

Institute of Clinical Biochemistry and Laboratory Diagnostics
1st Faculty of Medicine, Charles University
General Faculty Hospital, Prague

**P.Kocna, Z.Vaničková, T.Krechler,
M.Lukáš, J.Doseděl, P.Kohout**

EXOCRINE PANCREATIC FUNCTION TEST ¹³C-MIXED TRIGLYCERIDE BREATH TEST



XXXVIII Meeting of EPC - Tampere - June 9, 2006

GOLD STANDARDS FOR EXOCRINE PANCREATIC FUNCTION

FAT 72 hr.

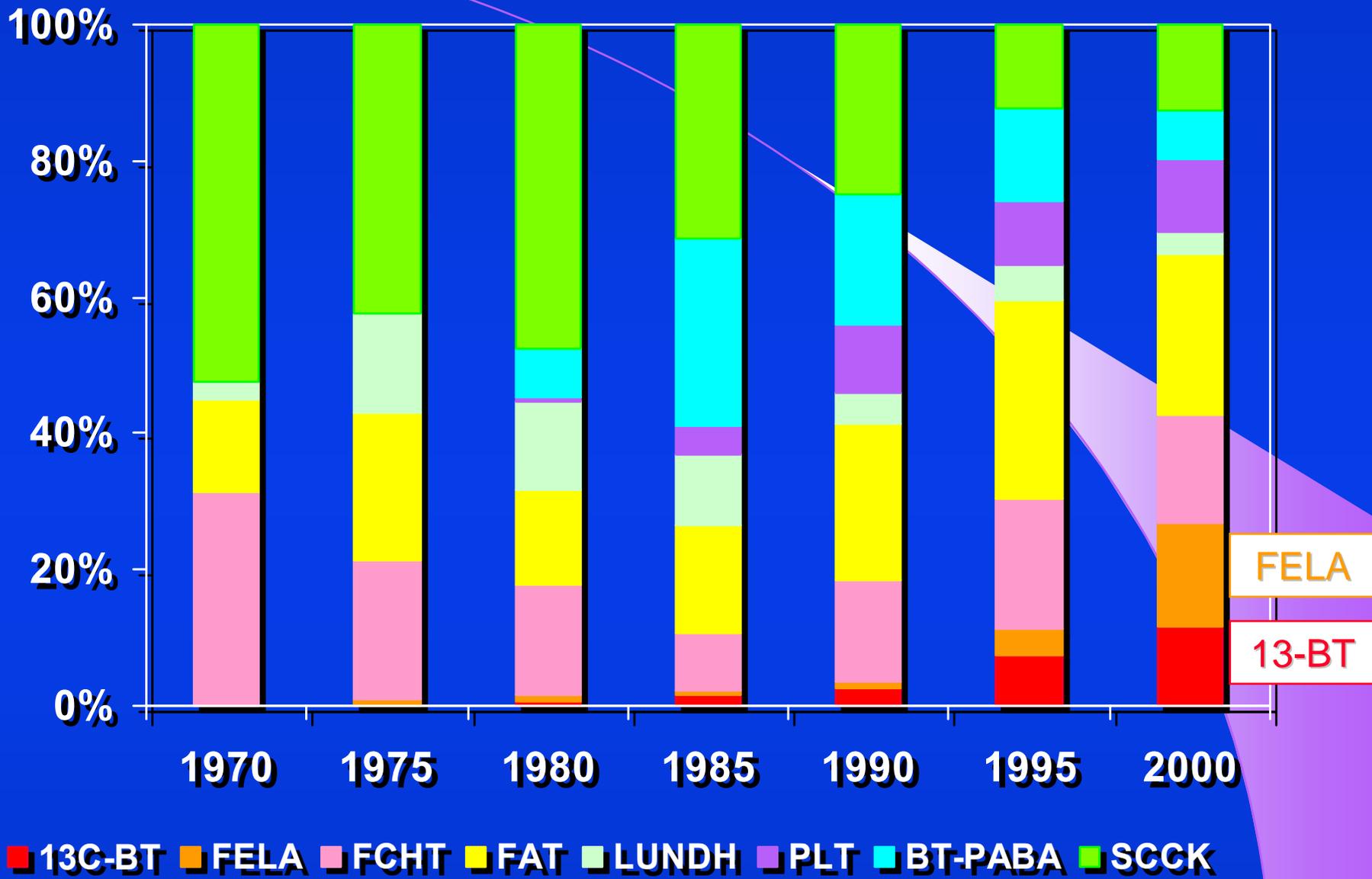
S-CCK TEST

QUANTITATIVE FECAL FAT
STOOL SAMPLING - 72hr.



WGO-OMGE Practice Guideline: Malabsorption
The gold standard still is the
SECRETIN-PANCREOZYMIN-TEST

<http://www.worldgastroenterology.org/?globalguidelines>



Motto:

*... if only we had
simple, cheap and reliable test
of exocrine pancreatic function ...*

EXOCRINE PANCREATIC FUNCTION TEST

WHEN - WHICH - WHY

We compared

laboratory and clinical aspects

FECAL ELASTASE - 1

¹³C-MIXED TRIGLYCERIDE BREATH TEST

Friday poster - P122

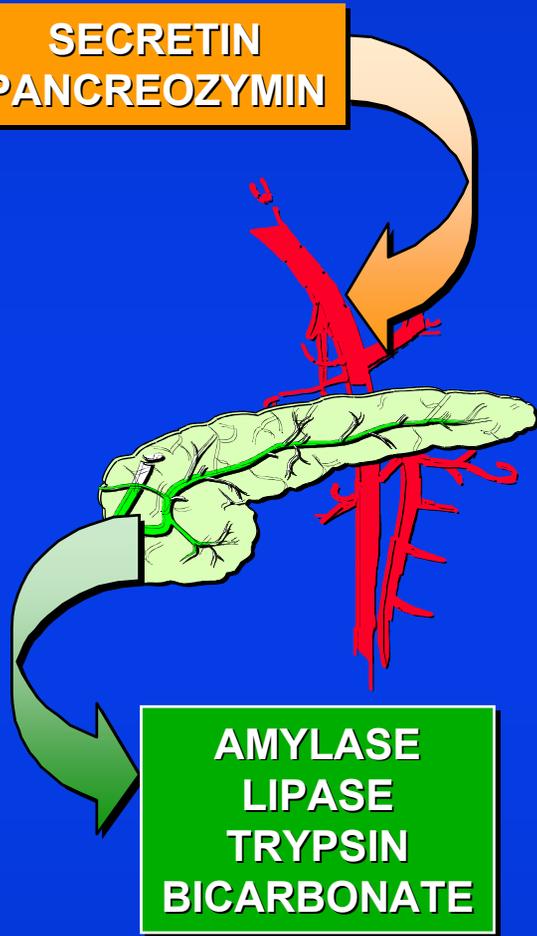
Faecal Elastase 1 Performance & Use in Diagnosis of Chronic Pancreatitis

DIRECT PZS TEST

FECAL ELASTASE

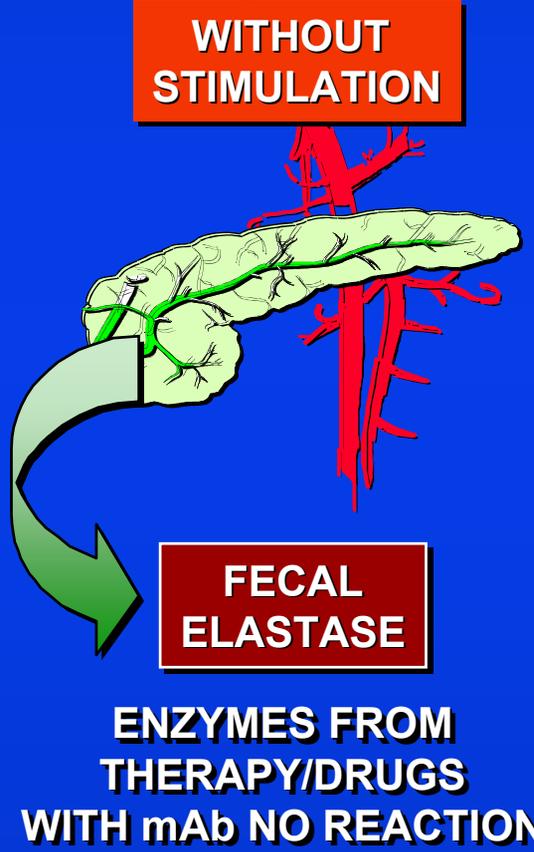
PABA, 13C-MTG

SECRETIN
PANCROZYMIN



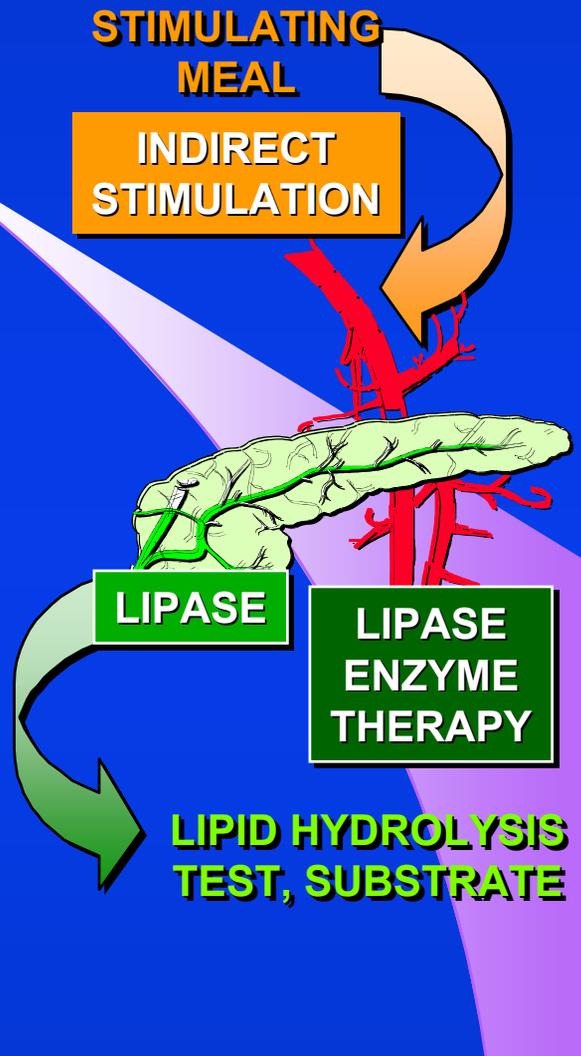
DIRECT RESPONSE
TO STIMULATION

WITHOUT
STIMULATION



SECRETORY CAPACITY
GRADING CHP

STIMULATING
MEAL
INDIRECT
STIMULATION



DIGESTIVE FUNCTION
OF (LIPID) DIGESTION

CHRONIC PANCREATITIS CLASSIFICATION BERN 2000 (Büchler, Malfertheiner)

CHP A - non-complicated, mild CHP, **with normal functions**

CHP B - clinical complications, **with normal functions**

CHP C = clinical manifestation of **functional insufficiency**

CHP C1 - steatorrhoea **or** DM

CHP C2 - steatorrhoea **and** DM

CHP C3 - steatorrhoea **and/or** DM + complications

This study 2001 - 2005, **184 patients** with susp. CHP

CHP group	NON	A	B	C1/2	C3
number	62	35	29	23	35
age (mean)	44.7	50.5	48.6	56.9	51.2
F : M	1 : 1	1 : 1	1 : 2	1 : 1	1 : 6

¹³C-MTG BREATH TEST - PROCEDURE

TEST PROCEDURE

TWO SAMPLE BAGS AFTER FASTING

STIMULATION MEAL

4 CRISP SLICES, MAIZE WITH FIBRES

(WITHOUT CHOLESTEROL, GLUTEN-FREE)

2 x 10g RAMA (VEGETABLE FAT WITHOUT MILK PROTEINS)

TEST SUBSTANCE ADMINISTRATION - 250mg ¹³C-MTG

STIRRED INTO VEGETABLE FAT

HOURLY BREATH-BAG SAMPLING (1 - 6 hr)

TEST ANALYTICS

DOB MEASUREMENT OF EACH SAMPLE $^{13}\text{CO}_2 : ^{12}\text{CO}_2 \text{ v } \text{‰}$

T_x SAMPLE AGAINST T₀ (DOB = Delta Over Baseline)

EVALUATION OF PANCREATIC INSUFFICIENCY

BSA CALCULATED (BASED ON WEIGHT, HEIGHT ONLY)

BMR AND CO₂ PRODUCTION CALCULATION

CUMMULATIVE RECOVERY FOR 6 HOURS CALCULATION

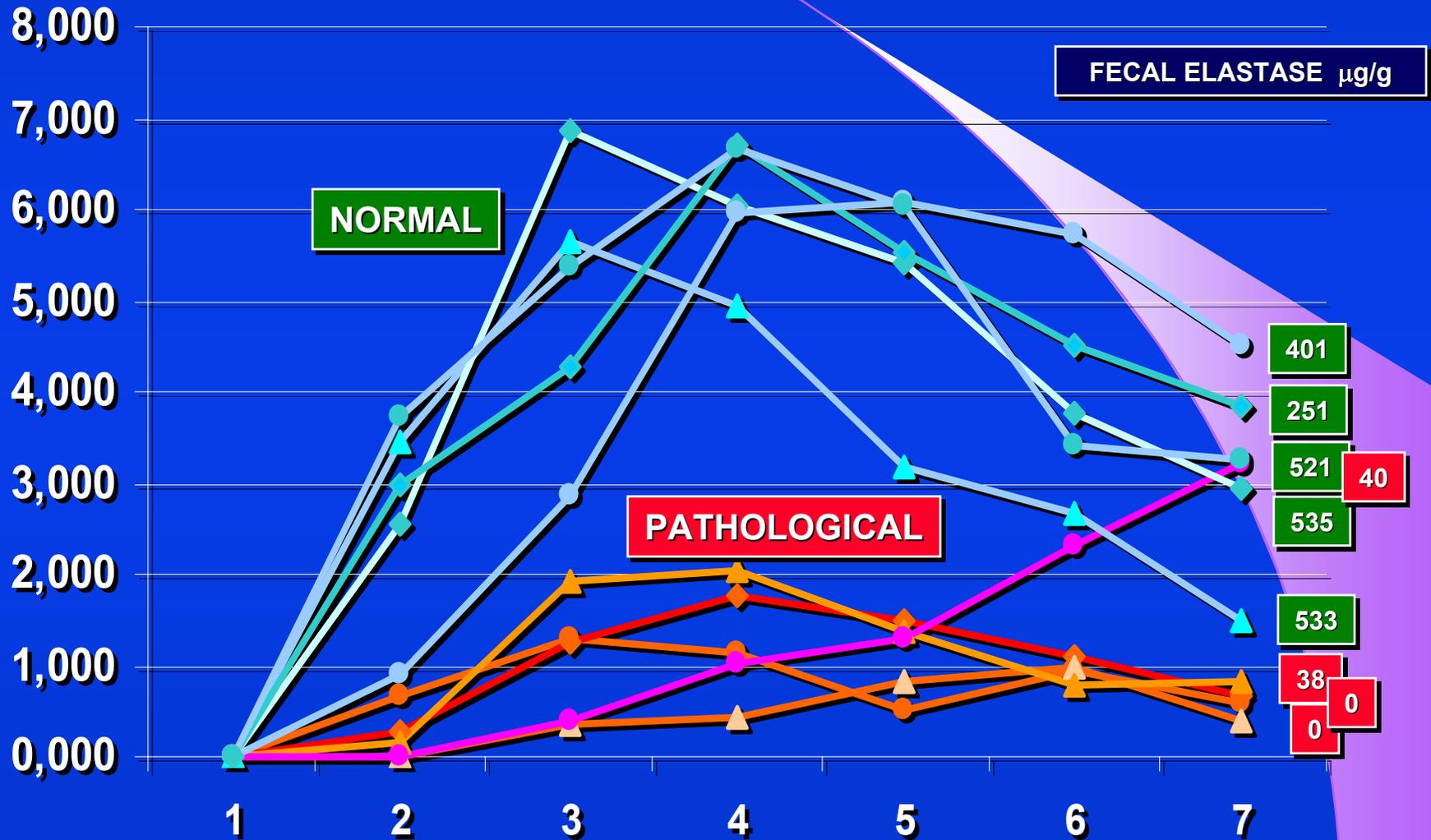
^{13}C -MTG BREATH TEST - IR ANALYSIS



**$^{13}\text{C}/^{12}\text{C}$ ratio analysis
NDIRS analytical units
Isomax 4000 (Canada)
HeliFAN plus (Germany)**

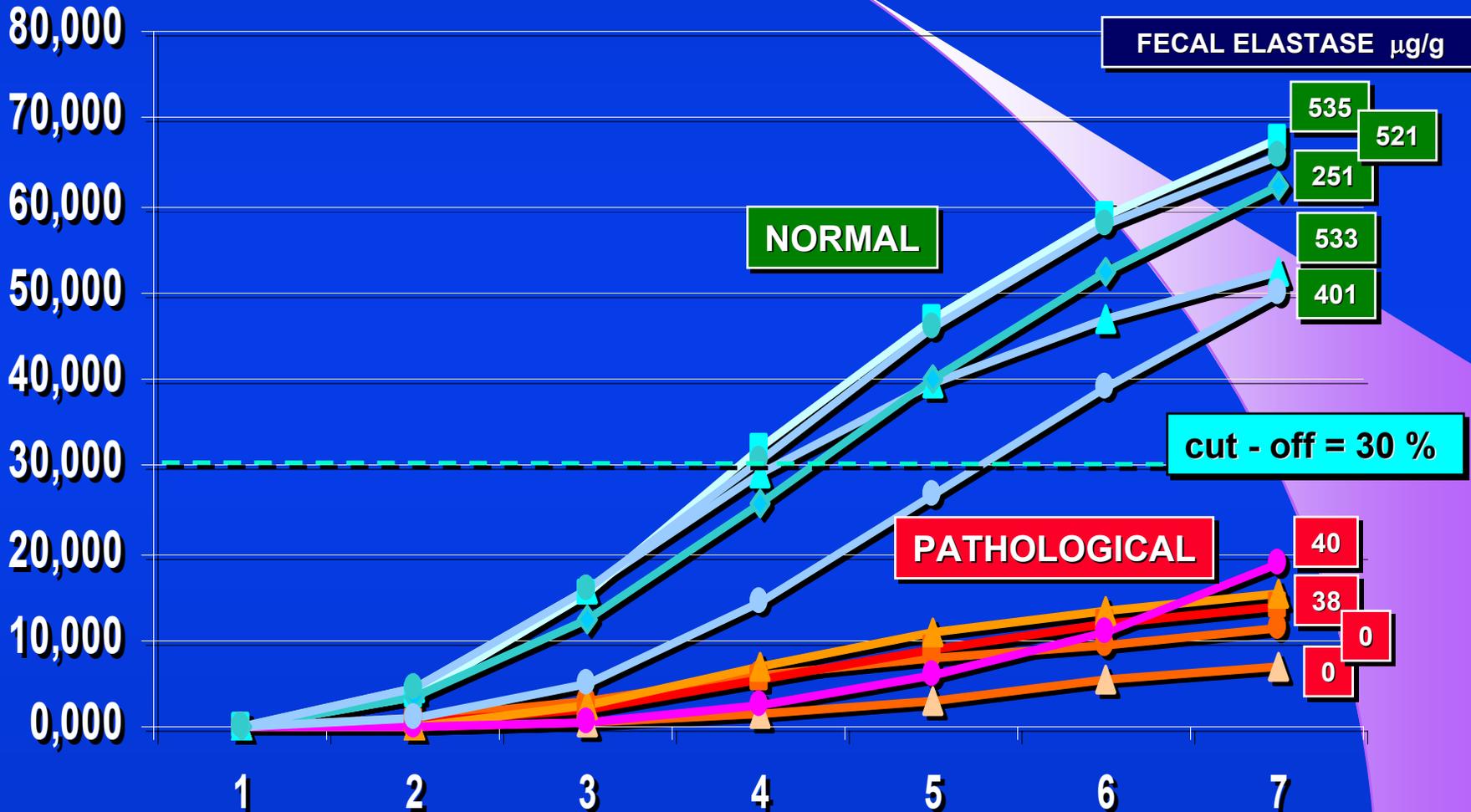
¹³C-MTG BREATH TEST - KINETIC

DOB VALUES ¹³CO₂ : ¹²CO₂ in ‰ AFTER 250mg MTG

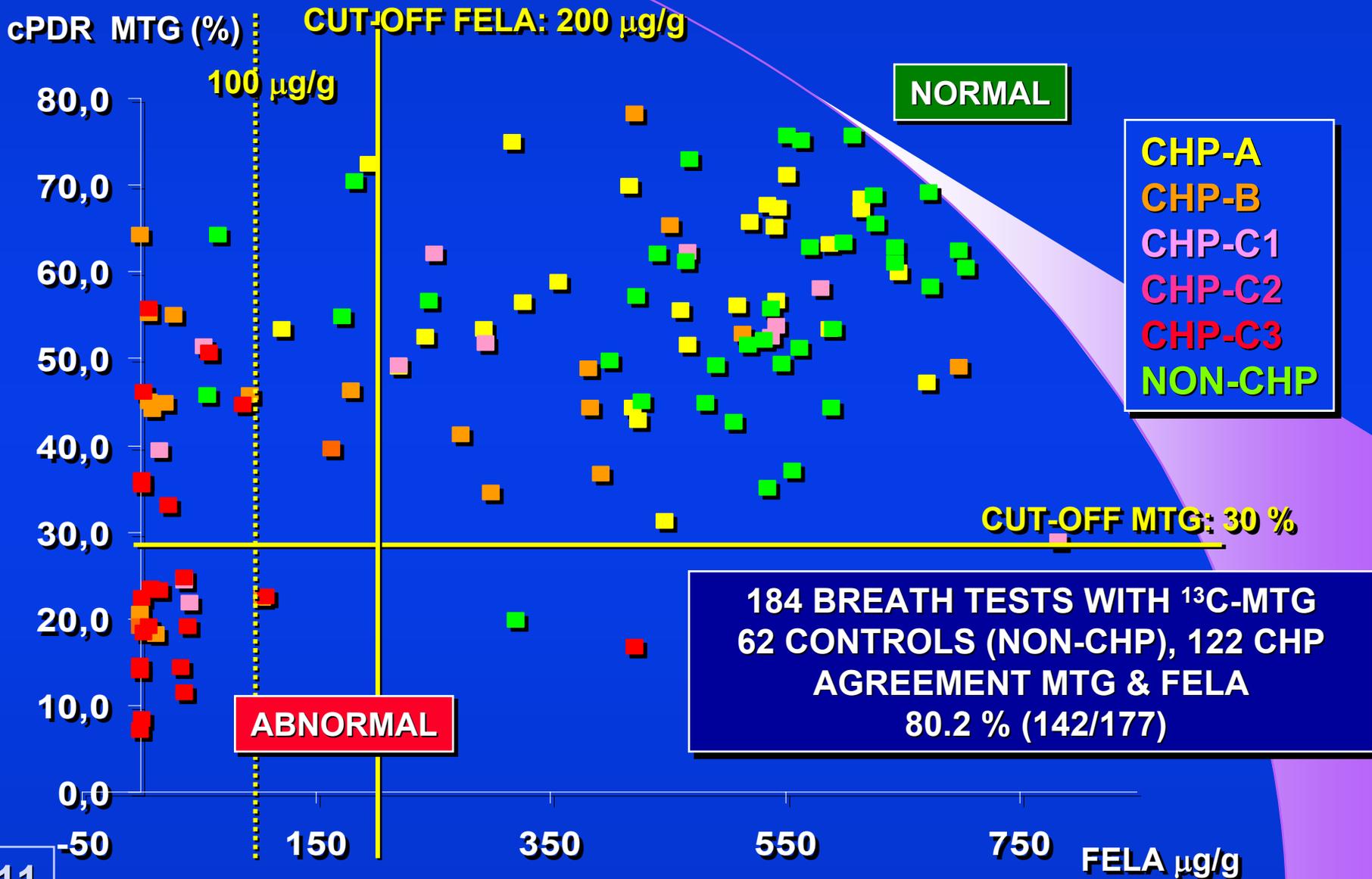


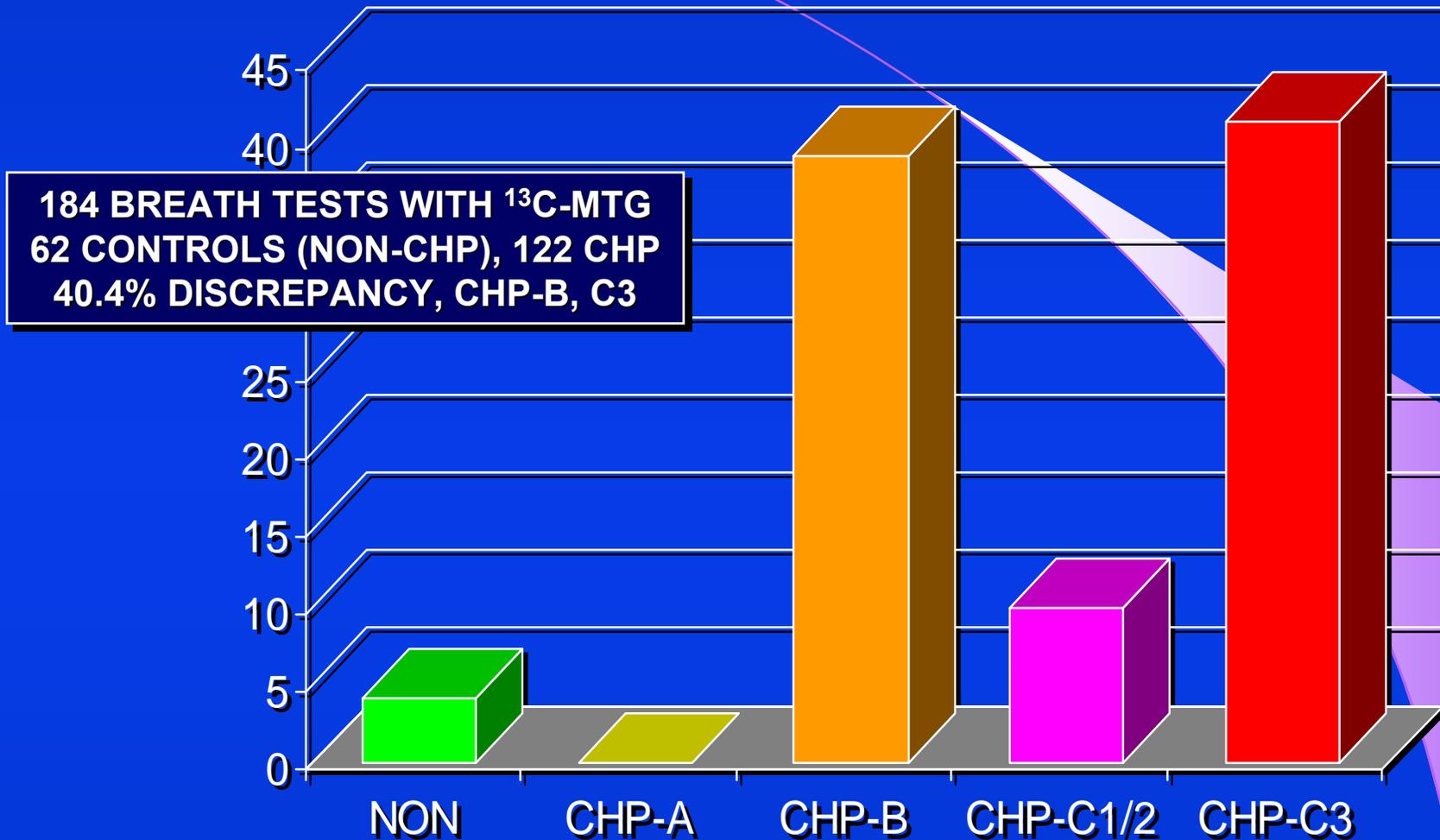
¹³C-MTG BREATH TEST - RECOVERY

CUMMULATIVE RECOVERY ¹³CO₂ in %



¹³C-MTG BREATH TEST x FECAL ELASTASE



^{13}C -MTG BREATH TEST x FECAL ELASTASE

FREQUENCY OF CASES FELA < 100 $\mu\text{g/g}$ & ^{13}C -MTG > 30%

¹³C-MTG BREATH TEST x FECAL ELASTASE**CHRONIC PANCREATITIS
GROUP B - WITH NORMAL FUNCTIONS**

13.0 % LOW FELA, LOW MTG

**SERIOUS PANCREAS DAMAGE
WHIPPLE - TUMOUR - DRAINAGE**

0 % HIGH FELA, LOW MTG

39.1 % LOW FELA, HIGH MTG

**SERIOUS PANCREAS DAMAGE
WHIPPLE - TUMOUR - DRAINAGE - C3**

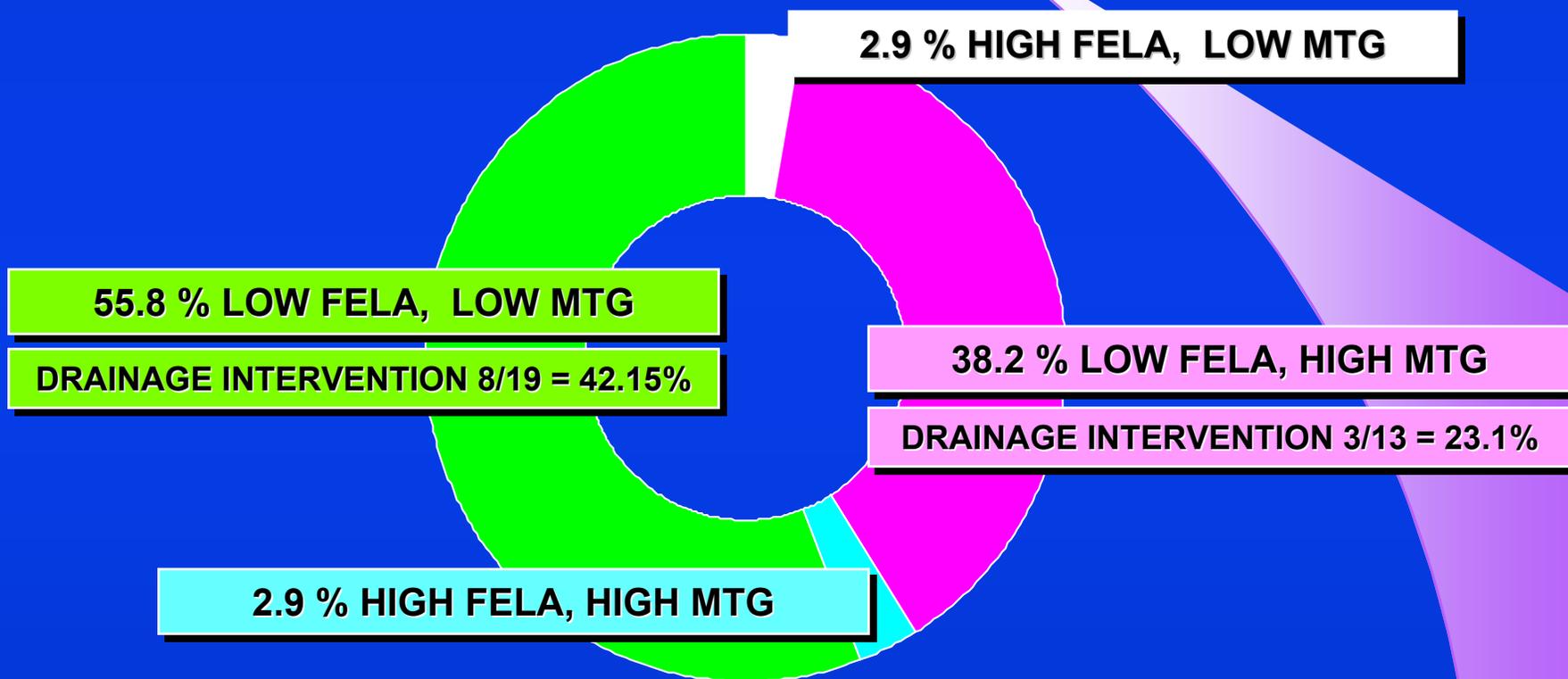
47.8 % HIGH FELA, HIGH MTG

**NORMAL EXOCRINE FUNCTION
BEGER 4x, NONE WHIPPLE,
NONE TUMOUR, NO ONE TO C3**

FREQUENCY OF CASES FELA < 100 µg/g & ¹³C-MTG > 30%

^{13}C -MTG BREATH TEST x FECAL ELASTASE

**CHRONIC PANCREATITIS, GROUP C3
WITH CLINICAL SYMPTOMS EXOCRINE INSUFFICIENCY
(DM, STTRH) + COMPLICATIONS**



FREQUENCY OF CASES FELA < 100 $\mu\text{g/g}$ & ^{13}C -MTG > 30%

EXOCRINE PANCREATIC FUNCTION

Conclusions: study comparing **184 subjects** with susp. CHP

Cut-off value of cPDR ^{13}C -MTG test calculated by mathematical approximation, and from the control group of 62 NON-CHP subjects is equivalent - **30%**

^{13}C -MTG test value, in **CHP-A/B**, classified as clinically normal function, was normal/high in 60 from 64 (94%), while FELA was normal/high only in 45 (70%)

Agreement of FELA and ^{13}C -MTG in NON-CHP was 90.2%, as well as in **CHP-A/C1/C2** (without complications) - 89.5%

Discrepancy of FELA and ^{13}C -MTG in 40.4% was found in groups **CHP-B/C3** with complications.

The **combination** of both tests, **FELA and ^{13}C -MTG**, we suggest in **evaluation of exocrine pancreatic function**.

(post)motto:

*simple, cheap and reliable test
of exocrine pancreatic function we have not,*

**THANK
YOU**

*however both
FECAL ELASTASE-1 & ¹³C-MTG BREATH TEST
are clinically efficient in combination*