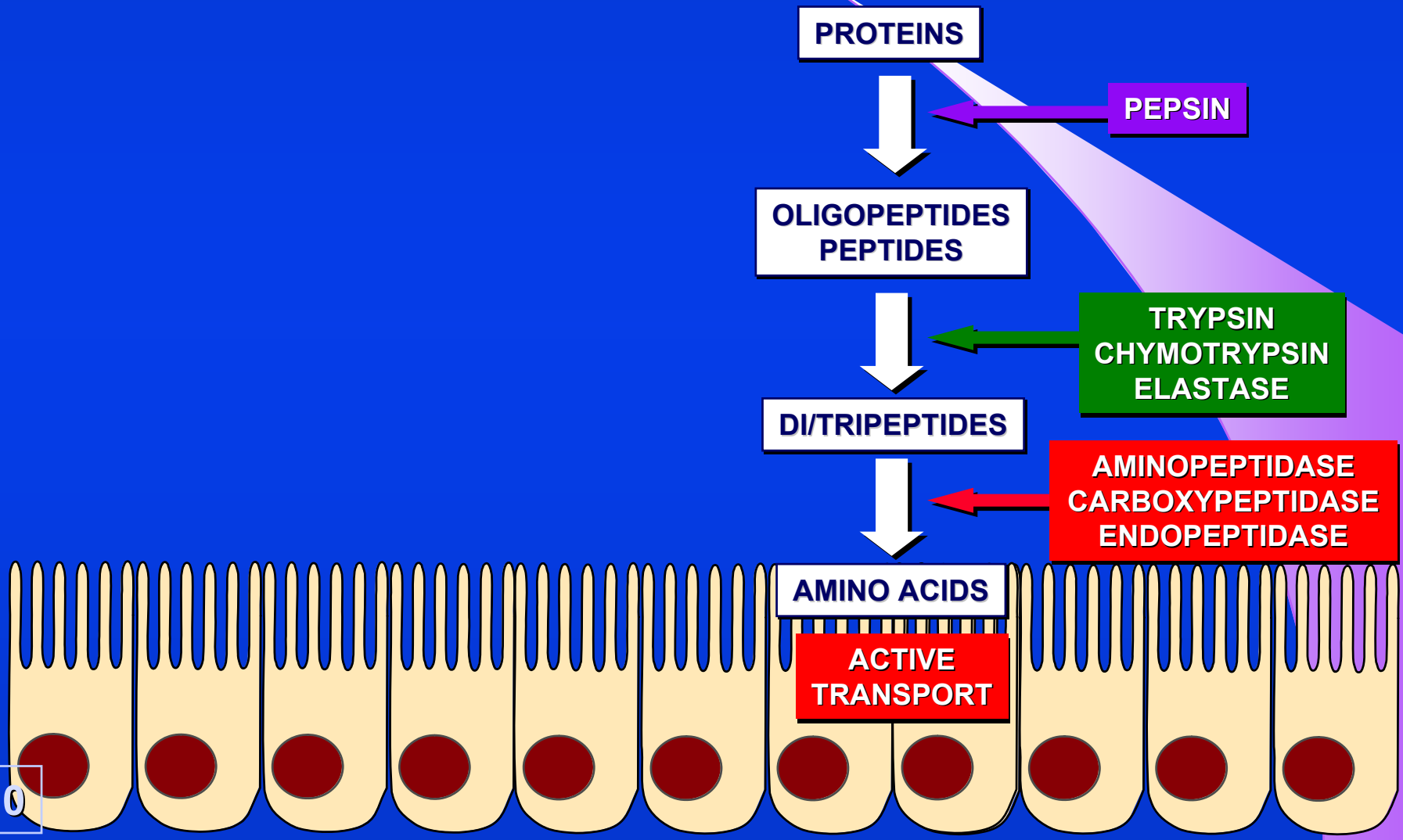
CARBOHYDRATE DIGESTION PROCESS



LIPID DIGESTION PROCESS

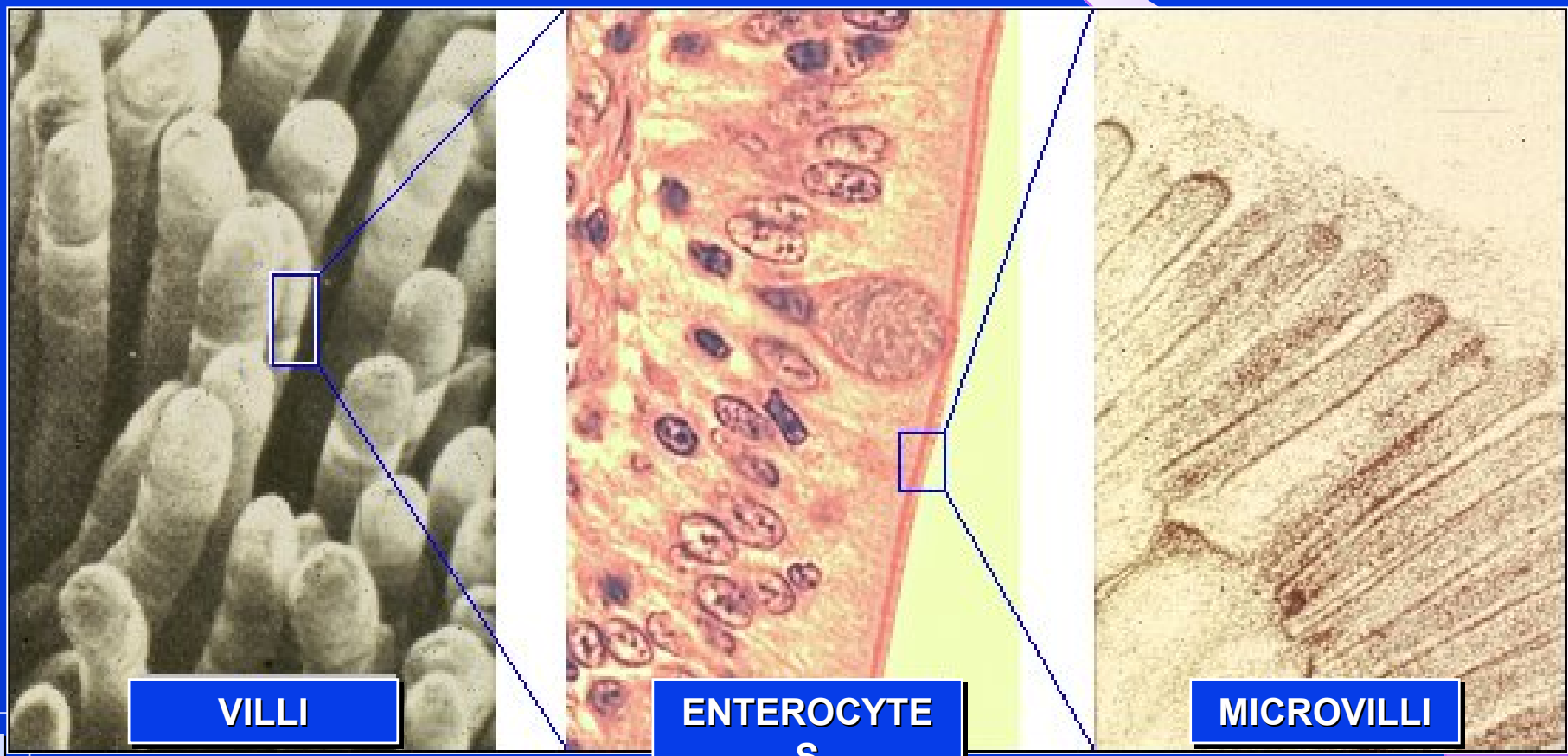


PROTEIN DIGESTION PROCESS



SMALL INTESTINE

DUODENUM - JEJUNUM - ILEUM, LENGTH 3 - 4 METERS
SURFACE 5 x ENLARGE BY VILLI (0.5 - 1 mm, 20 - 40 villi / mm2)
MICROVILLI - BRUSH BORDER - ENLARGE THE SURFACE 30x - 100 m2

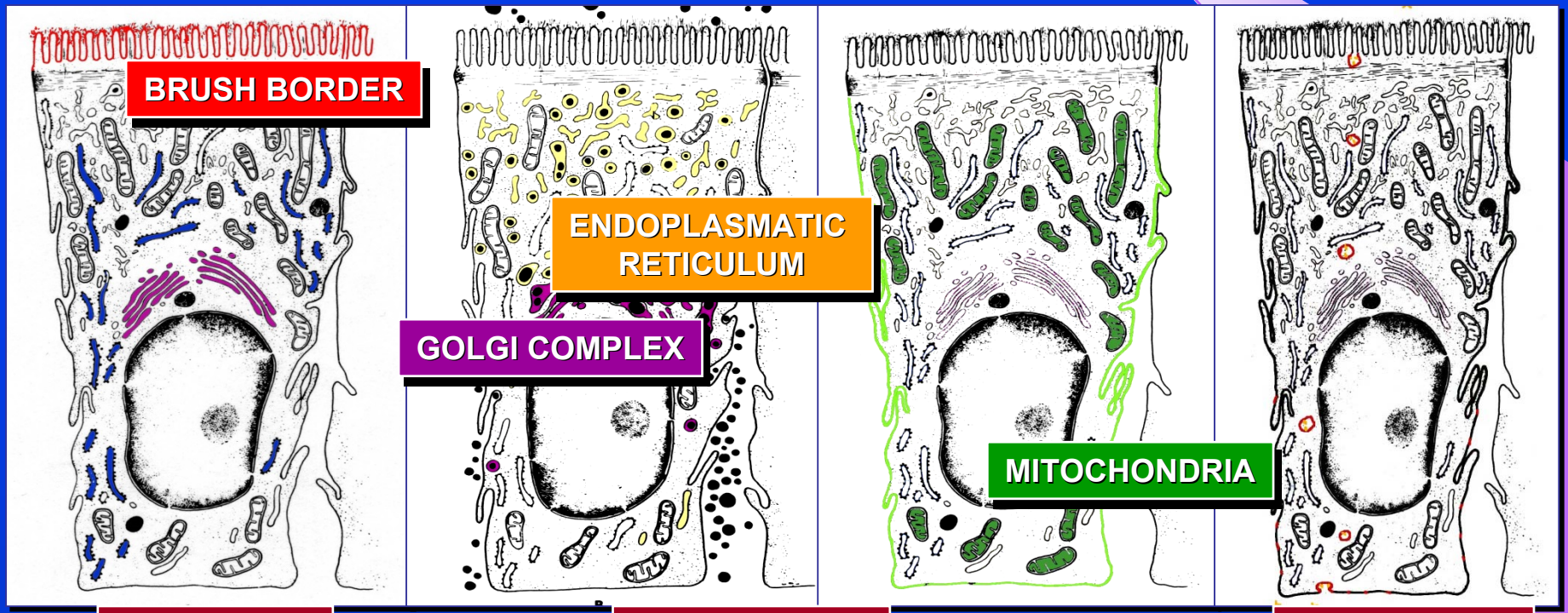


SMALL INTESTINE - ENTEROCYTE FUNCTION

ENZYMES
BRUSH BORDER
PEPTIDE CLEAVAGE
DISACCHARIDE

MEMBRANE DIFFUSION
AMINO ACIDS
MONOSACCHARIDES

TRANSEPITHELIAL
TRANSPORT
PROTEINS, IgA



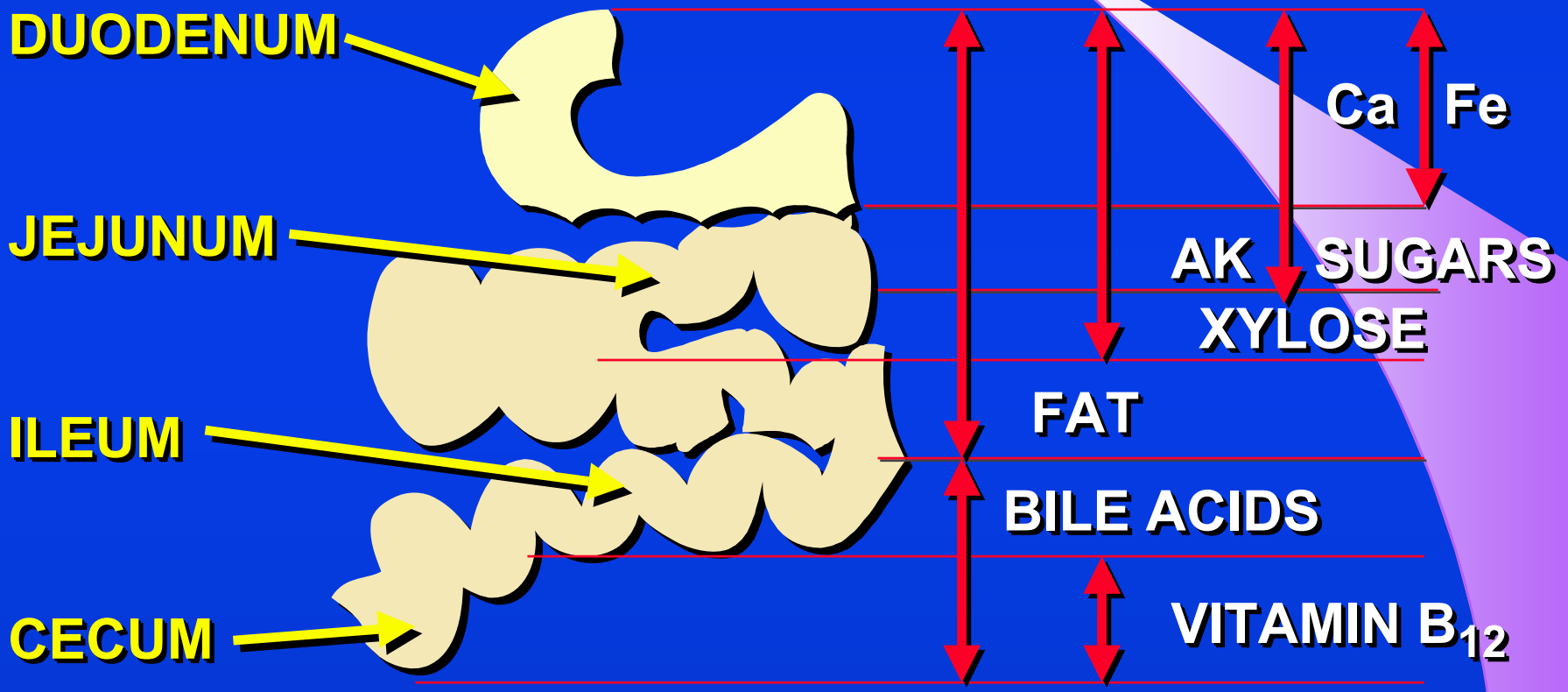
MALABSORPTION, MALDIGESTION, MALASIMILATION

- **MALABSORPTION**
  A STATE OF DEFICIENCY OF ONE OR MORE ESSENTIAL NUTRIENTS IT IS NOT DIGESTED AND ABSORBED, OR IS NOT SUFFICIENTLY DIGESTED
- **MALABSORPTION SYNDROME** (MS) INCLUDES:
  - DISORDER OF INTRALUMINAL DIGESTION,
  - DIGESTION NUTRIENT ABSORPTION DISORDER,
  - ABNORMAL SECRETION OF DIGESTIVE JUICES
  - SERIOUS MOTILITY DISORDER
  - INSUFFICIENT FOOD INTAKE
- **PRIMARY MALABSORPTION SYNDROME**
  DISORDER AT THE LEVEL OF THE ENTEROCYTE
  CELIAC DISEASE, TROPICAL SPRUE, WHIPPLE'S DISEASE
- **SECONDARY MALABSORPTION SYNDROME**
  DISEASE OF THE PANCREAS, GALLBLADDER, LIVER, OBSTRUCTIVE INTESTINAL DISEASES, INFECTION

MALABSORPTION - CLINICAL MANIFESTATIONS

FATS FATTY ACIDS BILE SALTS	→	STEATORHOEA DIARRHEA
PROTEINS SUGARS	→	MUSCLE WEAKNESS, FATIGUE WEIGHT LOSS
LACTOSE	→	MILK INTOLERANCE
IRON CALCIUM	→ →	ANEMIA PATHOLOGICAL FRACTURES
VITAMIN B12, FOLATES VITAMIN K VITAMIN D, Ca, Mg	→ → →	MEGALOBLASTIC ANEMIA BLEEDING NEUROLOGICAL SY., TETANIA

RESORPTION AND ABSORPTION FROM THE SMALL INTESTINE



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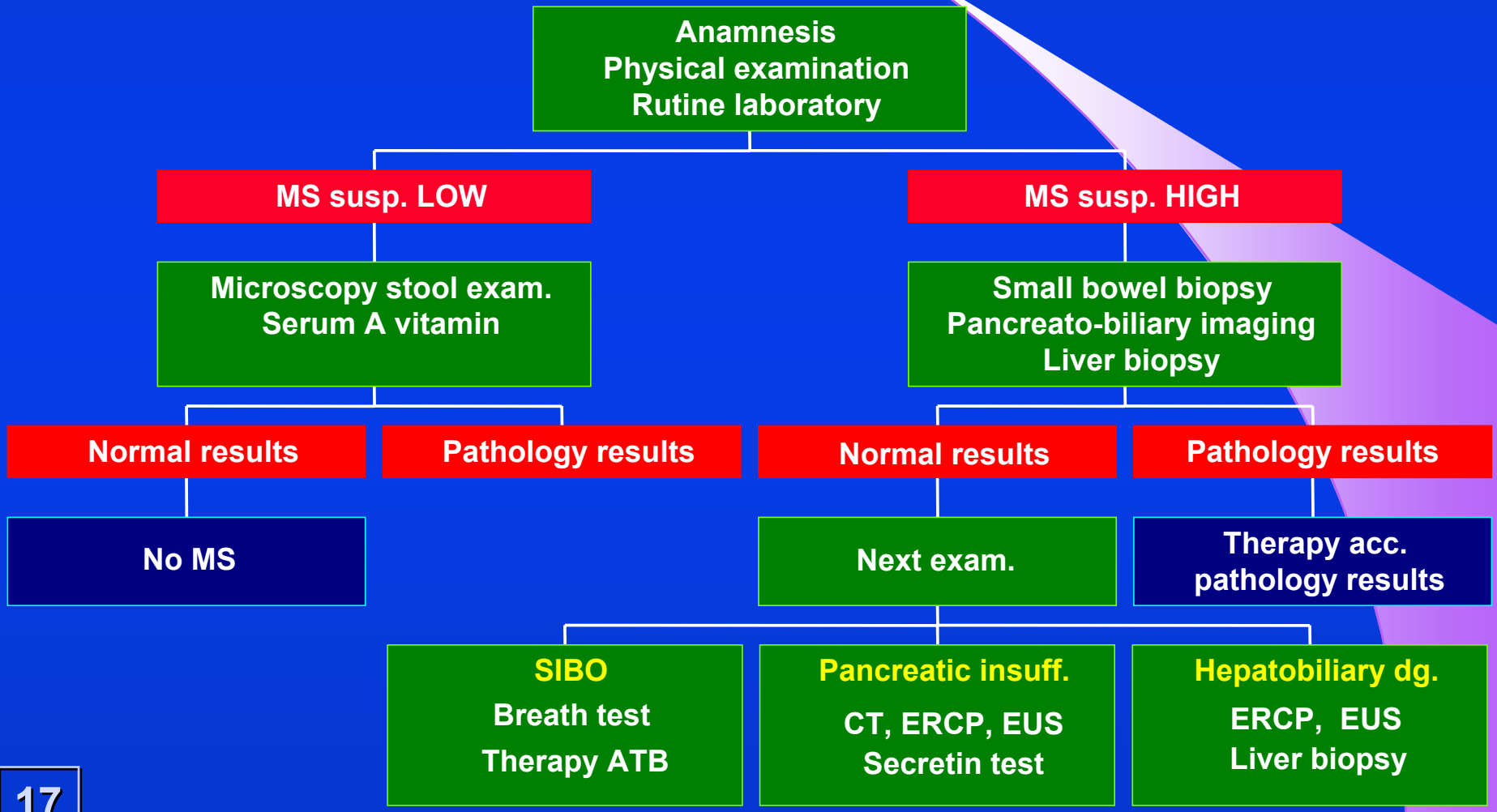
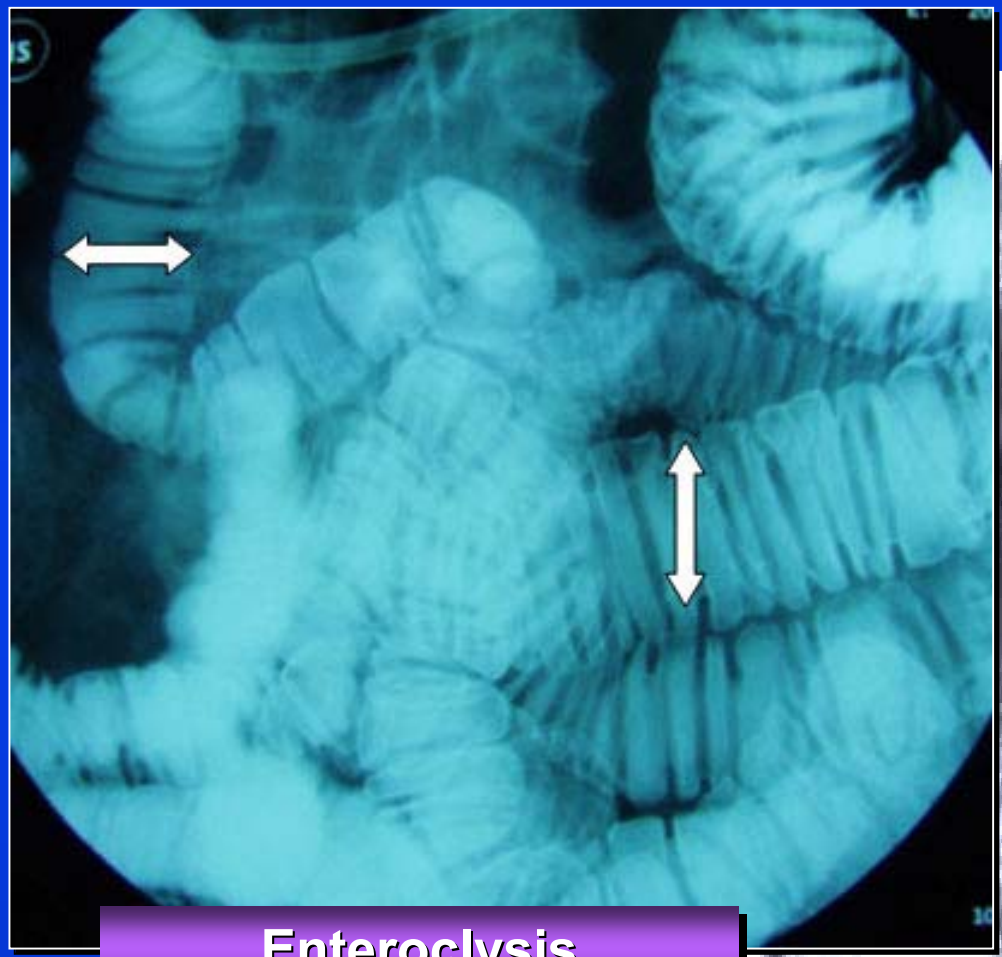
DIAGNOSTIC ALGORITHM FOR MALABSORPTION



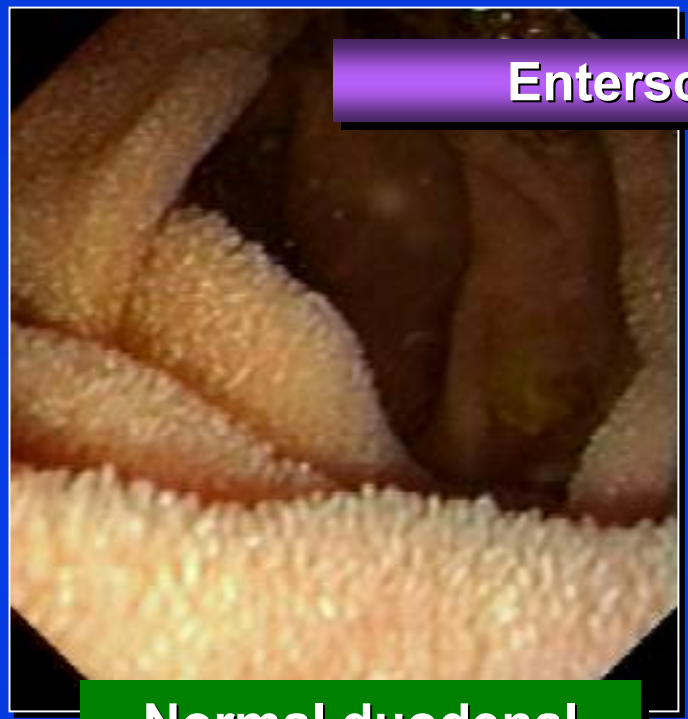
X RAY EXAMINATION



Enteroclysis

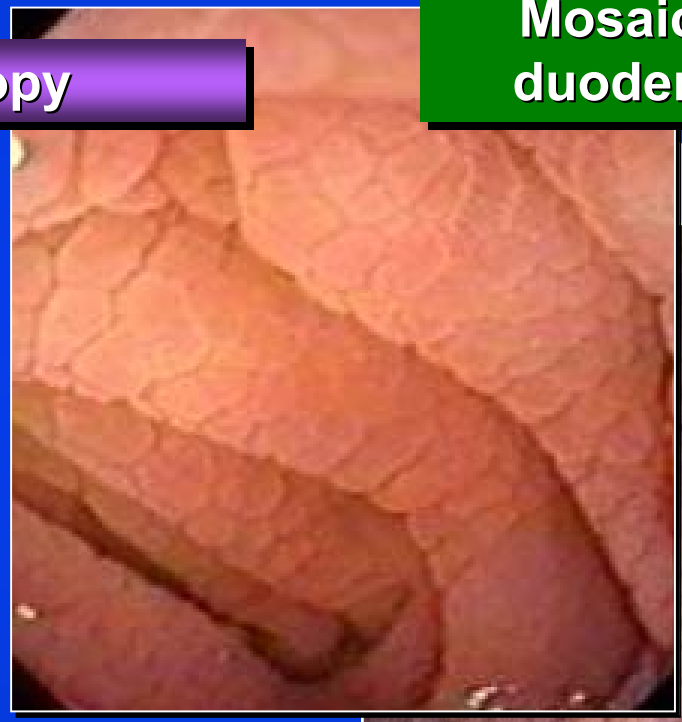
Contrast examination

ENDOSCOPY EXAMINATION

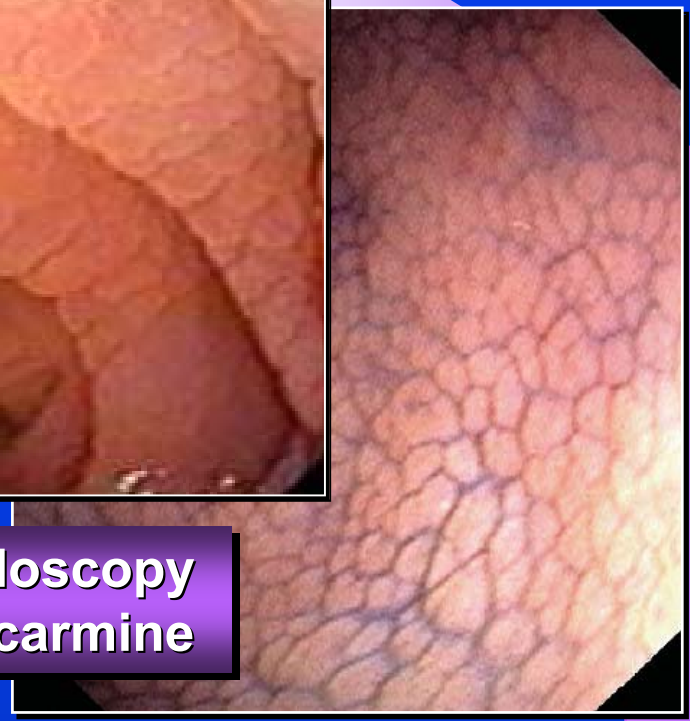


Enterscopy

Normal duodenal mucosa



Mosaic pattern of duodenal mucosa



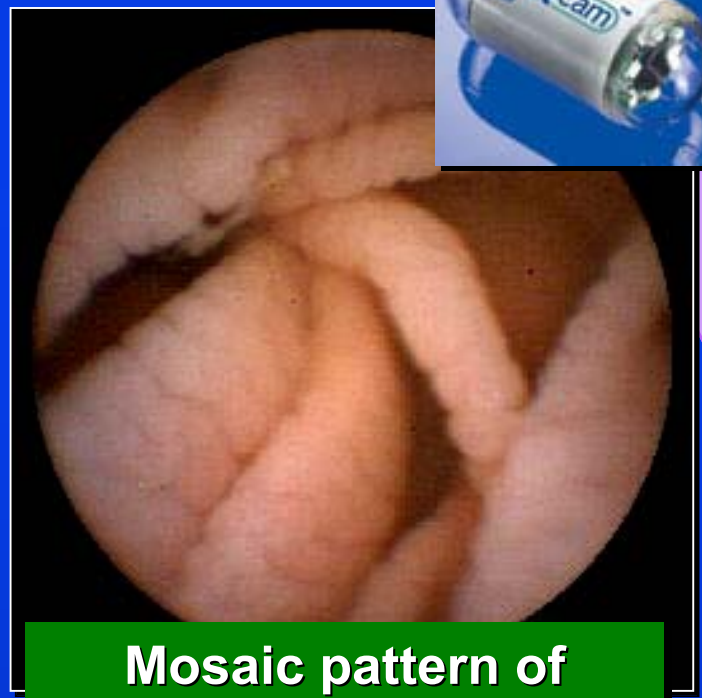
Chromoendoscopy with indigocarmine

http://www.lfhk.cuni.cz/kcvl/stranky/ENTERO/E-cel1.html

CAPSULE ENDOSCOPY

NON-INVASIVE ENDOSCOPIC EXAMINATION

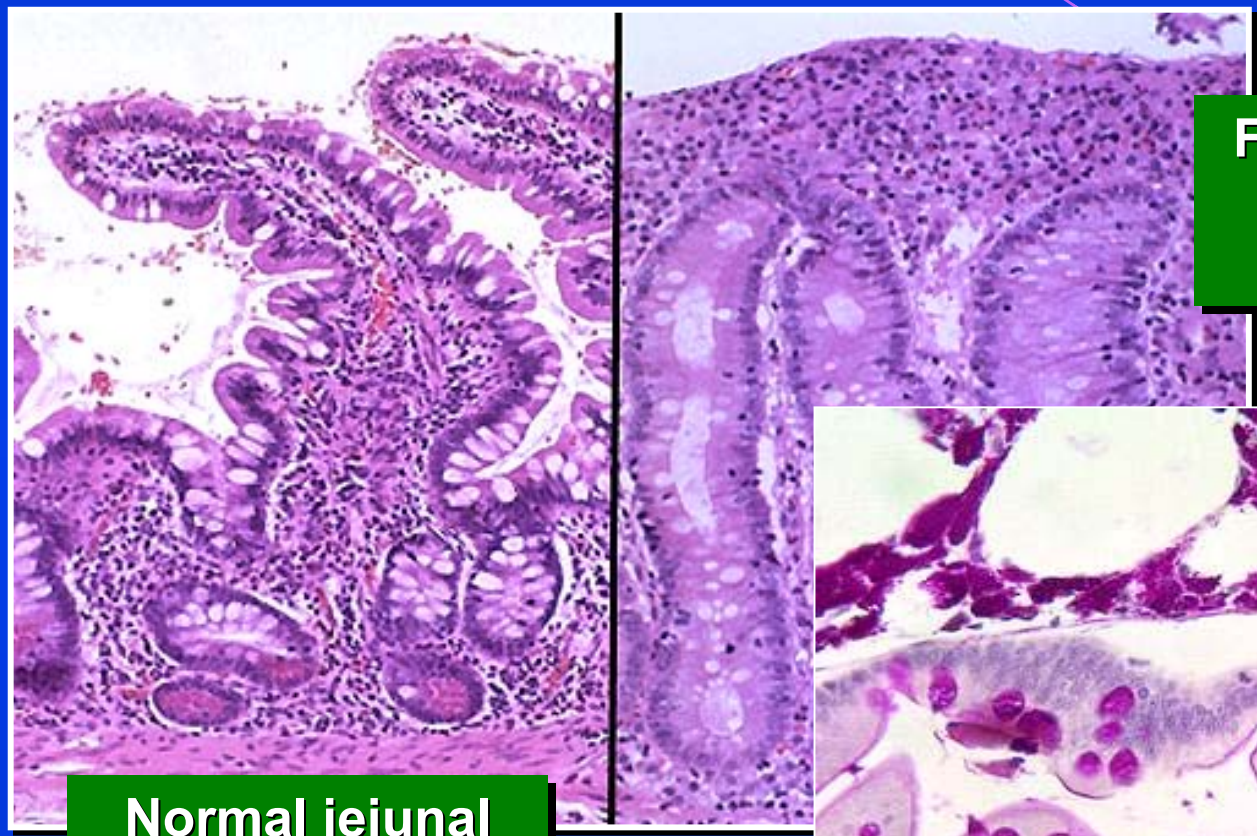
Normal duodenal mucosa



Mosaic pattern of duodenal mucosa

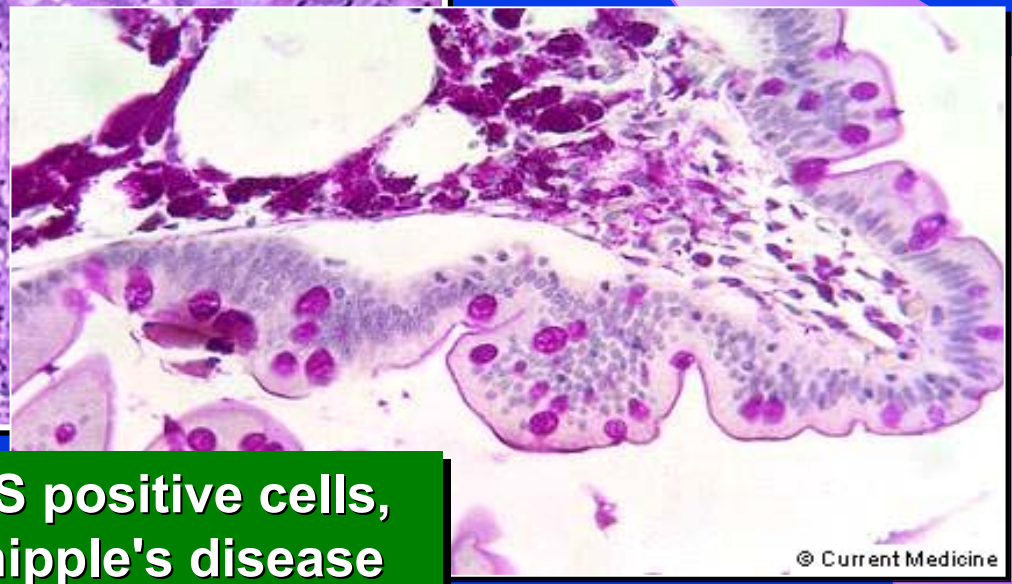
http://www.lfhk.cuni.cz/kcvl/stranky/Kapsle/C-CE1.html

HISTOLOGICAL EXAMINATION OF BIOPSY - MUCOSA



Normal jejunal mucosa

Flat, atrophic mucosa, crypt hyperplasia, celiac disease



PAS positive cells, Whipple's disease

http://az.gastroatlas.com/index.aspx

STOOL EXAMINATION

ANALYSIS OF FACES ENABLES THE DIAGNOSTIC PROCESS OF DISEASES OF THE DIGESTIVE SYSTEM, LIVER AND PANCREAS. CLARIFICATION OF THE CAUSES LEADING TO SYMPTOMS AFFECTING THE GI tract INCLUDING DIARRHEA, NAUSEA, VOMITING, EDEMA, PAIN, SPAMS, FEVER, LOSS OF TASTE, ETC.

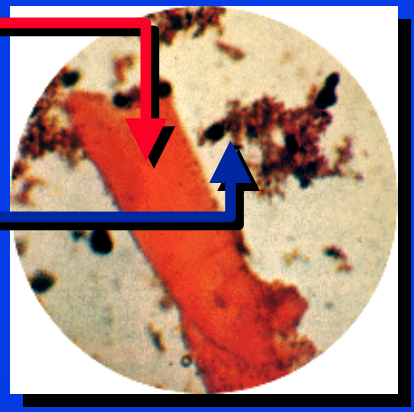
- **DETECTION OF SOME ENZYMES IN THE FACES TO DETERMINE THE RATE OF PANCREATIC FUNCTION.**
- **DETECTION OF OCCULT BLEEDING FOR COLORECTAL TUMOR SCREENING**
- **DETECTION OF THE PRESENCE OF PARASITES, E.G. LAMBLIA**
- **DETECTION AND IDENTIFICATION OF SOME TYPES OF BACTERIA**
- **DETECTION OF UNDIGESTED FOOD REMAINS IN MALABSORPTION SYNDROME**

MICROSCOPIC EXAMINATION OF STOOL

Gastroenterologie für die Praxis
München, 1975

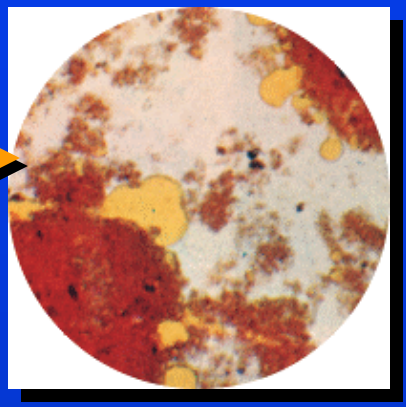
MUSCLE FIBRES

STARCH GRAIN



NATIVE PREPARATION
LEFTOVERS OF FOOD
CELLULOSE FIBER

FAT DROPLET



FRIEDIGER'S REAGENTS STAINING
- **MUSCLE FIBERS RED**
- **FAT DROPLETS YELLOW**
- **DARK BLUE STARCH GRAINS**

BIOCHEMICAL EXAMINATIONS OF THE STOOL SAMPLE

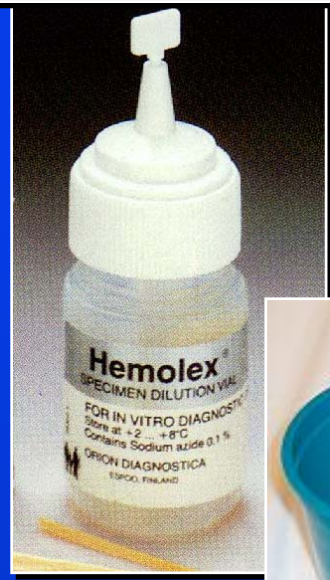
- Anti tTG IgA
- Anti Gliadin scIgA
- β-Defensin 2
- Zonulin
- α_1-antitrypsin
- Gliadin-33mer
- Bile acids
- Calprotectin
- Lactoferrin
- Haemoglobin
- Haptoglobin
- Transferrin

- Helicobacter pylori Ag
- Amylase
- Lipase
- Chymotrypsin
- Elastase - 1
- Lysozyme
- Albumin
- Myeloperoxidáza
- PMN Elastase
- EDN Eosi.Deriv.Neurotoxin
- PCR / DNA

Fecal markers	Indicatiom	Sensitivity	Specificity
Biomarkers IBD / IBS			
Calprotectin	IBD monitoring	70 - 100 %	70 - 100 %
S100 protein	IBD inflam. marker	60 - 67 %	70 - 90 %
Lactoferrin	Dif.diagnostics IBD - IBS	67 - 85 %	90 - 100 %
Biomarkers of cell turnover			
M2 - PK	Screening GE tumours	67 - 93 %	88 - 92 %
Biomarkers of digestion and malabsorption			
Elastase EL-1	Pancreatic insufficiency	100 %	96 %
Fecal fat	Liver, small bowell dg.	70 - 94 %	80 - 99 %
α_1-antitrypsin	Protein enteropathy	60 - 78 %	80 - 85 %

Update on clinical and research application of fecal biomarkers for gastrointestinal diseases. Siddiqui I, Majid H, Abid S. World J Gastrointest Pharmacol Ther. 2017; 8(1): 39-46

STOOL EXAMINATION - SAMPLE COLLECTION



AUTOMATIC ANALYZERS FOR STOOL ANALYSIS

OC-Pledia Eiken

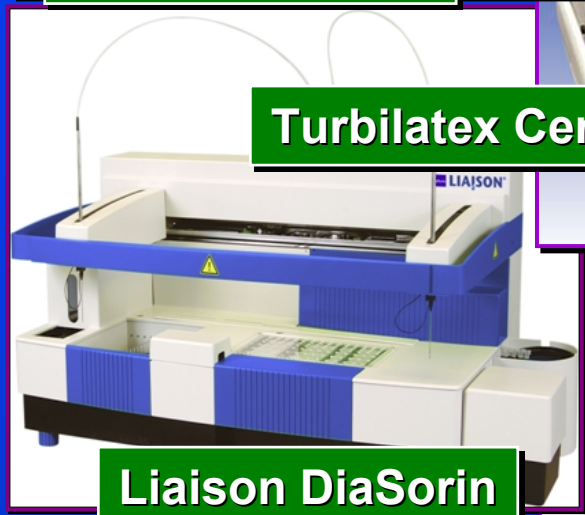
Hp ANTIGEN
HAEMOGLOBIN
CALPROTECTIN
TRANSFERRIN

OC-Ceres Eiken

Senti-FIT 270 Sentinel

Kroma iT Linear

Turbilatex Cer Test



Liaison DiaSorin

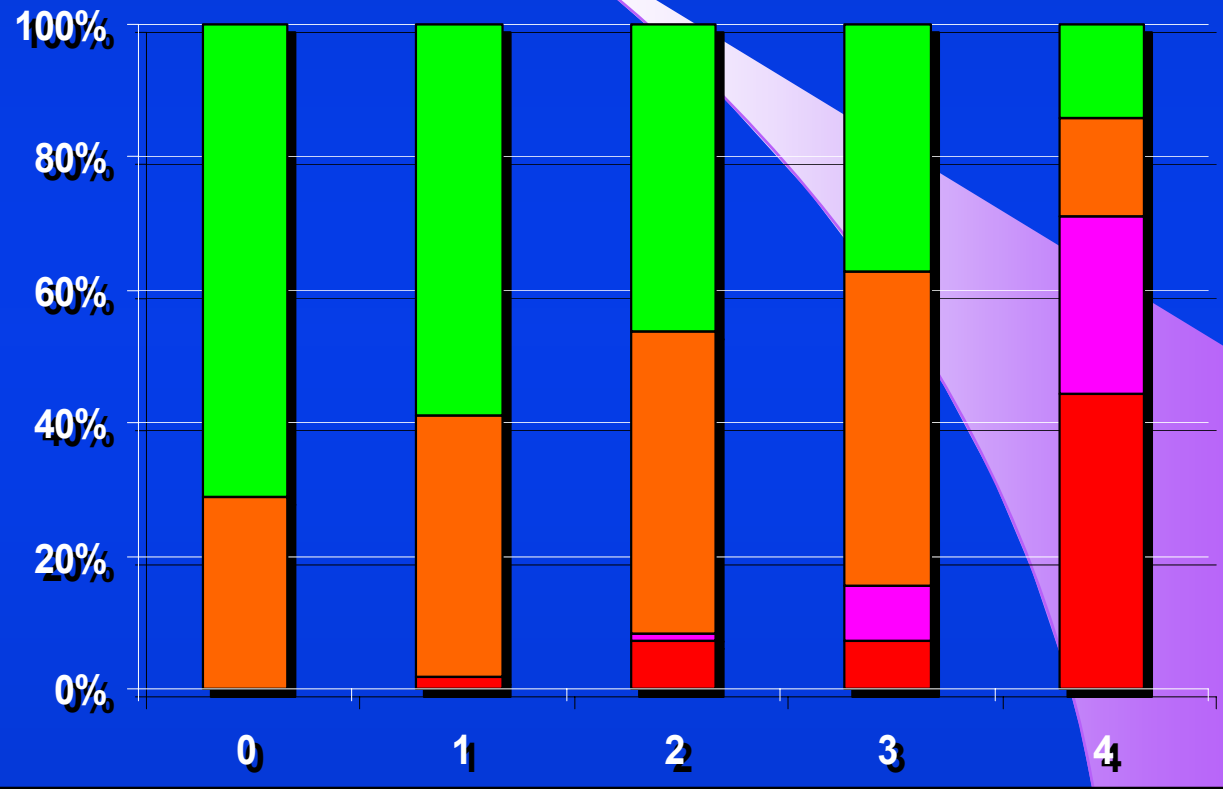
AVE 562 - AVE Tech.

AA01 Alfresa Pharma

COMBINATION OF 4 MARKERS - POCT SCREENING

Colonoscopy findings for 0-4 positive tests. CRC, IBD, GIT pathology, health

Spanish study, hemoglobin, transferrin, calprotectin and lactoferrin, highest negative predictive values: 94.8% for significant pathologies and 100% for CRC or IBD if all 4 markers were negative (36.8% of patients)



A Point-of-Care Faecal Test Combining Four Biomarkers Allows Avoidance of Normal Colonoscopies and Prioritizes Symptomatic Patients with a High Risk of Colorectal Cancer. Hijos-Mallada G, Saura N, Lué A.et al. Cancers (Basel). 2023; 15(3): 721

QUANTITATIVE ANALYSIS OF FATS IN STOOL

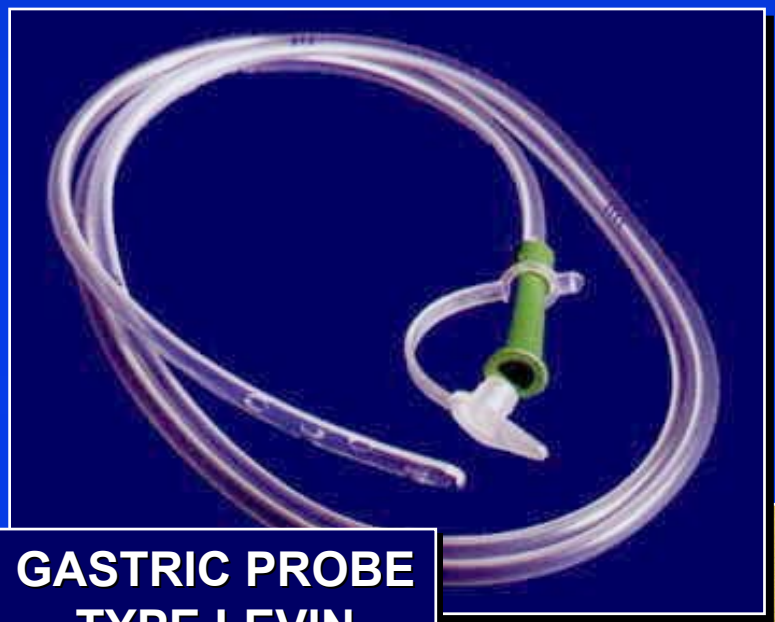
REFERENCE METHOD
EXOCRINE FUNCTIONS OF THE PANCREAS

COLLECTION OF STOOLS FOR 72 hr

FAT 72 hr.

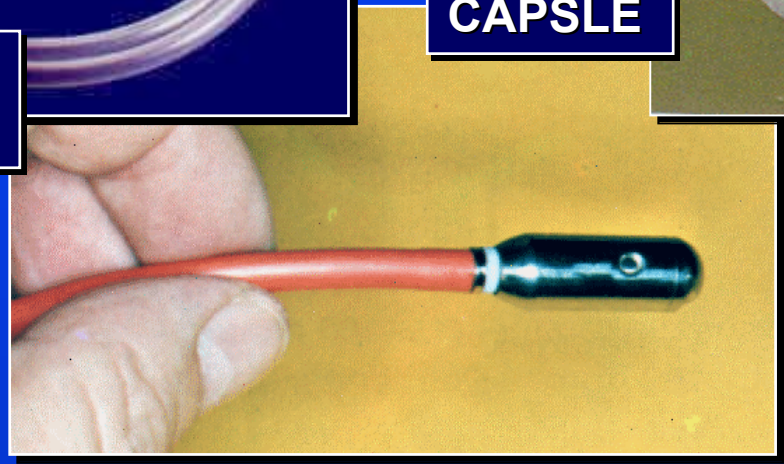
S-CCK TEST

GASTRIC, DUODENAL, INTESTINAL BIOPSY

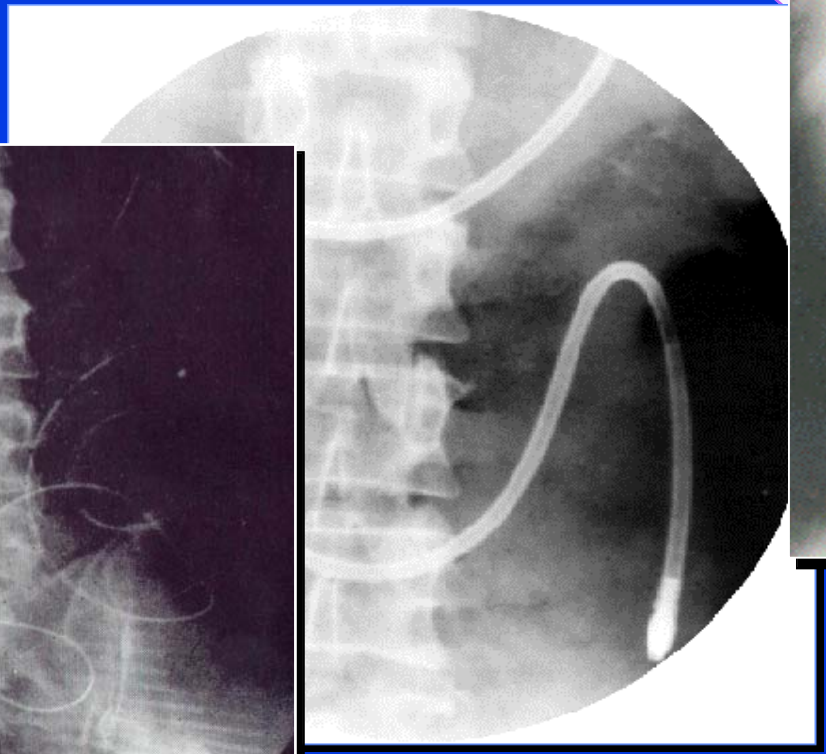


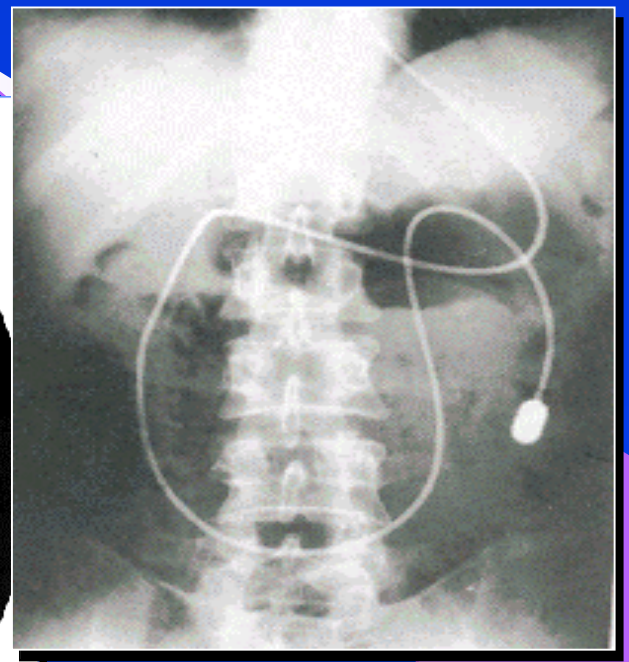
GASTRIC PROBE TYPE LEVIN

CROSBY CAPSLE



X-RAY CHECK OF PROBE POSITION

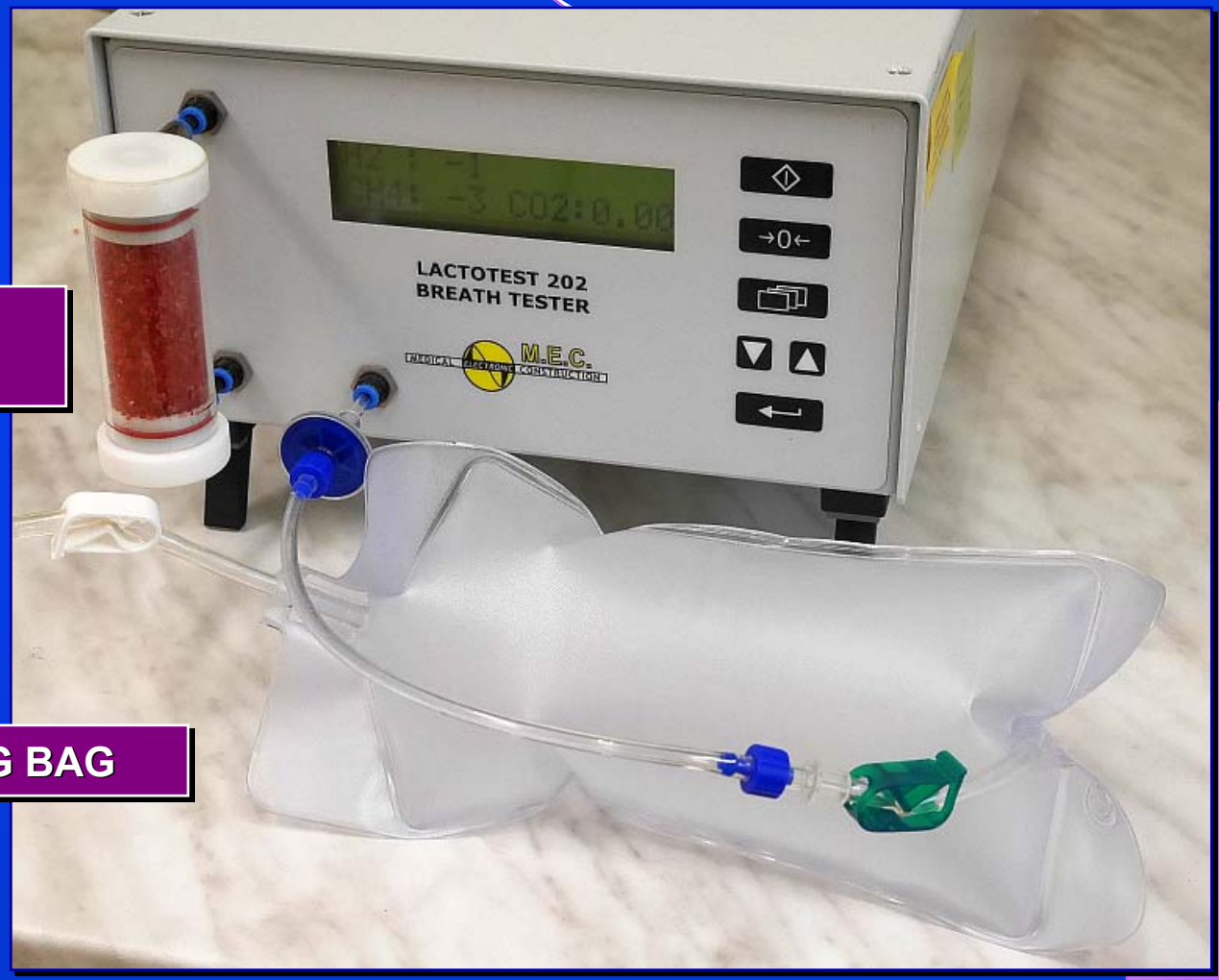




HYDROGEN / METHANE - LACTOTEST-202 XTEND

ABSORBER
water and CO_2

SAMPLING BAG



HYDROGEN / METHANE BREATH TESTS

Breath test for SIBO, 75g glucose,
Breath samples are taken every 15 minutes for 3 hours
Breath test for lactose/fructose intolerance
20g lactose / 25g fructose
Breath samples are taken every 15 minutes for 4 hours
Test positivity – H_2/CH_4 rise of 10ppm against basal value

CLINICAL RESULTS:	
NUMBER OF BREATH TESTS:	2300 x
SUSPECTED SIBO	80.4% of tests
SUSPECTED MALABSORPTION	19.6% of tests

POSITIVITY – 39.3%

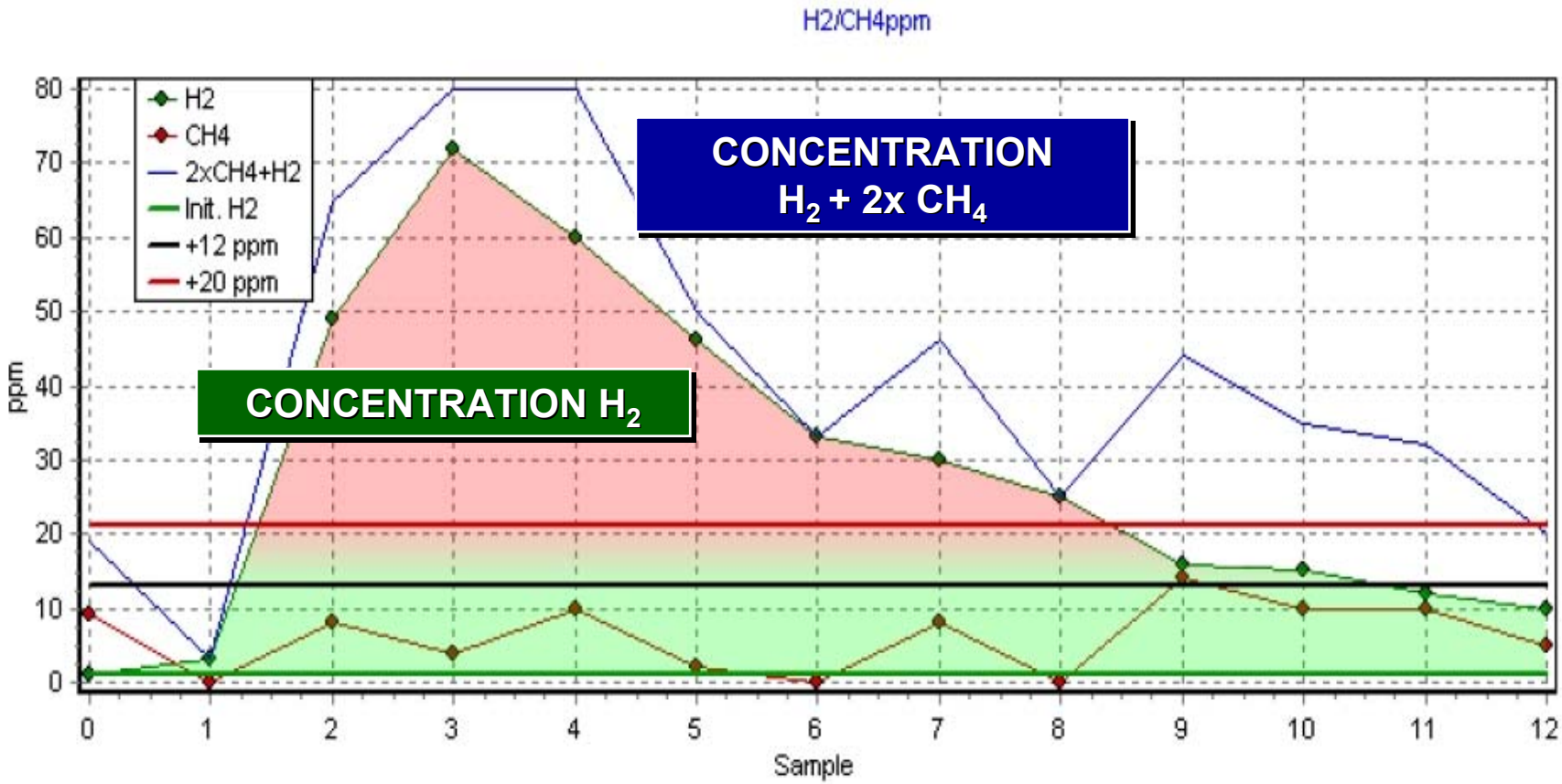
POCITIVITY – 55.0%

H_2 /CH_4 BREATH TESTS, INDICATIONS, RELIABILITY

Breath test	Indication	Sensitivity	Specificity
Glucoze HBT	SIBO	62%	83%
Lactulose HBT	SIBO	31%	86%
Fructose HBT	Malabsorption	98%	86%
Lactoze HBT	Malabsorption	80%	100%

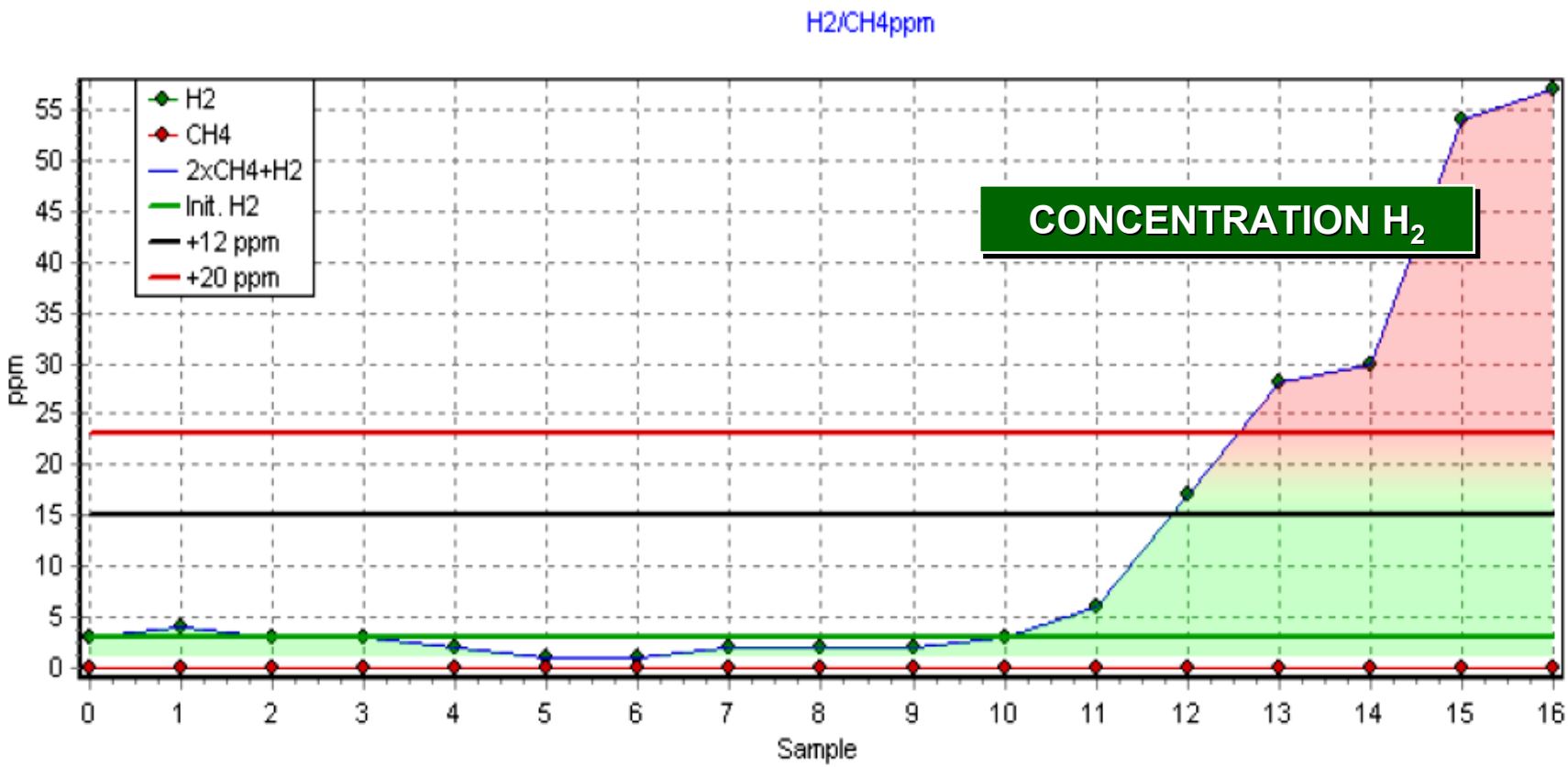
Update on diagnostic value of breath test in gastrointestinal and liver diseases.
Siddiqui I, Ahmed S, Abid S.
World J Gastrointest Pathophysiol. 2016 Aug 15;7(3):256-265

H_2 /CH_4 /CO_2 - GLUCOSE TEST FOR SIBO



75 g GLUCOSE

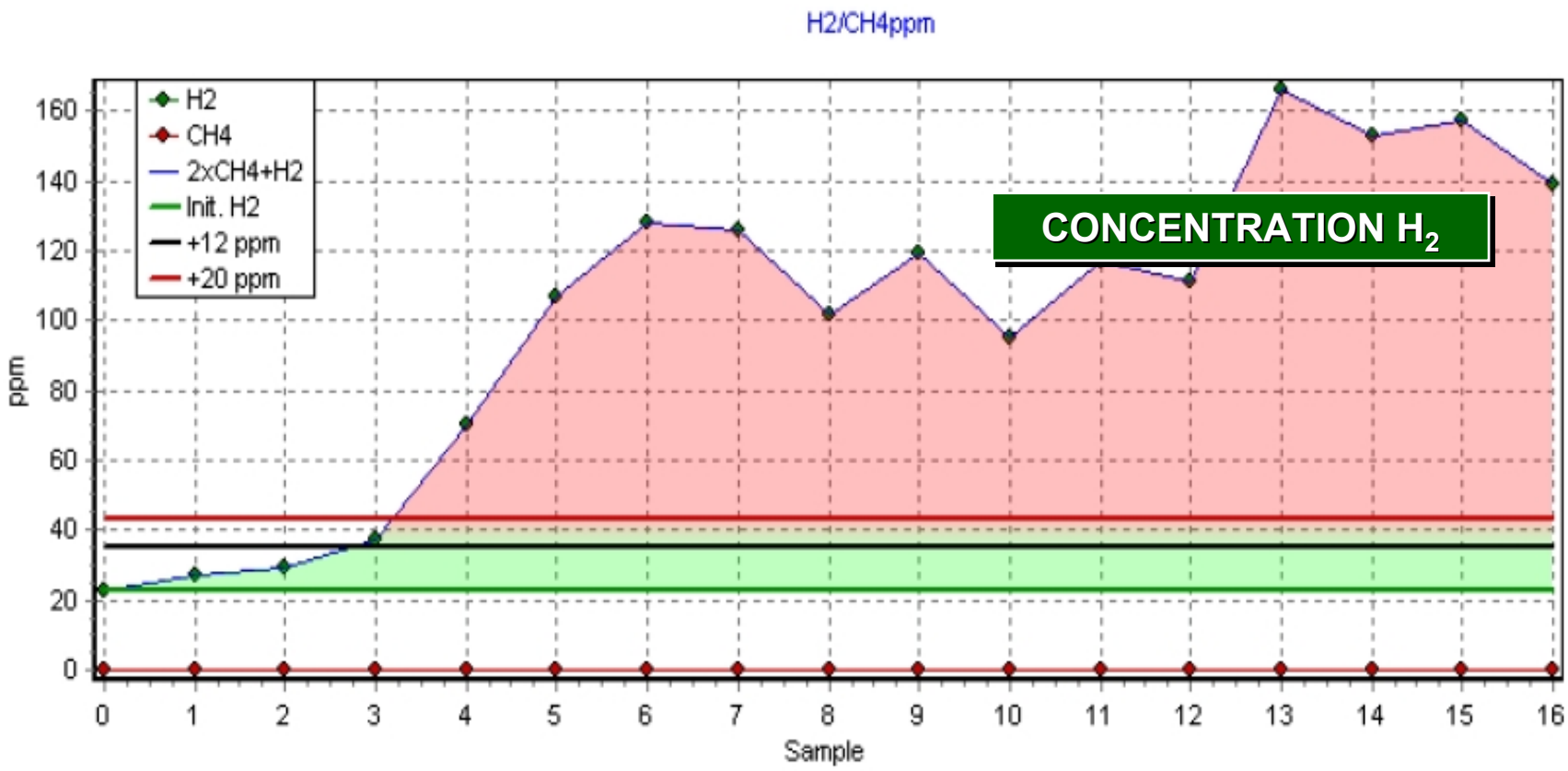
H_2 /CH_4 /CO_2 - LACTOSE MALABSORPTION



CONCENTRATION H_2

20 g LACTOSE

H_2 /CH_4 /CO_2 - LACTOSE MALABSORPTION + SIBO

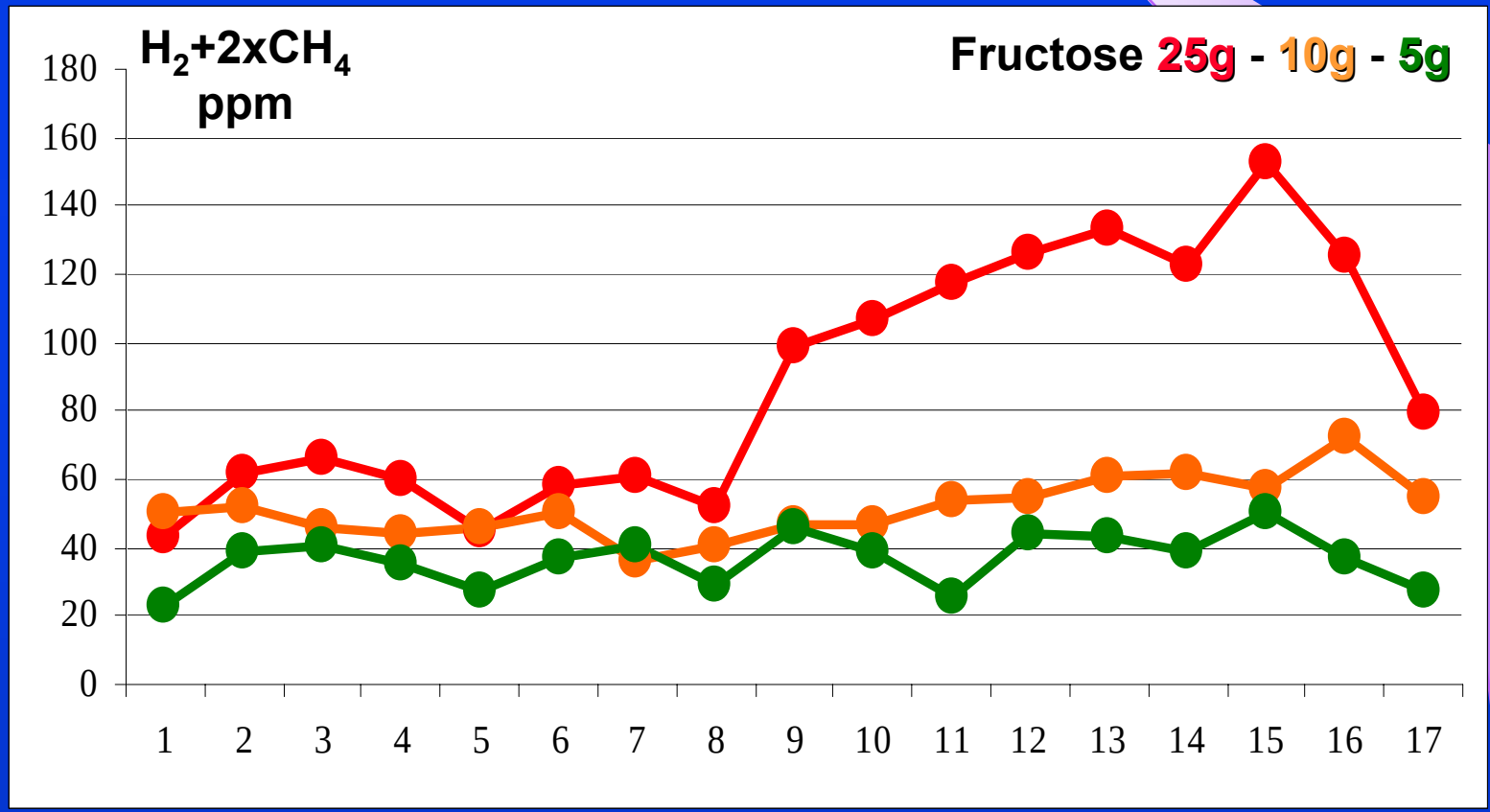


CONCENTRATION H_2

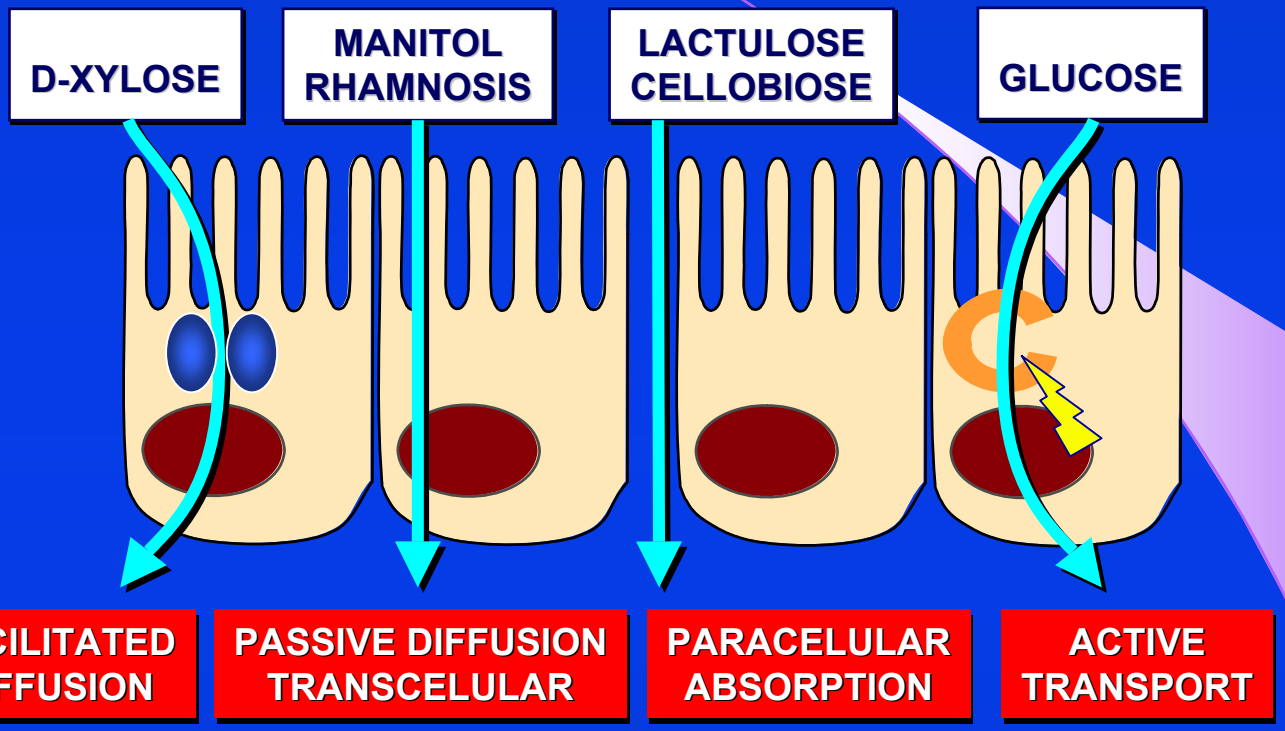
20 g LACTOSE

H_2-FRUCTOSE BREATH TEST

Fructose breath test - 46-year-old patient L.S.
Breath test performed with fructose in doses of 25g, 10g and 5g during 6 weeks
Samples taken every 4 hours and 15 minutes



INTESTINAL PERMEABILITY, ABSORPTION



- ORAL ADMINISTRATION - LACTULOSE 10g MANNITOL 2g XYLOSE 2g
- 5 HOUR COLLECTION OF URINE, DETERMINATION OF CONCENTRATIONS
- INDEX CALCULATION LA/MA, LA/XY

Assessment of intestinal permeability: enzymatic determination of urinary mannitol, raffinose, sucrose and lactose on Hitachi analyzer. Hessels J. et al. - Clin Chem Lab Med. 2003;41:33-38

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COELIAC DISEASE - GLUTEN ENTEROPATHY
LACTOSE INTOLERANCE
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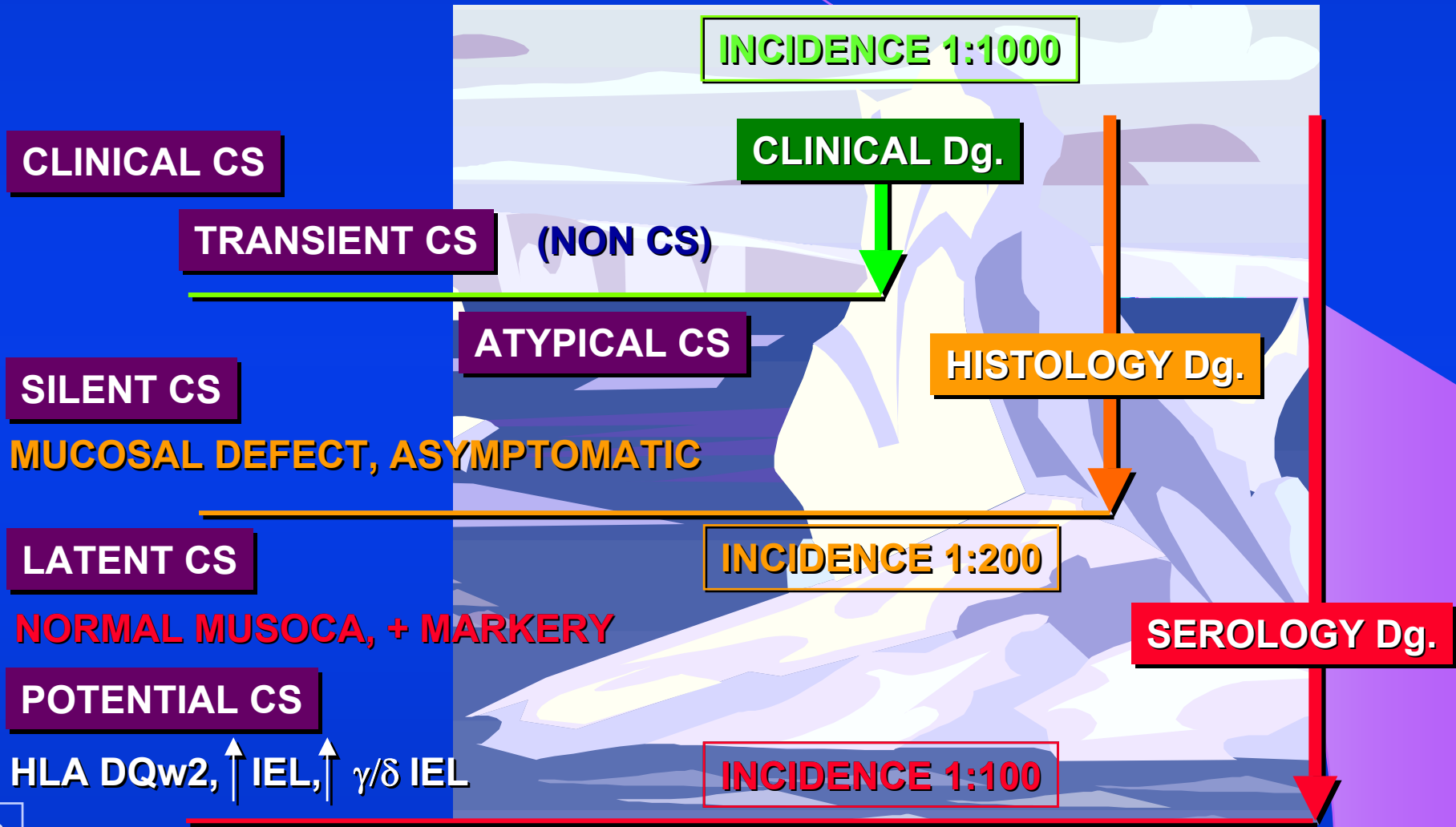
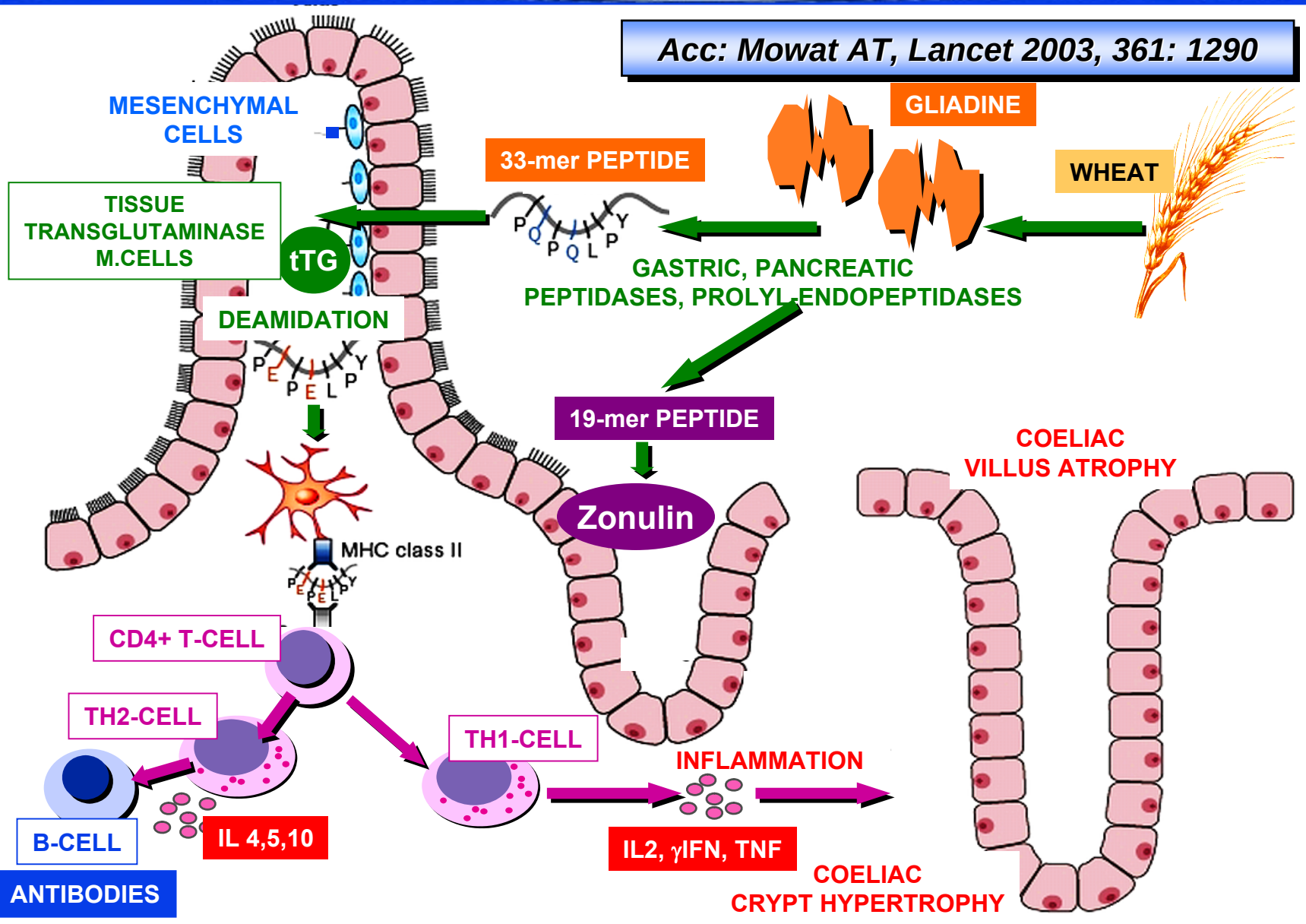
SMALL INTESTINAL BACTERIAL OVERGROWTH

WHAT IS CELIAC DISEASE?

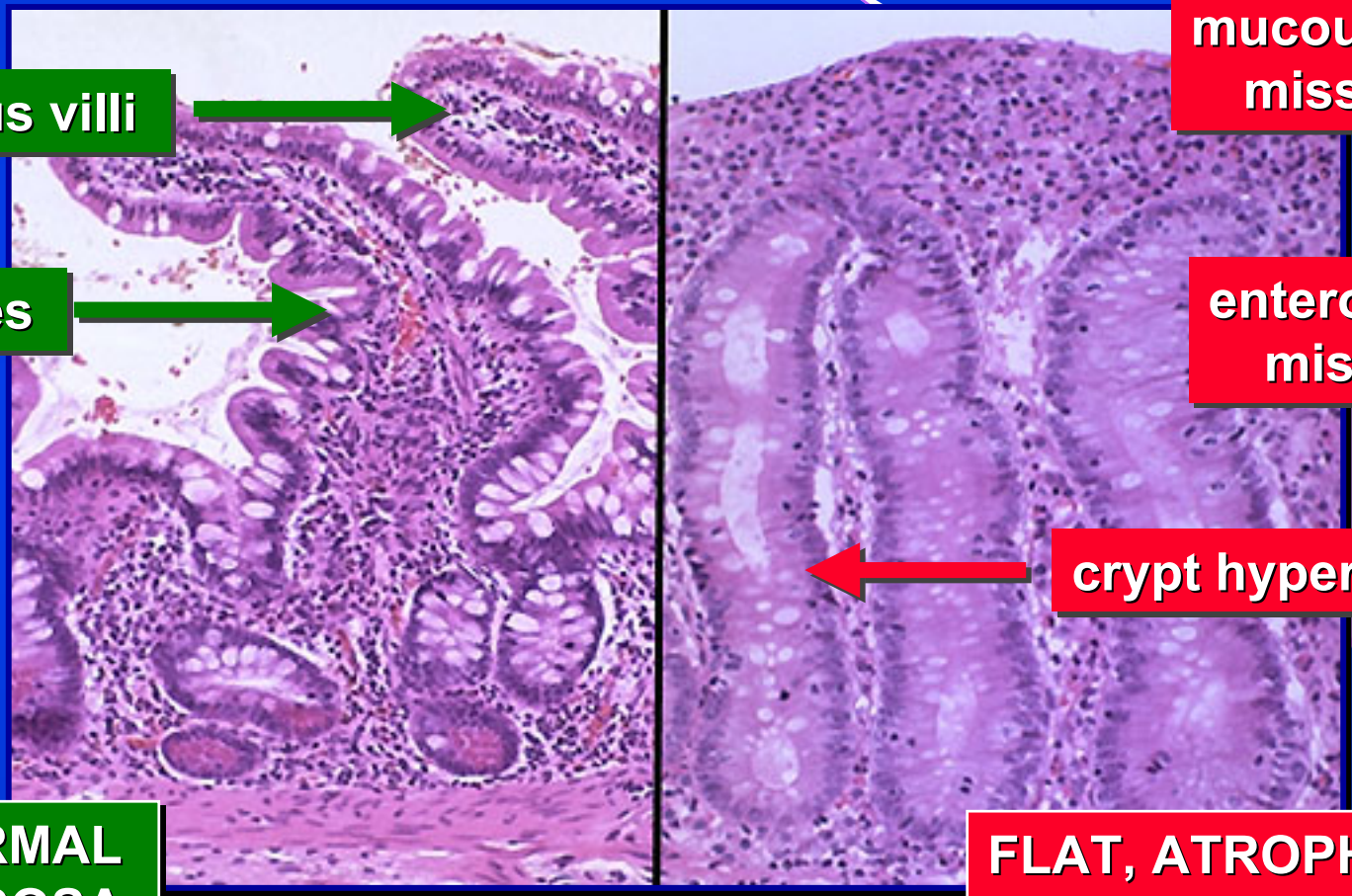
- LIFELONG DISEASE, PERMANENT GLUTEN INTOLERANCE
- GENETIC FACTOR IS HLA-B8, HLA-DR3 and HLADQ2
- GLIADIN PEPTIDES ARE THE TRIGGERING FACTOR
- IMMUNOLOGICAL RESPONSE, AUTOIMMUNE CHARACTER
- DAMAGE TO THE MUCOSA OF THE SMALL INTESTINE
- MANIFESTATIONS OF MALABSORPTION SYNDROME
- THE ANSWER TO A GLUTEN-FREE DIET

ICEBERG HYPOTHESIS OF COELIAC INCIDENCE



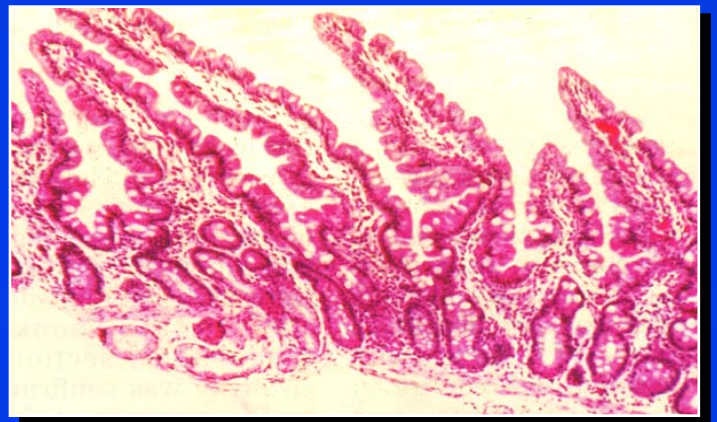

Acc: Mowat AT, Lancet 2003, 361: 1290
GLIADINE
WHEAT
33-mer PEPTIDE
MESENCHYMAL CELLS
TISSUE TRANSGLUTAMINASE M.CELLS
tTG
GASTRIC, PANCREATIC PEPTIDASES, PROLYL-ENDOPEPTIDASES
DEAMIDATION
19-mer PEPTIDE
Zonulin
COELIAC VILLUS ATROPHY
MHC class II
CD4+ T-CELL
TH2-CELL
TH1-CELL
INFLAMMATION
B-CELL
IL 4,5,10
IL2, γIFN, TNF
ANTIBODIES
COELIAC CRYPT HYPERTROPHY

COELIAC DIAGNOSIS - HISTOLOGY



GLUTEN FREE DIET (GFD) - SCREENING & DIAGNOSTICS

NORMAL MUCOSA



NEGATIVE ANTIBODIES

HEALTHY SUBJECT
TREATED COELIAC

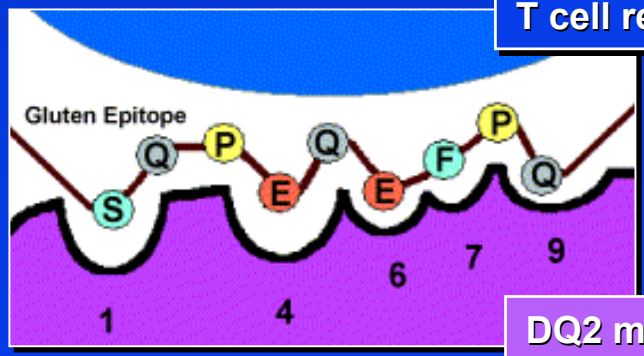
TREATED COELIAC ?
OTHER AUTOIMMUNITY ?

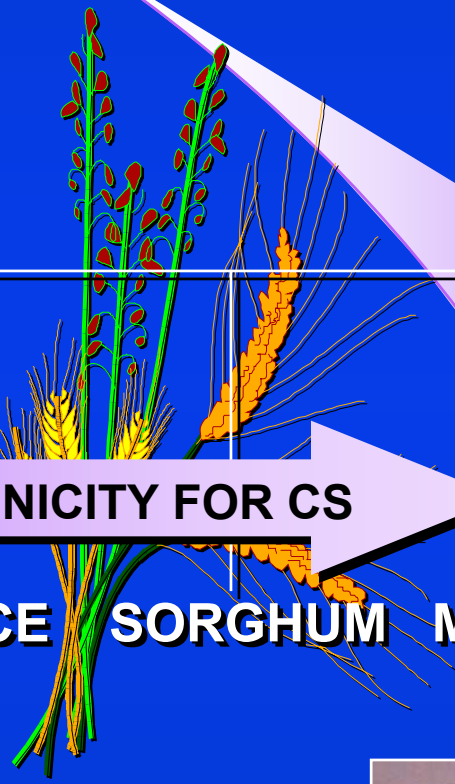
TOTAL ATROPHY

FLORID COELIAC
UNTREATED

POSITIVE ANTIBODIES

GLUTEN FREE DIET - CEREALS





DECREASING PATOGENICITY FOR CS

WHEAT RYE BARLEY OATS RICE SORGHUM MILLET MAIZE

GLIADIN SECALIN HORDEIN AVENIN ZEIN

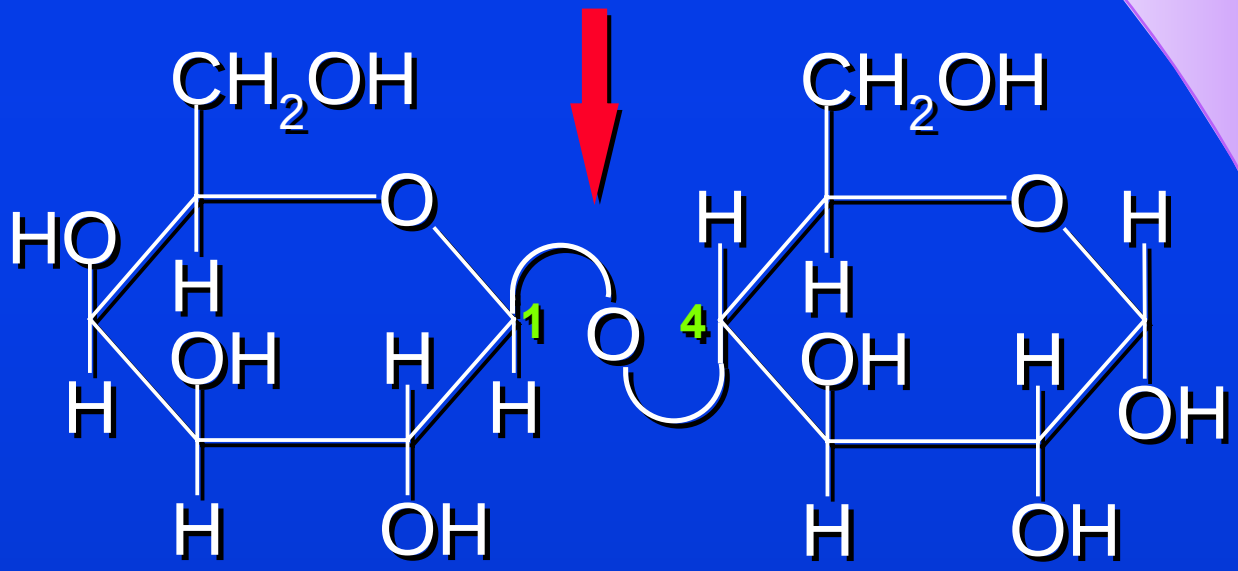
DECREASING TEST SENSITIVITY

MALABSORPTION-MALDIGESCE-MALASIMILATION
GIT FUNCTIONS
EXAMINATION METHODS
COELIAC DISEASE - GLUTEN ENTEROPATHY
LACTOSE INTOLERANCE
PANCREATIC INSUFFICIENCY
SMALL INTESTINAL BACTERIAL OVERGROWTH

LACTASE INTOLERANCE

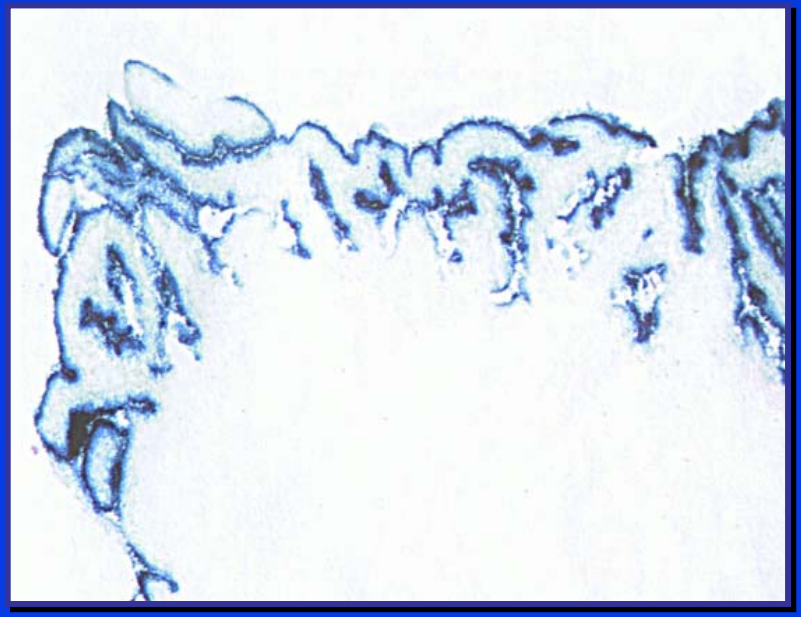
DISACCHARIDE - LACTOSE IS HYDROLYZED INTESTINAL DISACCHARIDASE

LACTASE



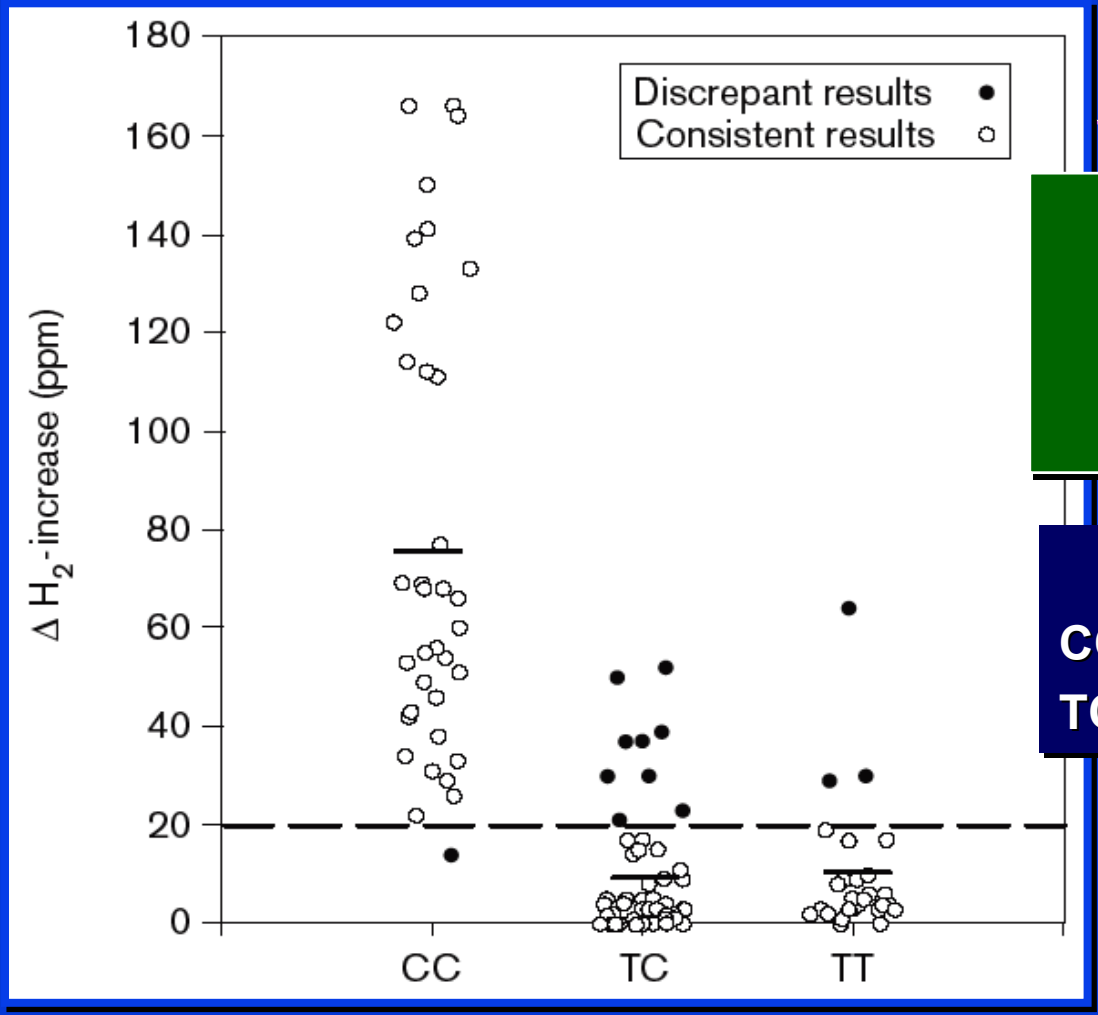
β-D-galactose **α-D-glucose**

DIAGNOSIS OF LACTASE INTOLERANCE



HISTOCHEMICAL EVIDENCE
ACTIVITIES OF LACTASE IN THE BRUSH BORDER OF THE ENTEROCYTE
IMMUNOHISTOCHEMICAL DETECTION

MODERN RAPID TEST
DETECTION OF LACTASE ACTIVITY
CHROMOGENIC METHOD



PCR DETECTION
13910 T/C POLYMORPHISM
CORRELATION
WITH H2-BREATH TEST

GENOTYPES 13910
CC - LACTOSE INTOLERANCE
TC, TT - LACTOSE TOLERANCE

Hogenauer C, Hammer H.F., Mellitzer K. et al.: Evaluation of a new DNA test compared with the lactose hydrogen breath test for the diagnosis of lactase non-persistence. Eur.J.Gastro.Hepato. 2005, 17:371–376

LACTOSE ^{13}C / ^{2}H - GLUCOSE TEST

ORAL ADMINISTRATION OF SUGARS

25 g ^{13}C-lactose + 0.5 g 6,6-$^{2}H_2$-glucose

BLOOD COLLECTION - 45, 60, 75 min

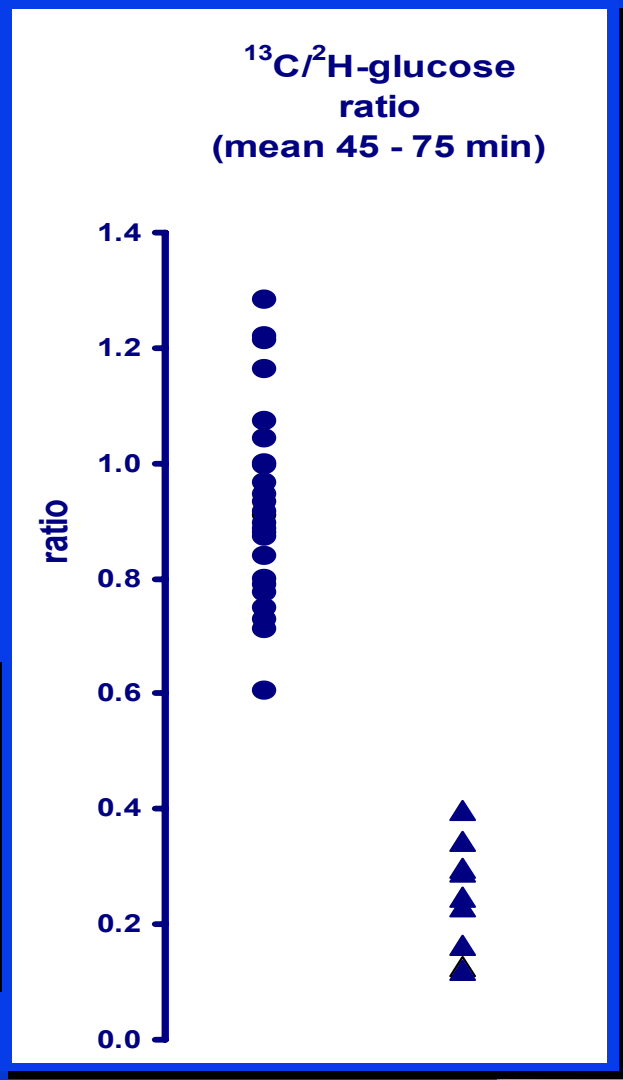
DETERMINATION IN PLASMA

^{13}C-glucose enrichment - GC/IRMS

$^{2}H_2$-glucose enrichment - GC/MS

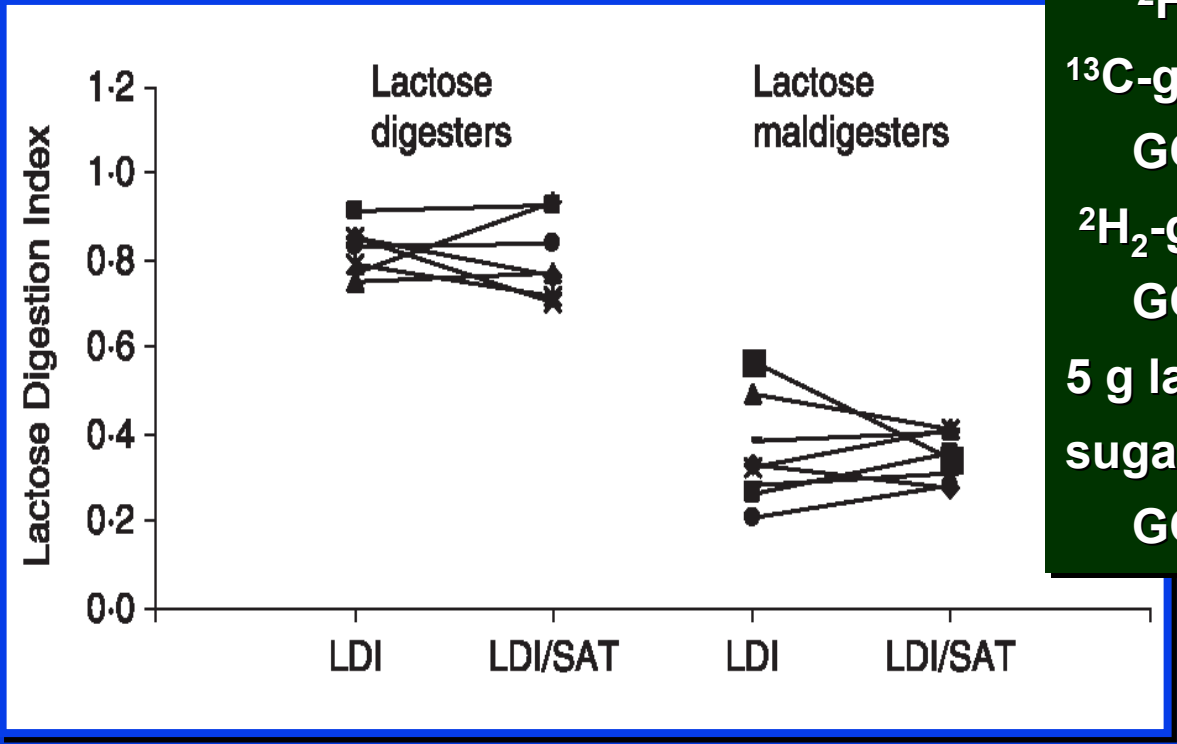
CALCULATION OF THE LDI INDEX

(Lactose Digestion Index)



New trends in laboratory methods for intestinal digestion and absorption
Frans Stellaard, University Medical Center Groningen, The Netherlands
VIIth Czech National Congress of Clinical Biochemistry, Olomouc, 11-13.9.2005

COMBINED LDI - SAT INDEX



LDI: 25 g ^{13}C-lactose + 0.5 g 6,6-$^{2}H_2$-glucose

^{13}C-glucose enrichment

GC/C/IRMS;

$^{2}H_2$-glucose enrichment

GC/MSSAT:

5 g lactulose, 1 g L-rhamnose;

sugar level in urine

GC

Combined LDI/SAT test to evaluate intestinal lactose digestion and mucosa permeability. Koetse HA, Klaassen D, … Stellaard F. Eur J Clin Invest. 2006; 36(10): 730 - 736

MALABSORPTION-MALDIGESCE-MALASIMILATION
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SMALL INTESTINAL BACTERIAL OVERGROWTH

EXOCRINE PANCREATIC INSUFFICIENCY - PEI

Causes of exocrine pancreatic insufficiency - EPI
Chronic pancreatitis - the main cause of EPI
Cystic fibrosis
Pancreatic duct obstruction (tumor, lithiasis)
Celiac disease, Crohn's disease, Schwachman-Diamond syndrome
Postoperative status (gastrectomy, gastric bypass, TS operation)
Inactivation of pancreatic enzymes (low pH), Zollinger-Ellison syndrome
Diabetes mellitus

Alkaade S, Vareedayah AA. A primer on exocrine pancreatic insufficiency, fat malabsorption, and fatty acid abnormalities. Am J Manag Care. 2017; 23: S203-S209.

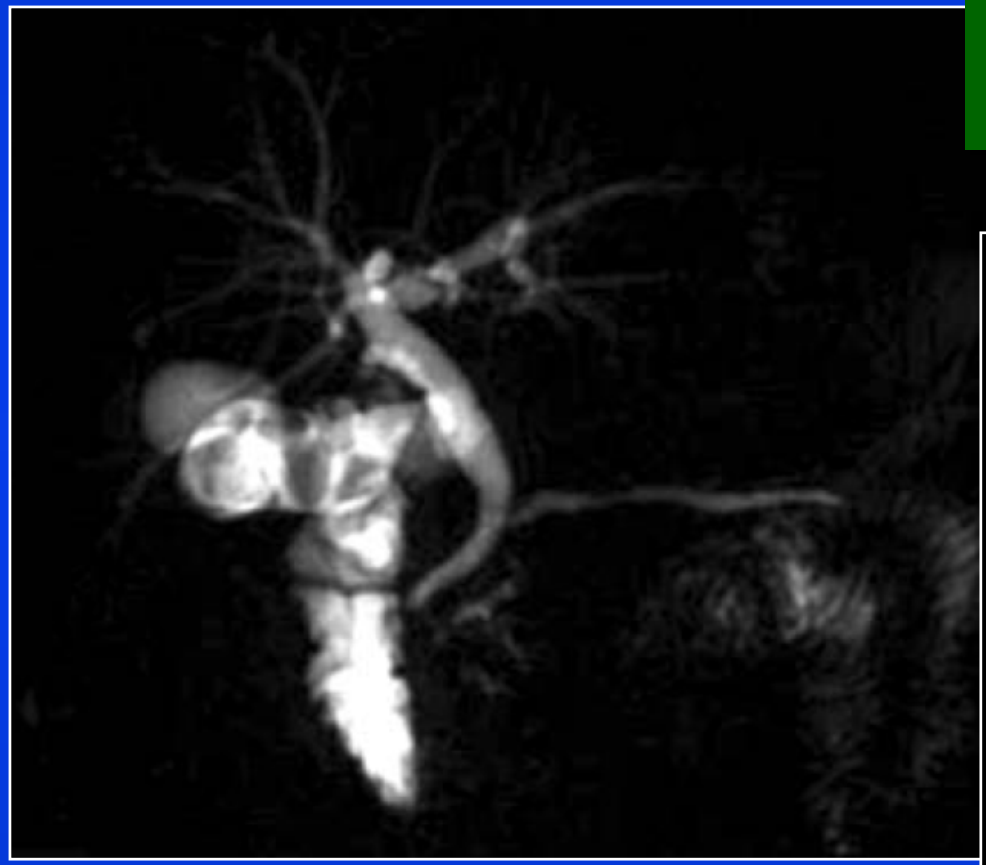
CHRONIC PANCREATITIS DIAGNOSTICS

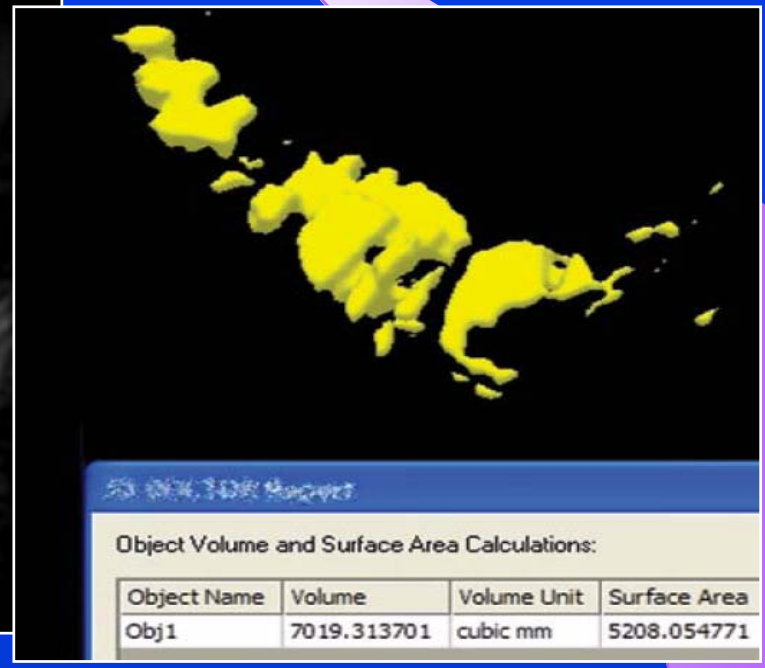
Diagnostic imaging for mild chronic pancreatitis
Endoscopic ultrasound (EUS)
Endoscopic retrograde cholangiopancreatography (ERCP)
Magnetic resonance cholangiopancreatography (MRCP)

	EUS	ERCP	MRCP
SENSITIVITY	56% (40-72)	72% (58-86)	54% (44-64)
SPECIFICITY	81% (68-95)	75% (60-90)	78% (72-83)

Diagnosis of mild chronic pancreatitis (Cambridge classification)
Sai JK, Suyama M, Kubokawa Y, Watanabe S.
World J Gastroenterol 2008 February 28; 14(8): 1218 - 1221
Researchers Test the Value of ERPC for the Detection of Early Chronic Pancreatitis
Frei R. - Gastroent.Endoscop.News 2007, 58, 02

MRCP - SECRETION VOLUME MATHEMATICAL PROCEDURE PANCREATIC FUNCTION TEST





Object Volume and Surface Area Calculations:

Object Name	Volume	Volume Unit	Surface Area
Obj1	7019.313701	cubic mm	5208.054771

Quantitative MRCP assessment of pancreatic exocrine reserve and its correlation with faecal elastase-1 in patients with chronic pancreatitis
Manfredi R. el al. Radiol med. - DOI 10.1007/s11547-011-0774-6

EXOCRINE PANCREAS INSUFFICIENCY GUIDELINES

Which test is clinically indicated
for diagnosing exocrine pancreatic insufficiency (PEI) ?
Statement 3-6. In a clinical setting, **a non-invasive pancreatic function test (PFT) should be performed.** The **FE-1 test** is feasible and widely available and is therefore most frequently used in this setting, while the **13C mixed triglyceride** breath test (13C-MTG-BT) offers an alternative. The s-MRCP test may also be used as an indicator of PEI but provides only semiquantitative data.
(Grade 1B, agreement)

Is a pancreatic function test required for the diagnosis of CP?
Statement 3-7. A function test is required for the diagnosis of CP.
(Grade 2B, strong agreement)

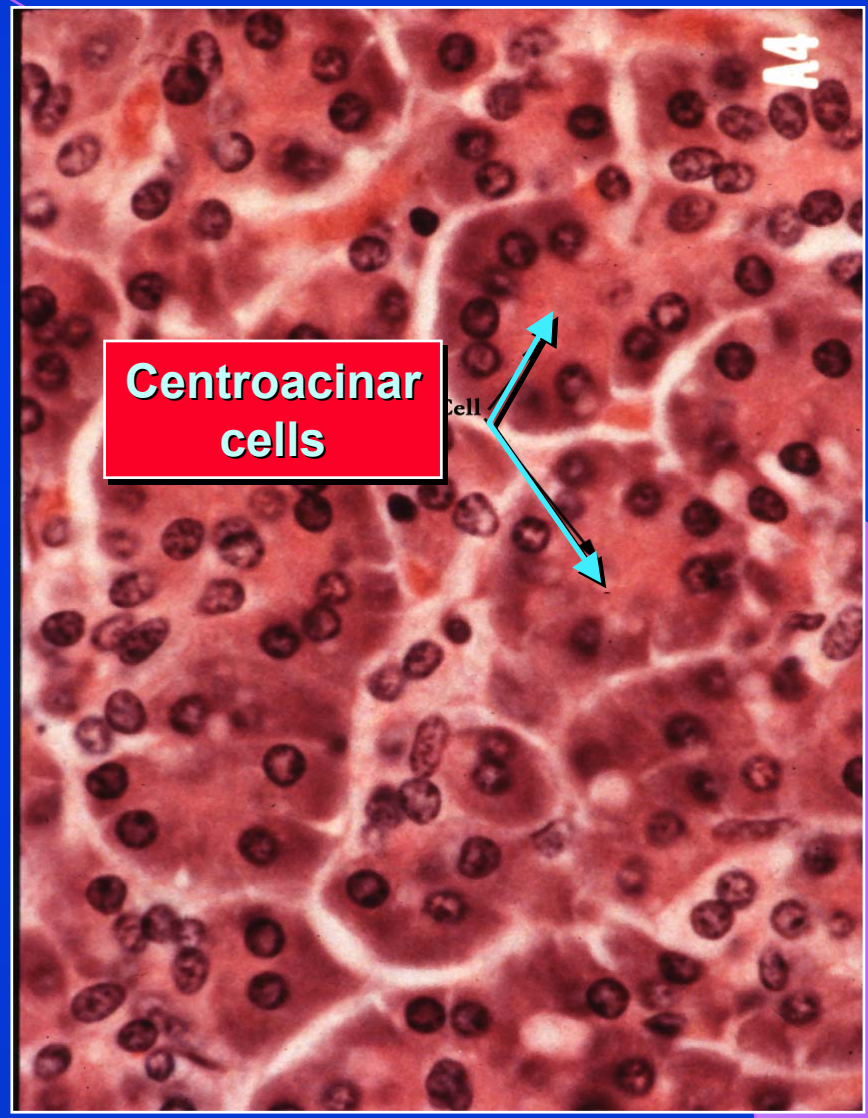
Should a pancreatic function test be performed at the time of diagnosis?
Statement 3-8. Every patient with a new diagnosis of CP
should be screened for PEI. (Grade 1A, strong agreement)

Löhr M. - HaPanEU/UEG Working Group, UEG Journal, 2017, Vol. 5(2) 153–199 United European Gastroenterology evidence based guidelines for the diagnosis and therapy of chronic pancreatitis (HaPanEU)

EXOCRINE PANCREAS
SECRETORY ACINS

PANCREATIC ENZYMES
pH OPTIMUM

α - AMYLASE	6.5 -7.2
LIPASE	7 - 9
PHOSPHOLIPASE A_2	5.8 -7.7
PHOSPHOLIPASE B	6
ELASTASE	8.6
TRYPSIN	7 - 9
CHYMOTRYPSIN	7.5 - 8.5
CARBOXYPEPTIDASE	7.5 - 7.8
CALICREINS	7 - 8



EXOCRINE PANCRAETIC FUNCTION TESTS

PERORAL ADMINISTRATION

INDIRECT STIMULATION

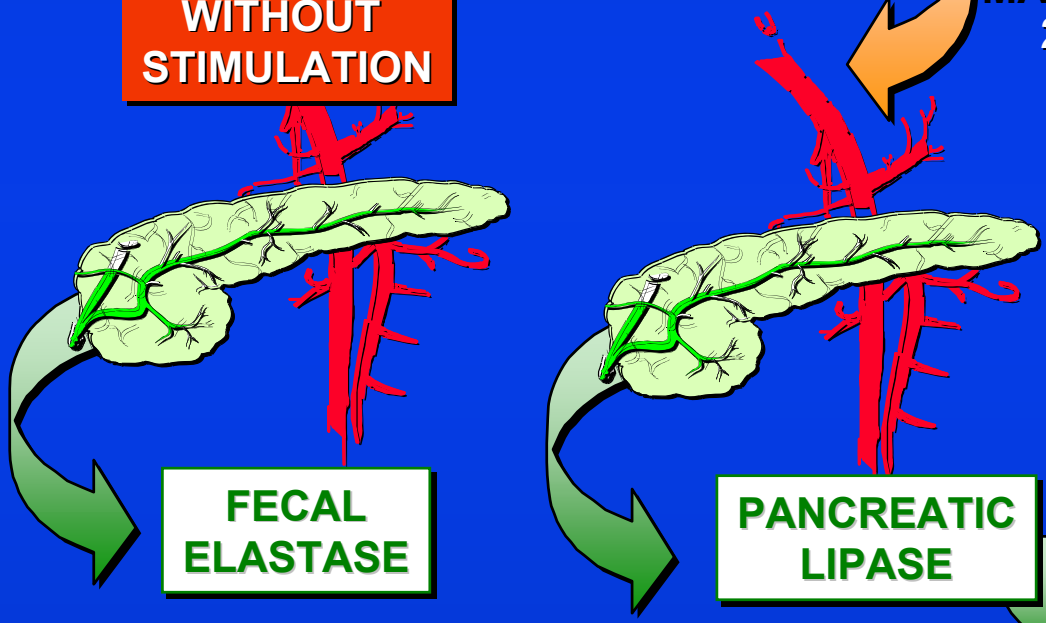
STIMULATING MEAL

SUBSTRATE

SUBSTITUTION THERAPY

MAIZE BREAD
20g FAT

WITHOUT STIMULATION



^{13}C-MARKER ANALYSIS

250mg ^{13}C-MTG

FECAL ELASTASE

PANCREATIC LIPASE

DRUG LIPASE

SECRETORY CAPACITY GRADING CHP

DIGESTIVE FUNCTION OF (LIPID) DIGESTION

AGA CLININAL PRACTICE – UPDATE 2023

✓ BEST PRACTICE RECOMMENDATION 4:

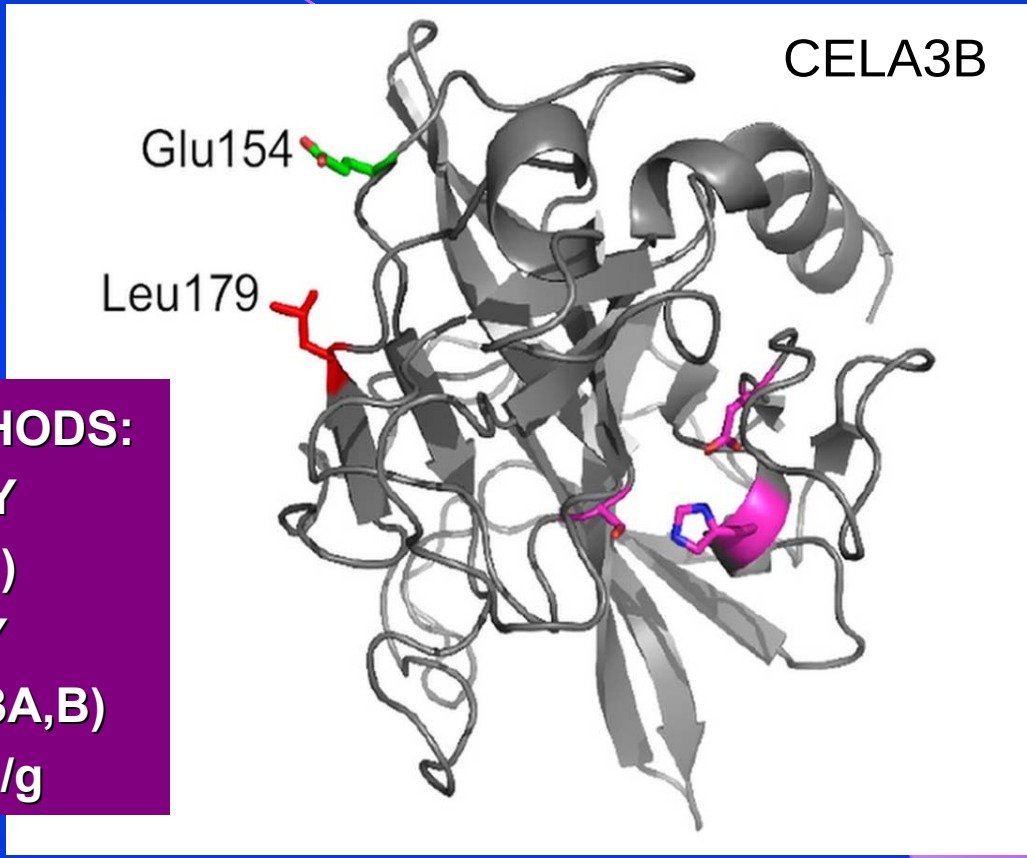
The stool elastase test is the most appropriate initial test and must be performed on a semi-solid or solid stool sample. A stool elastase level <100 mg/g stool provides good evidence of EPI and levels of 100–200 mg/g are indeterminate for EPI.

✓ BEST PRACTICE RECOMMENDATION 5:

Stool elastase testing can be performed during pancreatic enzyme replacement therapy

Whitcomb DC, Buchner AM, Forsmark CE. AGA Clinical Practice Update on the Epidemiology , Evaluation, and Management of Exocrine Pancreatic Insufficiency: Expert Review. Gastroenterology. 2023 Sep 20

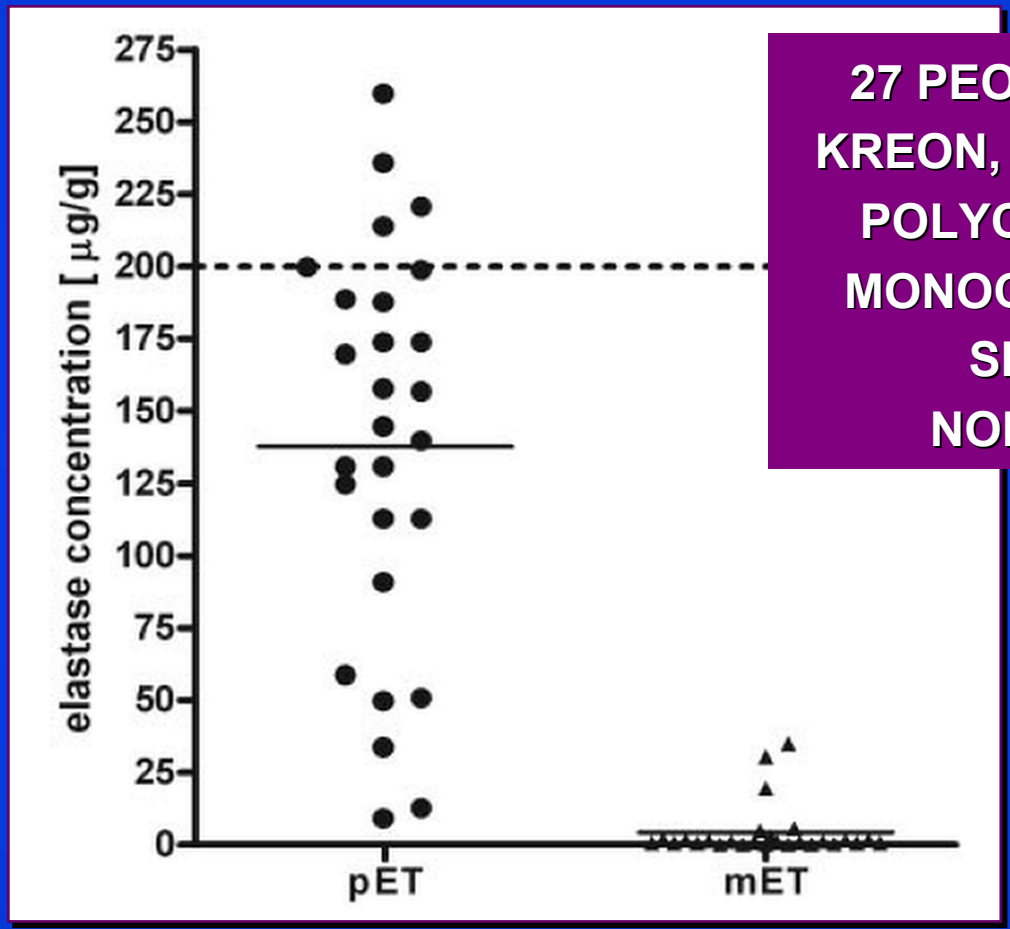
PANCREATIC ELASTASE IN THE STOOL



ELISA - TWO DIFFERENT METHODS:
MONOCLONAL ANTIBODY
AGAINST ELA1 (ENTIRE1)
POLYCLONAL ANTIBODY
AGAINST ELA3A,3B (ENTIRE3A,B)
NORMAL VALUES > 200 μg/g

Tóth AZ, Szabó A, Hegyi E, Hegyi P, Sahin-Tóth M. Detection of human elastase isoforms by the ScheBo Pancreatic Elastase 1 Test. Am J Physiol Gastrointest Liver Physiol. 2017; 312(6): G606-G614

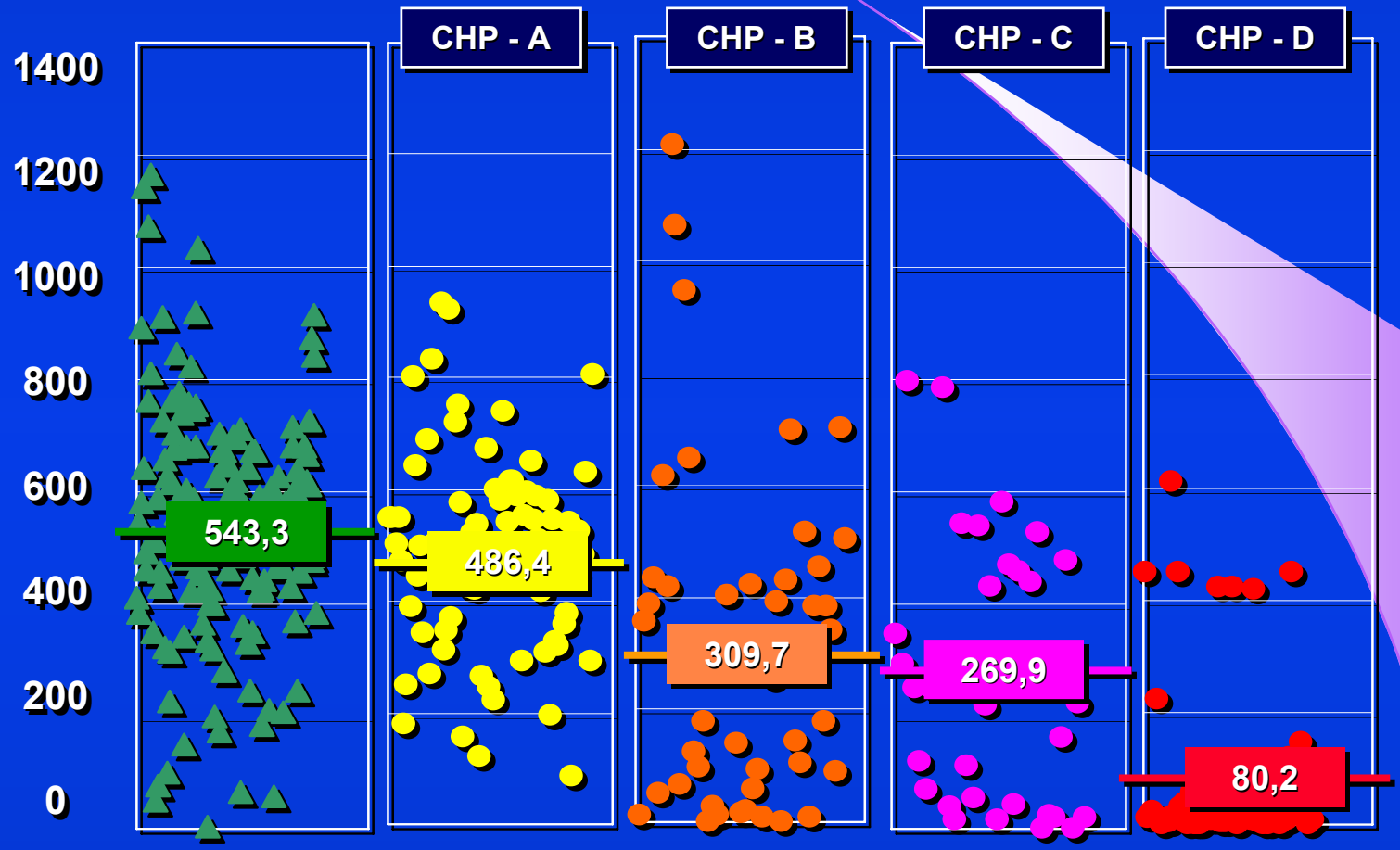
PANCREATIC ELASTASE IN STOOL – FELA x PELA



27 PEOPLE WITH CYSTIC FIBROSIS
KREON, LIPASE, 5,000-10,000 U/kg/day
POLYCLONAL - pET - 138 ± 69 µg/g
MONOCLONAL - mET - 4.3 ± 9.0 µg/g
SIGNIFICANCE p < 0.0001
NORMAL VALUES > 200 µg/g

Schneider A, Funk B, Caspary W, Stein J.: Monoclonal versus Polyclonal ELISA for Assessment of Fecal Elastase Concentration: Pitfalls of a New Assay. Clinical Chemistry 2005: 51/6, 1052-1054

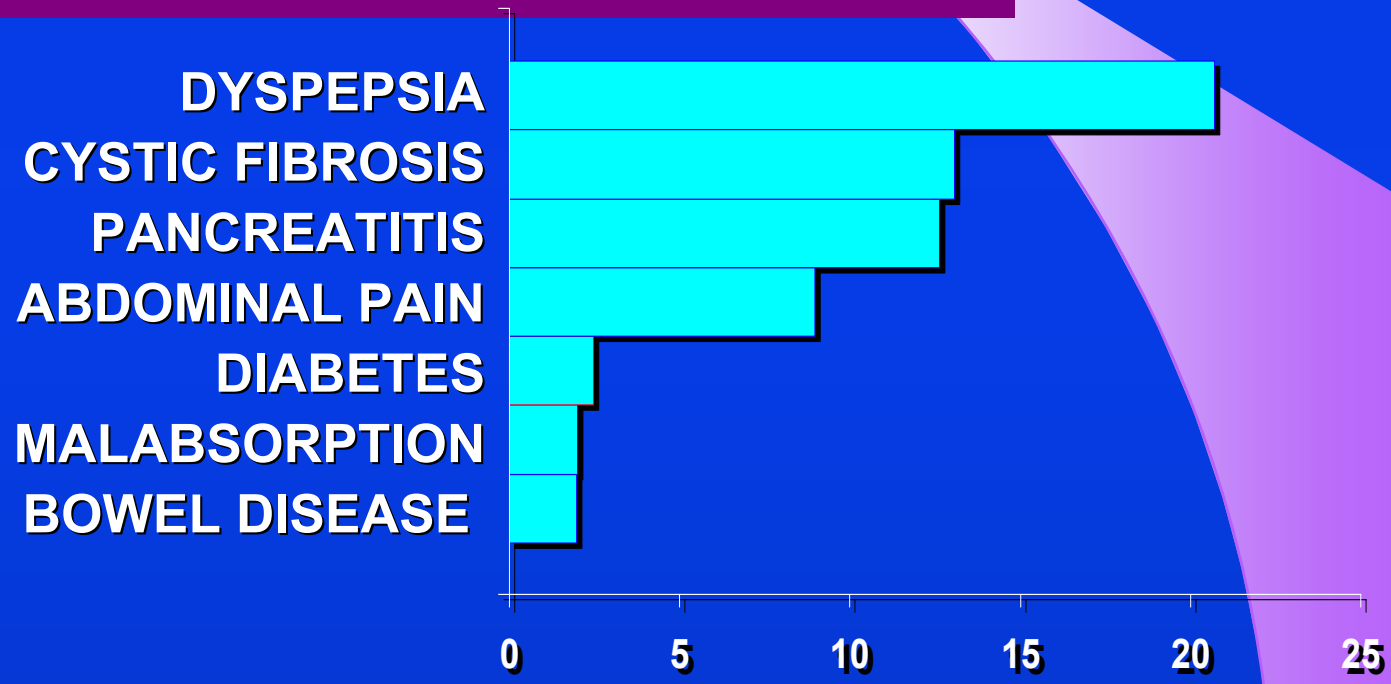
DETERMINATION OF ELASTASE-I IN THE STOOL AT CHP



368 STOOL SAMPLES ScheboTech ELISA ELASTASE
1155 CONTROLS (NON-CHP), 213 CHP CLASSIFIED A-B-C-D

PANCREATIC ELASTASE 1 - ELISA - VFN PRAGUE

9968 STOOL SAMPLES EXAMINED,
FROM CHILDREN 4068 - 40.8%
1381 FELA TEST VALUES < 100 - 13.5%
1897 FELA TEST VALUES < 200 - 18.8%



Kocna P.: Laboratorní diagnostika exokrinní funkce pankreatu. Klin. Biochem. Metab. 2020, 28 (49)/4; 150-160

^{13}C - BREATH TESTS FOR PANCREATIC FUNCTION

SUBSTRATE SELECTION

- ^{13}C - TRIOLEIN
- ^{13}C - HIOLEIN
- ^{13}C - MIXED TRIGLYCERIDE
- ^{13}C - CHOLESTERYL OCTANOATE
- ^{13}C - TRIPALMITIN
- ^{13}C - TRIOCTANOIN
- ^{13}C - STARCH
- ^{13}C - BzTyrAla

STEATORHEA > 11 - 14 g/day
INTRALUMINAL LIPOLYSIS
SPECIFICITY FOR PANCREATIC LIPASE
LIPASE OUTPUT < 90 kU/hr
PANCREAT. CHOLESTEROL ESTERASE
STEATORHEA > 11 g/day
FAT MALABSORPTION
TISSUE DAMAGE, FIBROSIS > 30%
AMYLASE SECRETION < 10%
CORRELATION with the PABA test

^{13}C- MIXED TRIGLYCERIDE - ^{13}C-MTG BREATH TEST

meal = bread + fat

peroral adminitration

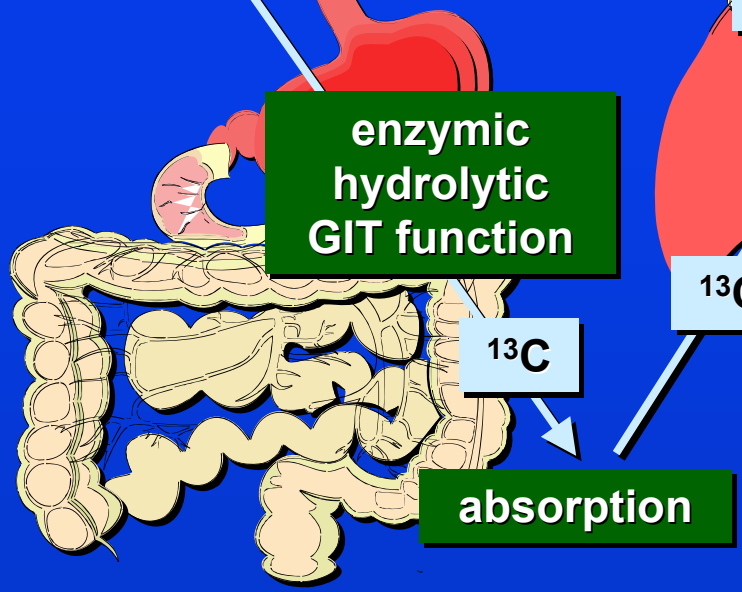
^{13}C-substrate

measurement of ^{13}C/^{12}C ratio

CO_2 excretion

$^{13}CO_2$

elimination



enzymic hydrolytic GIT function

^{13}C

^{13}C

absorption

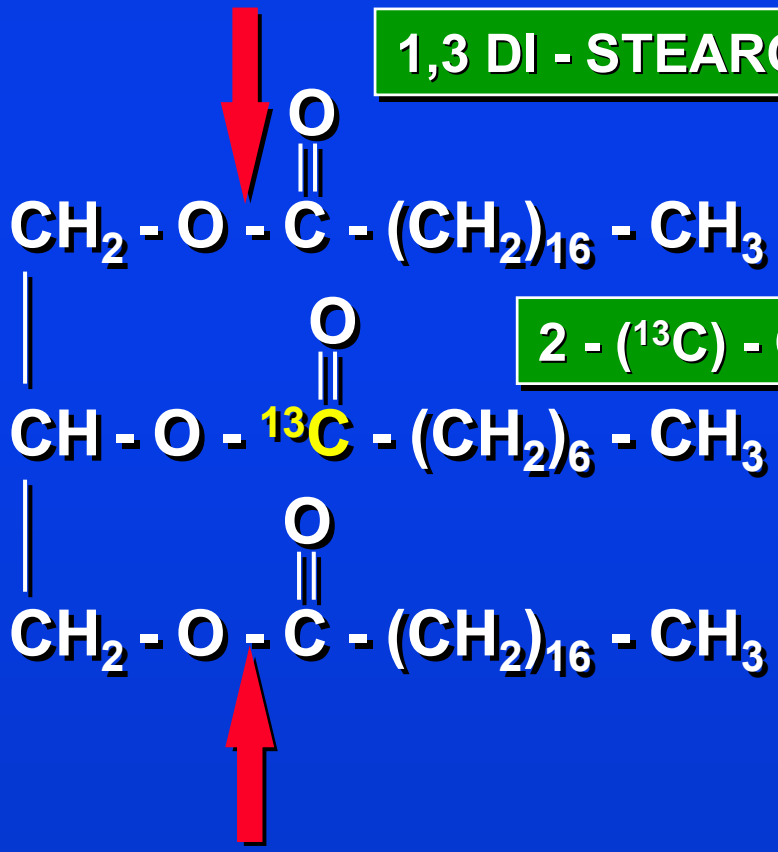
cummulative CO_2 output

cPDR

^{13}C- MIXED TRIGLYCERIDE - ^{13}C-MTG BREATH TEST

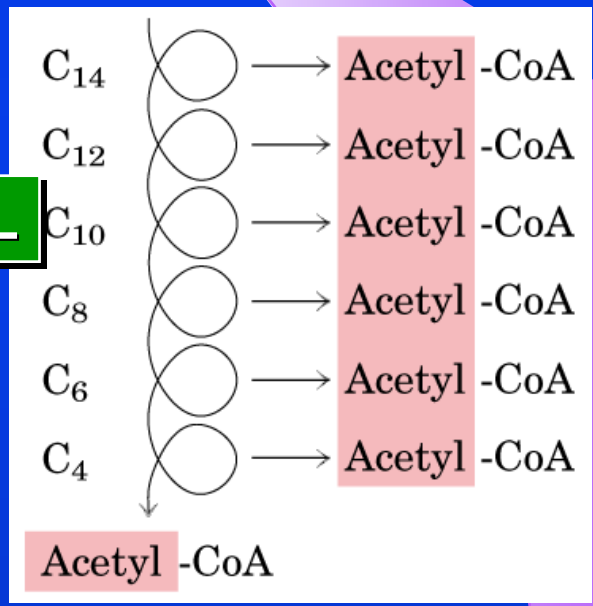
PANCREATIC LIPASE

1,3 DI - STEAROYL



2 - (^{13}C) - OCTANOYL

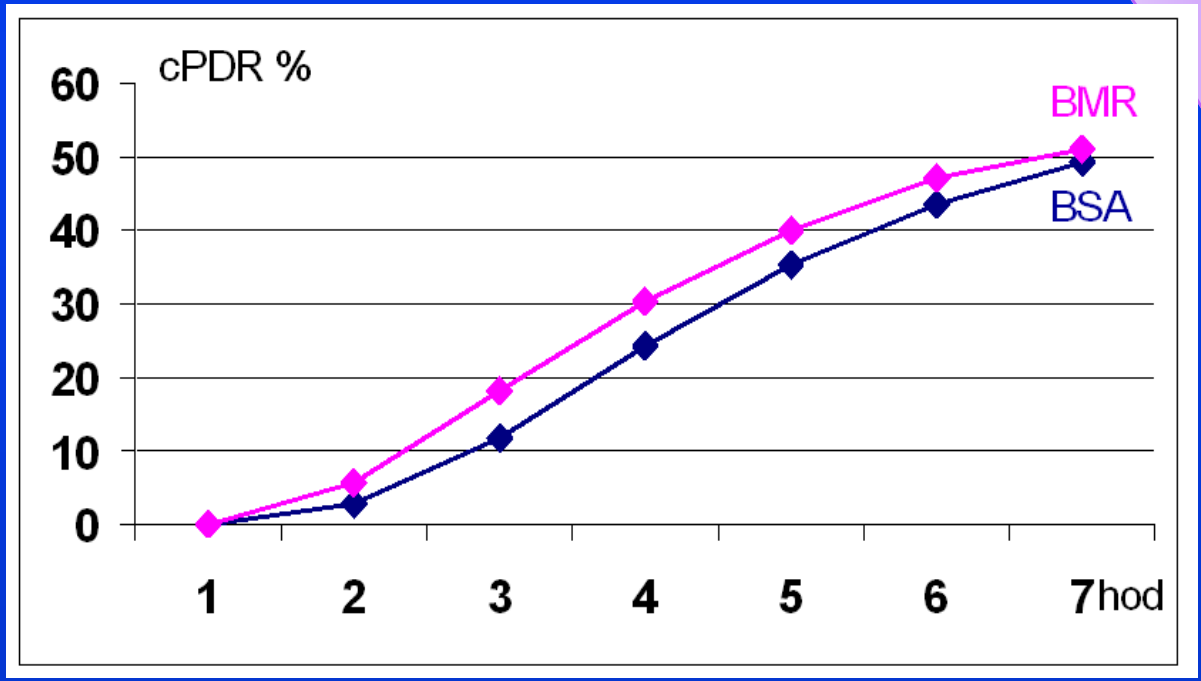
BREATH $^{13}CO_2$



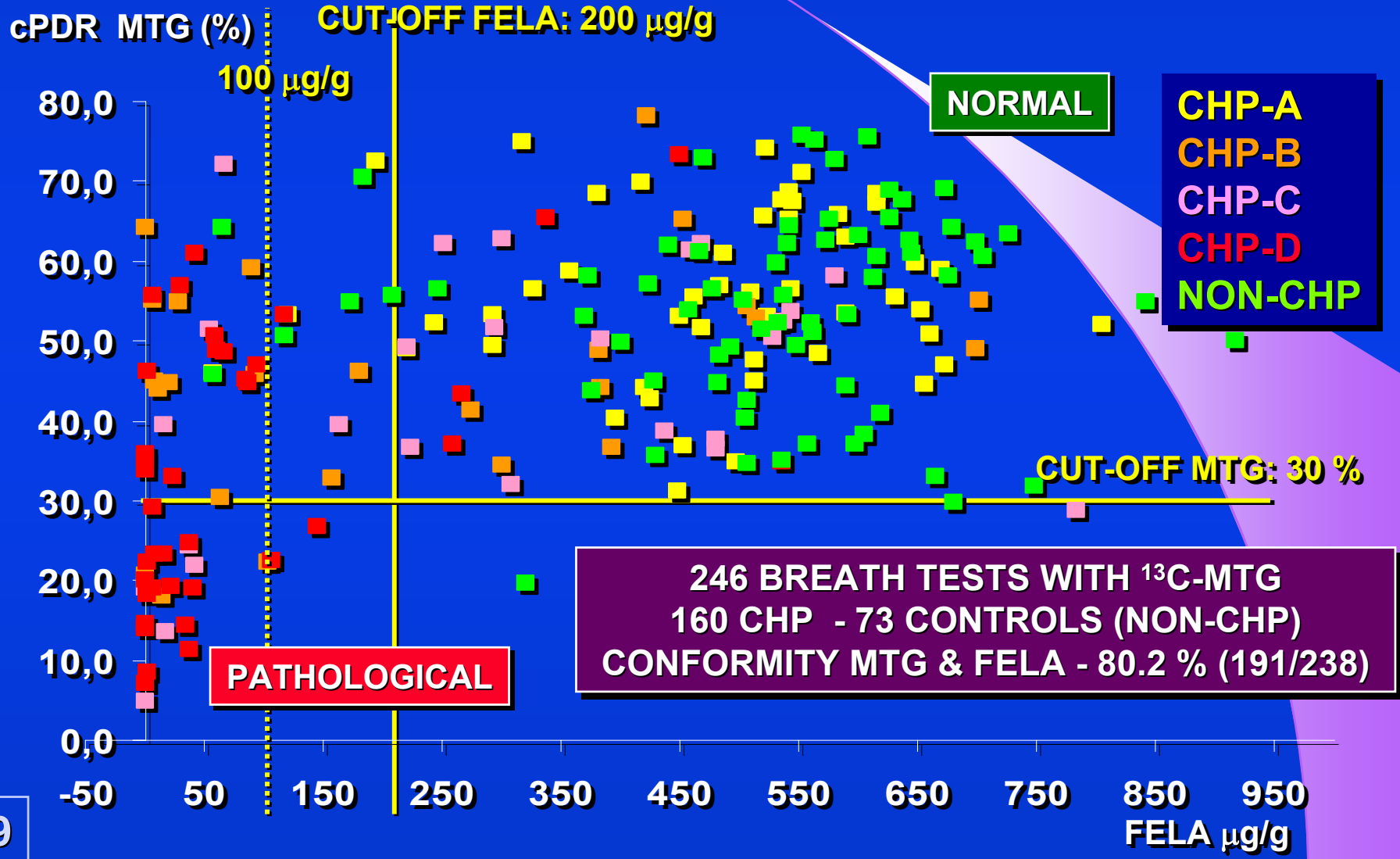
HEPATAL β - OXIDATION

^{13}C- MIXED TRIGLYCERIDE - ^{13}C-MTG BREATH TEST

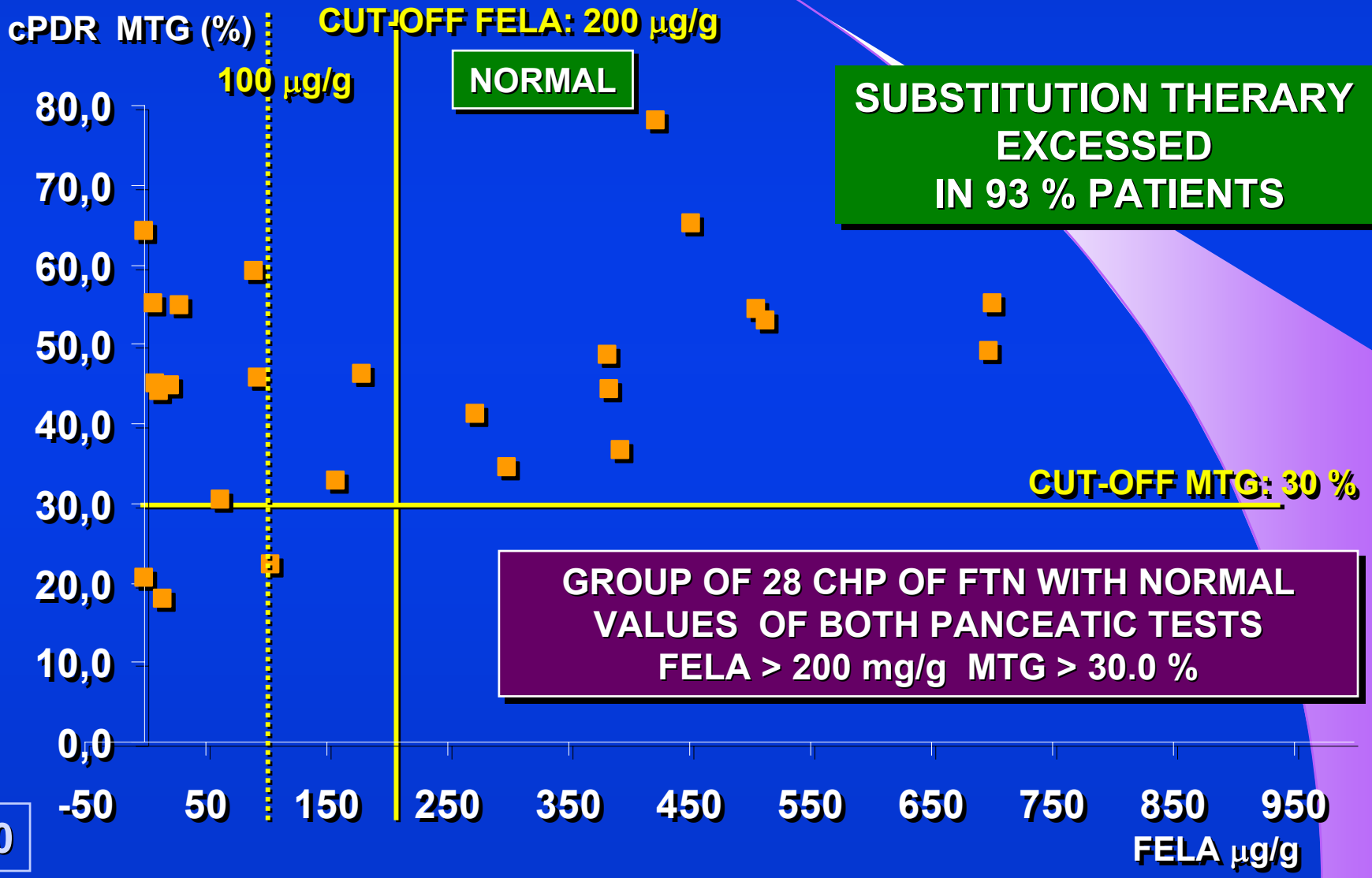
^{13}C-MTG test - in our arrangement we serve
100 g of gluten-free bread with
250 mg of mixed triglyceride in 20 g of margarine
breath samples at time T_0 to T_{360} minutes after 60 minutes
$cPDR_{6h}$ pathological below 30% (BMR)

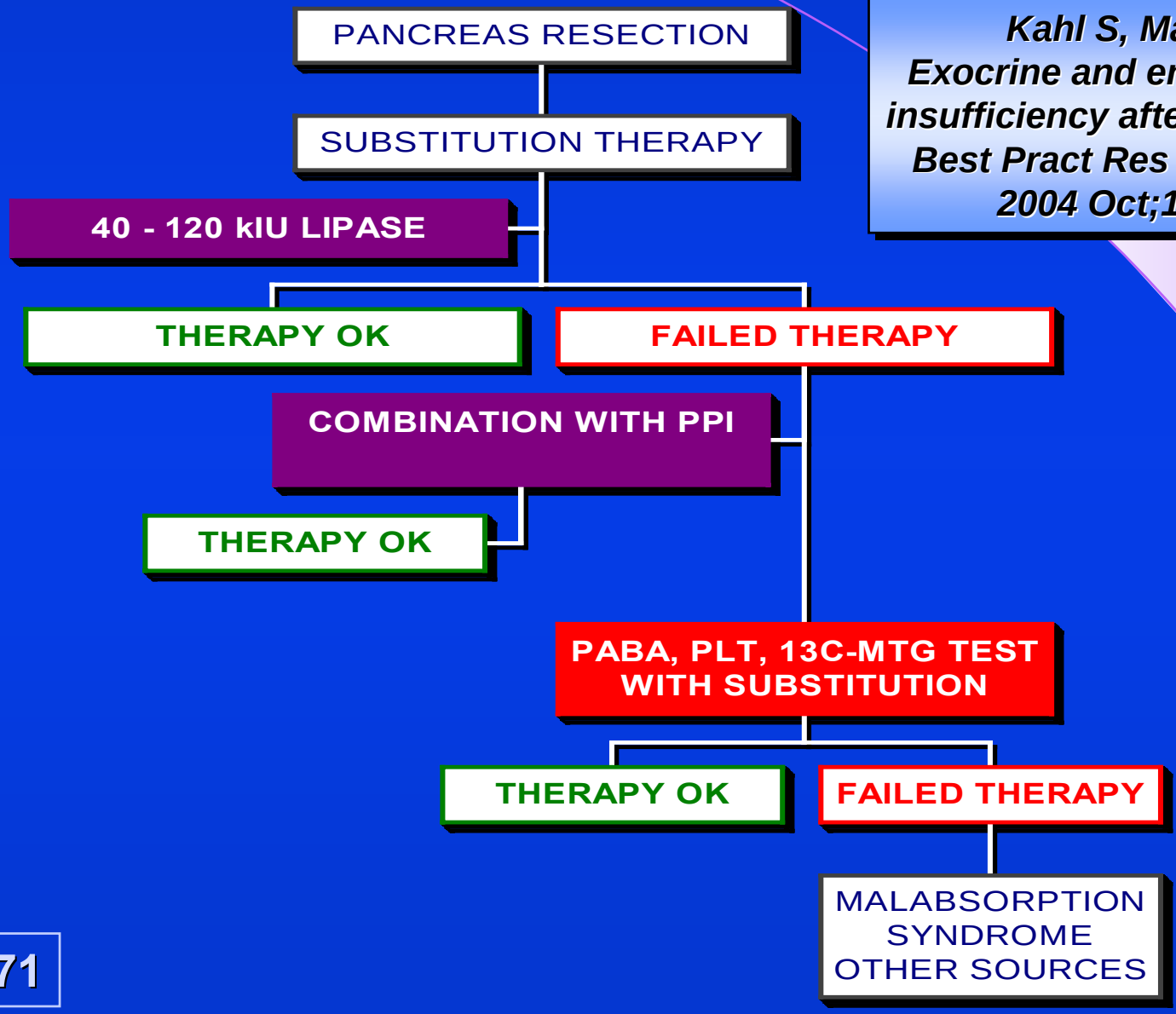


^{13}C-MTG - BREATH TEST & FELA IN STOOL



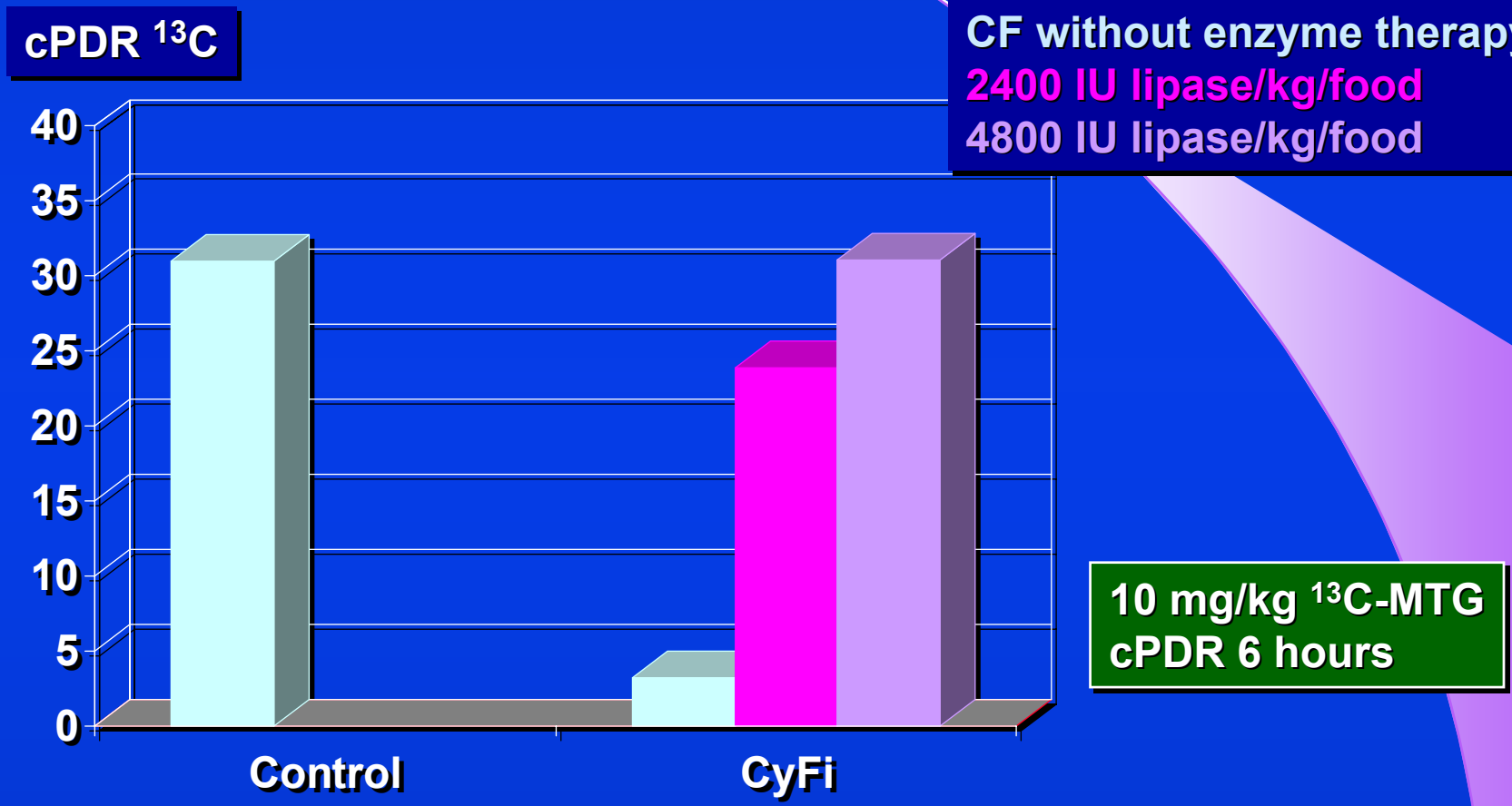
^{13}C-MTG - BREATH TEST & FELA IN STOOL





Kahl S, Malfertheiner P. Exocrine and endocrine pancreatic insufficiency after pancreatic surgery. Best Pract Res Clin Gastroenterol. 2004 Oct;18(5):947-55.

^{13}C- MIXED TRIGLYCERIDE - ^{13}C-MTG BREATH TEST



13Carbon mixed triglyceride breath test
and pancreatic enzyme supplementation in cystic fibrosis
Amarri S. et al.: Archives of Disease in Childhood 1997; 76: 349–351

EXOCRINE PANCRAETIC FUNCTION TESTS

^{13}C-breath test provides a comprehensive assessment of MTG digestive process - digestion of lipids

Values of cPDR ^{13}C-MTG test are cummulative data, which includes as well the pancreatic function, as substitution therapy

Cut-off value of cPDR ^{13}C-MTG test, lower limit of normals established by mathematical approximation is 30%

To assess exocrine pancreatic function testing is an appropriate combination of ^{13}C -MTG breath test and determination of faecal elastase 1, affecting various aspects

Economical benefit of exocrine pancreatic function tests is in possibility to exclude pancreatic substitution therapy in more than three-fourths patients with suspected pancreatic insufficiency.

MALABSORPTION-MALDIGESCE-MALASIMILATION
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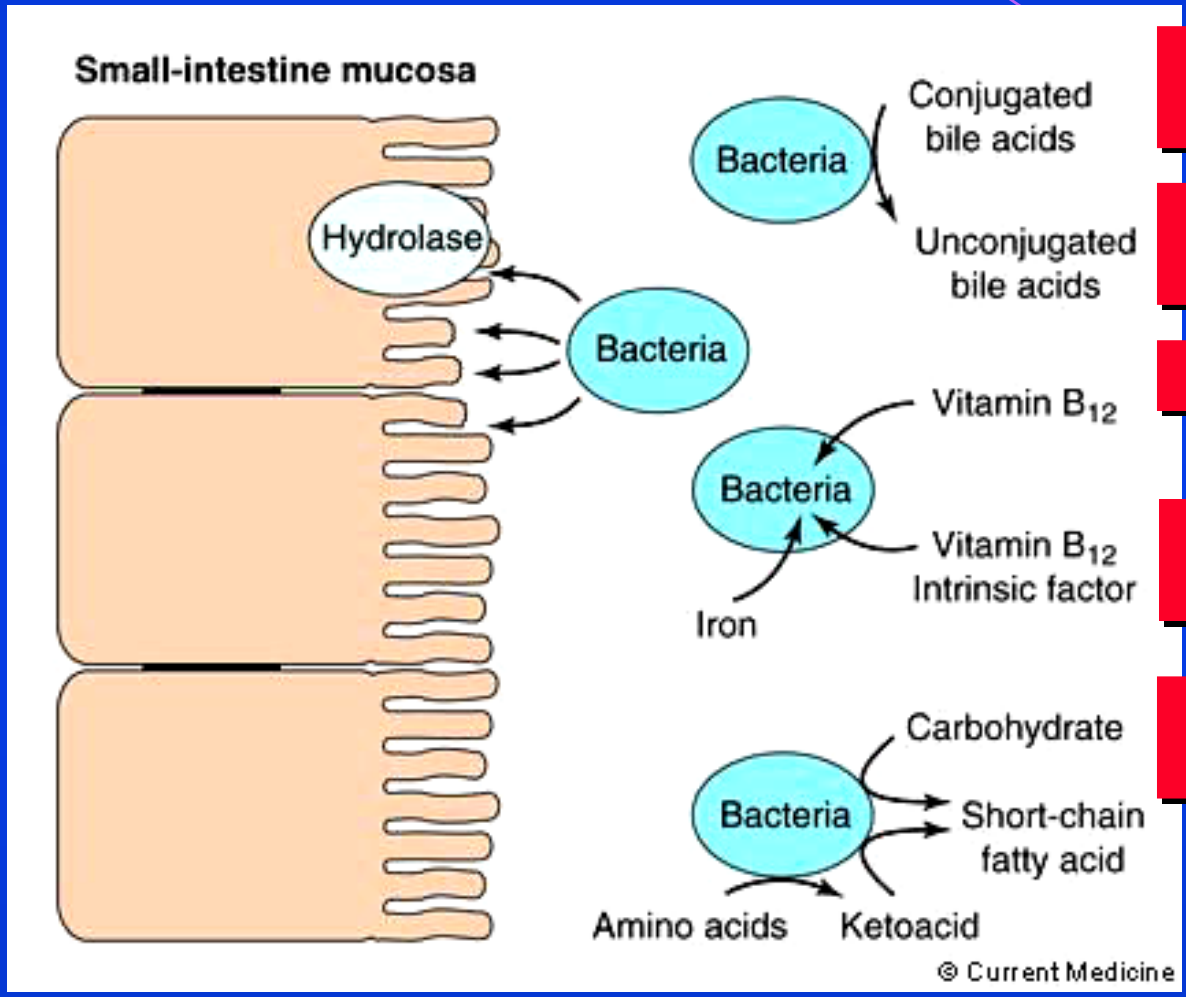
SMALL INTESTINAL BACTERIAL OVERGROWTH



BILE ACIDS DECONJUGATION

HYDROLASE ACTIVITY REDUCTION

ENTEROCYTES DAMAGE

B_{12} AND IRON CONSUMPTION

PRODUCTION OF SHORT FATTY ACIDS

http://az.gastroatlas.com/index.aspx

http://www1.lf1.cuni.cz/~kocna/glab/glency1.htm

http://gelab.zde.cz

Skupina metodik funkce tenkého střeva, malabsorpce, screening céliakie, střevní propustnost, bakteriální přerůstání

- Anti-endomysium IgA
- Anti-gliadin IgA, IgG
- Anti-tTG IgA, IgG
- Anti-gliadin, tTG ve stolici
- A-vitamin zátěžový test
- ß-karoten
- ß-karoten zátěžový test
- Céliakie - screening
- Dechový test s laktózou
- Dechový test s xylózou
- Laktózový toleranční test
- Laktulózo/mannitolový test
- Xylózový toleranční test

Intro

Abecední přehled metodik

Miniencyklopedie laboratorních metod v gastroenterologii

GastroLab

Protilátky ke tkáňové transglutamináze (atTG) - IgA a IgG

Tkáňová transglutamináza má přímý vztah k patogenezi onemocnění a byla popsána jako vlastní, chemický substrát endomysia. Tkáňová transglutamináza - (isoenzym transglutaminasa II, TG2 - EC 2.3.2.13, je transferázou, systémový název je protein-glutamin:amin-g-glutamyltransferasa. Je to Ca2+ dependentní enzym, katalyzující deaminaci glutaminu na glutamát, rovněž vede ke vzniku intramolekulární vazby glutaminu na další primární amin, např. lysin a vede k agregaci glutaminových peptidů. Stanovení protilátek ke tkáňové transglutamináze (atTG) má proto rovněž velmi vysokou diagnostickou efektivitu, podobně jako EmA protilátky (senzitivita 87-97% a specificita 88-98%). Stanovení atTG je prováděno klasickou metodou ELISA, což je pro rutinní diagnostiku technika dostupnější než immunofluorescenční průkaz EmA.

Protilátky atTG lze na rozdíl od EmA stanovovat ve třídě IgA i IgG, což má význam pro nemocné se selektivním deficitem IgA. Metoda byla popsána s použitím morčecího antigenu, který je použit ve většině starších souprav, novější soupravy již používají jako antigen tkáňovou transglutaminázu izolovanou z lidských buněk, z lidských erytrocytů, nebo rekombinantní tTG izolovanou na E.coli. Referenční hodnoty se liší u jednotlivých souprav, většinou je pro IgA protilátky uváděna horní hranice normy 10 - 15 IU/l, některé soupravy definují i tzv. gray-zone v rozsahu 10 - 20 IU/l. Stanovení protilátek atTG s lidským, rekombinantním antigenem vykazuje nižší falešnou pozitivitu než metody s morčecím antigenem. Nejnovější studie porovnávají protilátky třídy IgA a IgG, a POCT metodiky stanovení atTG protilátek. Stanovení protilátek atTG ve třídě IgA je doporučeno jako základní screeningový test pro diagnostiku celiakie. Pro screening byla v roce 2011 použita i technologie detekce atTG ve slinách, a nejnovější studie popisují zcela nové technologie detekce protilátek elektrochemickými imunosenzory.

Reference

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