

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 <sup>13</sup>C-MIXED TRIGLYCERIDE BREATH TEST**



**XXXVIII Meeting of EPC - Tampere - June 9, 2006**

## GOLD STANDARDS FOR EXOCRINE PANCREATIC FUNCTION

FAT 72 hr.

QUANTITATIVE FECAL FAT  
STOOL SAMPLING - 72hr.



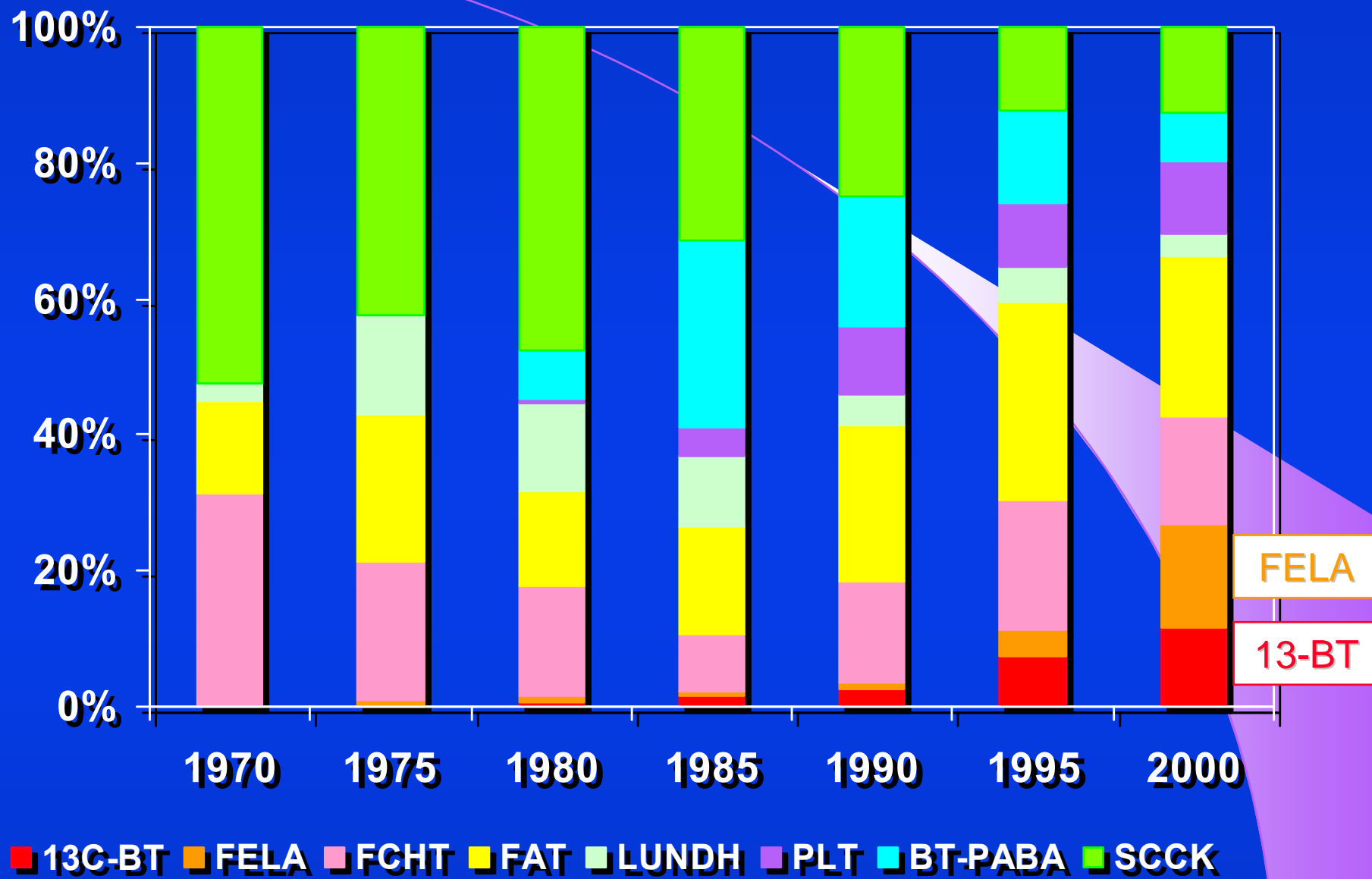
S-CCK TEST

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**

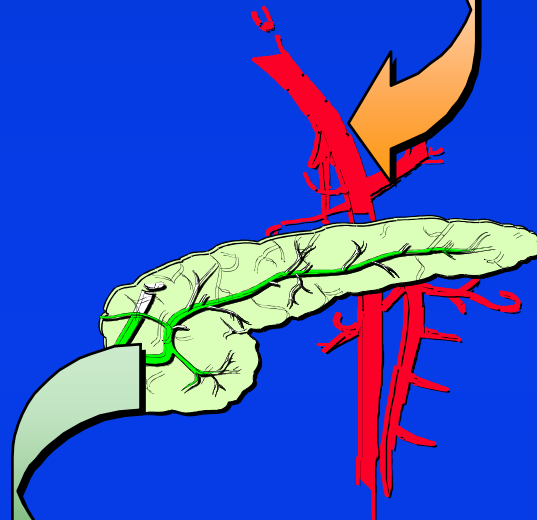
**<sup>13</sup>C-MIXED TRIGLYCERIDE BREATH TEST**

Friday poster - P122

Faecal Elastase 1 Performance & Use in Diagnosis of Chronic Pancreatitis

## DIRECT PZS TEST

SECRETIN  
PANCROZYMIN

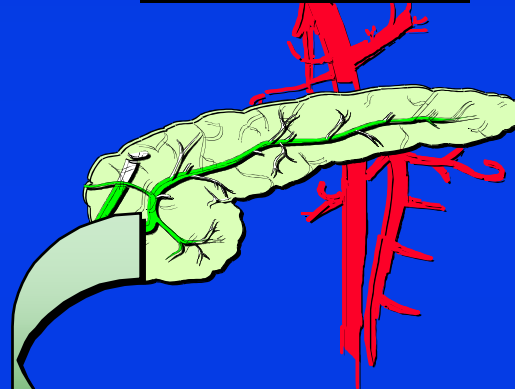


AMYLASE  
LIPASE  
TRYPSIN  
BICARBONATE

DIRECT RESPONSE  
TO STIMULATION

## FECAL ELASTASE

WITHOUT  
STIMULATION



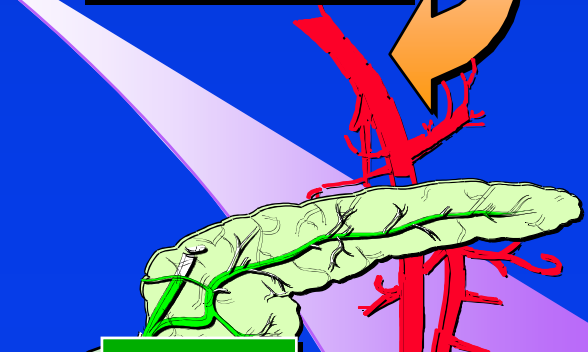
FECAL  
ELASTASE

ENZYMES FROM  
THERAPY/DRUGS  
WITH mAb NO REACTION  
SECRETORY CAPACITY  
GRADING CHP

## PABA, 13C-MTG

STIMULATING  
MEAL

INDIRECT  
STIMULATION



LIPASE

LIPASE  
ENZYME  
THERAPY

LIPID HYDROLYSIS  
TEST, SUBSTRATE

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

## **<sup>13</sup>C-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 <sup>13</sup>C-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<sub>x</sub> SAMPLE AGAINST T<sub>0</sub> (DOB = Delta Over Baseline)**

### **EVALUATION OF PANCREATIC INSUFFICIENCY**

**BSA CALCULATED (BASED ON WEIGHT, HEIGHT ONLY)**

**BMR AND CO<sub>2</sub> PRODUCTION CALCULATION**

**CUMMULATIVE RECOVERY FOR 6 HOURS CALCULATION**

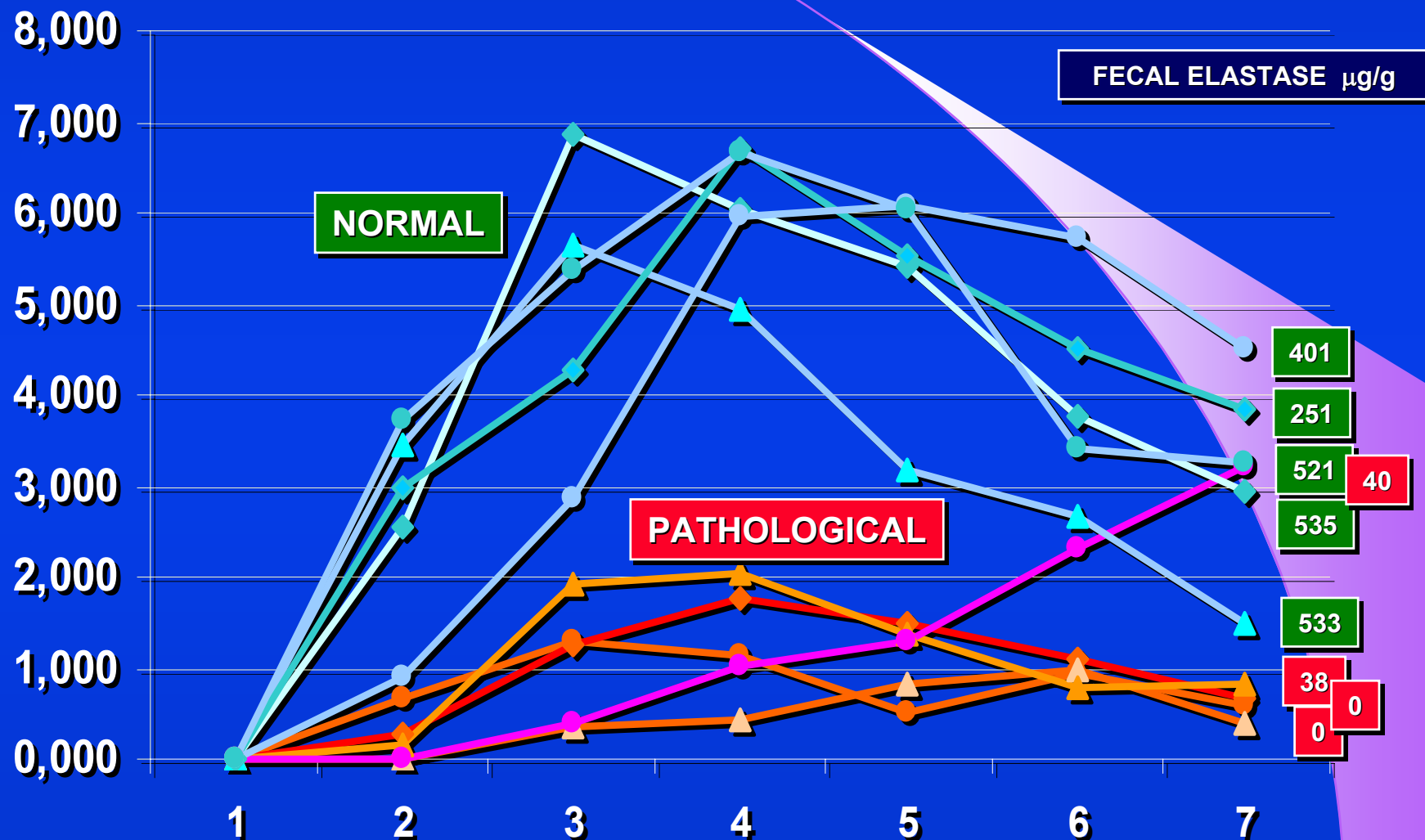


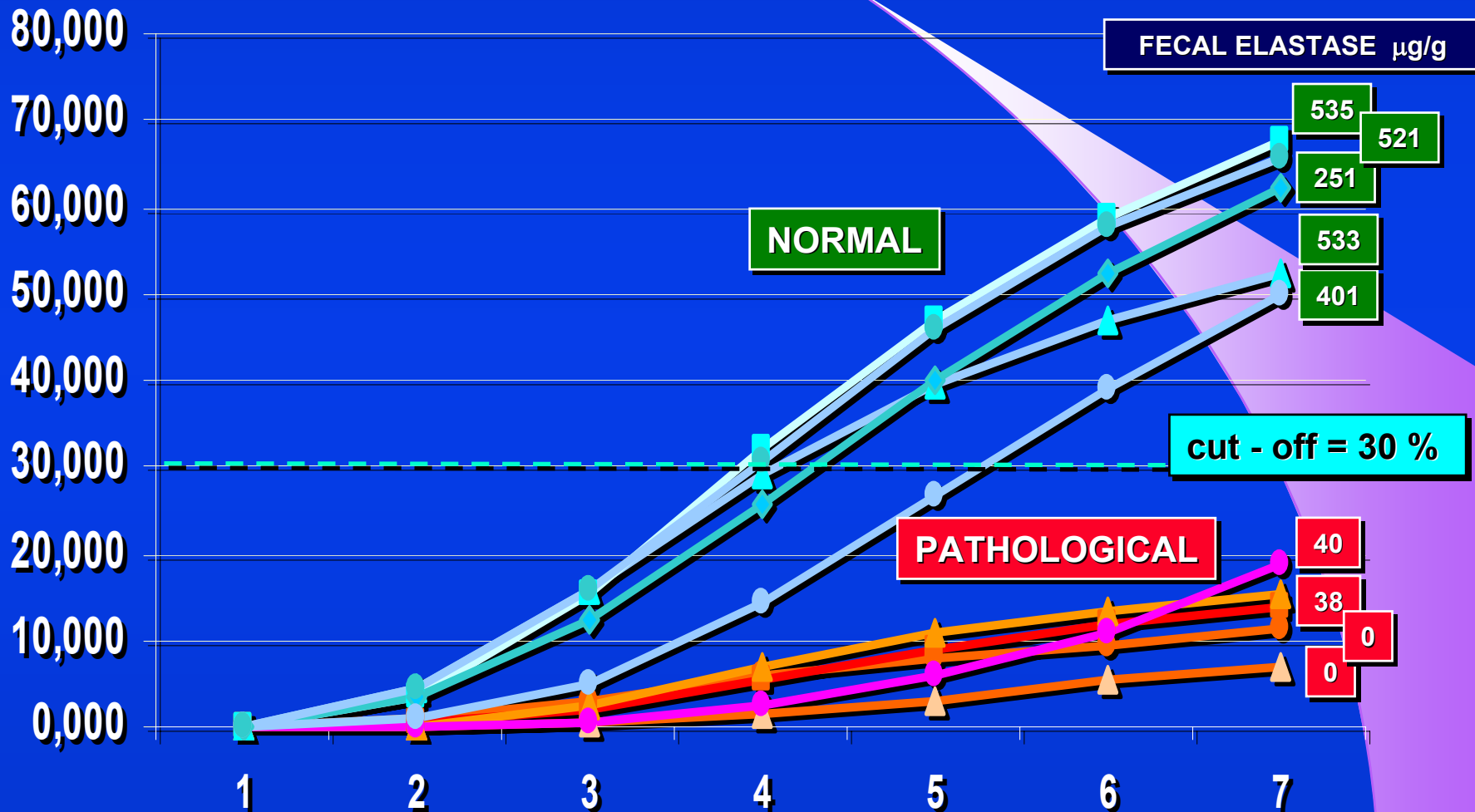
**$^{13}\text{C}$ -MTG BREATH TEST - IR ANALYSIS**

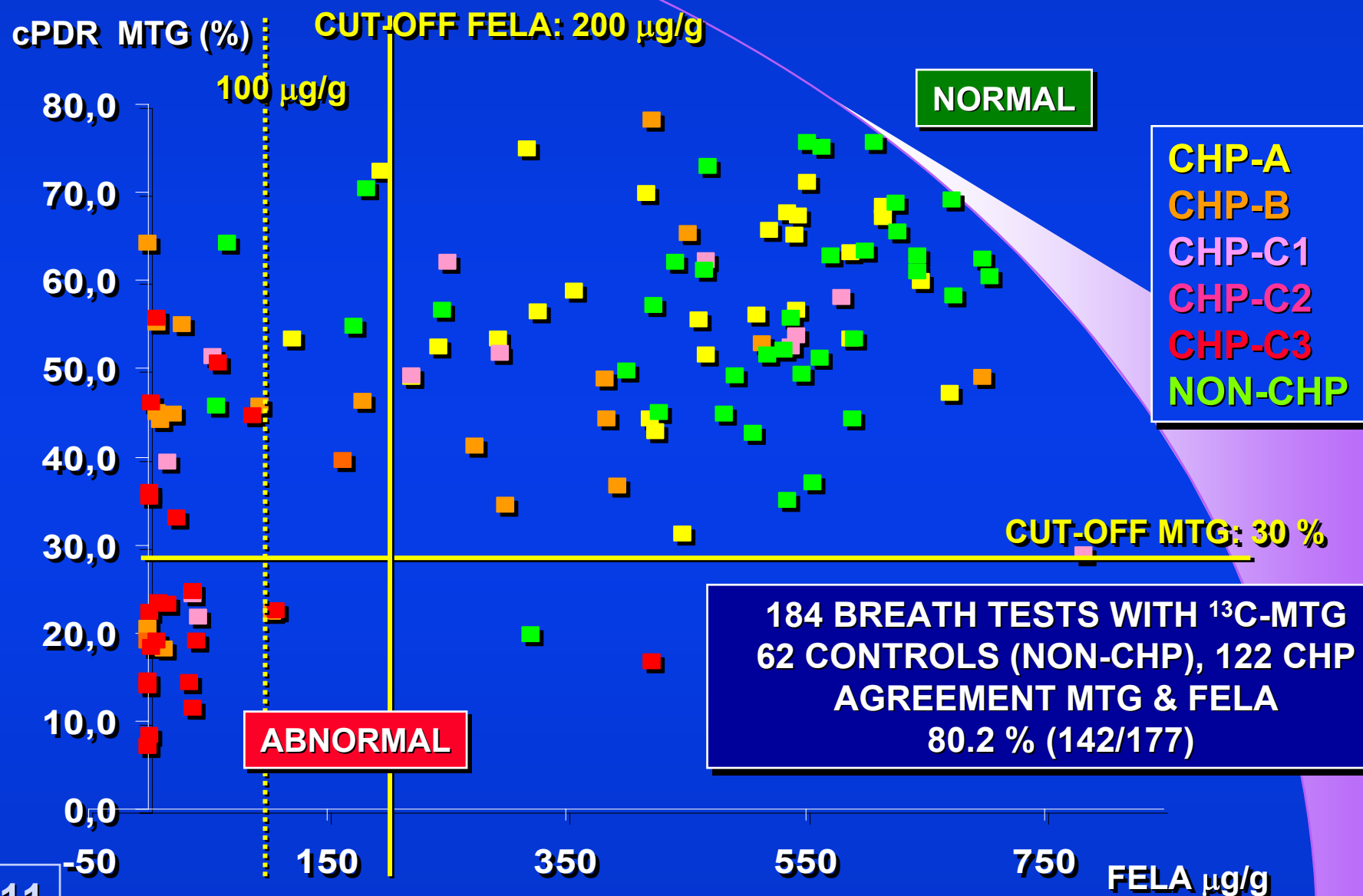
$^{13}\text{C}/^{12}\text{C}$  ratio analysis  
NDIRS analytical units  
Isomax 4000 (Canada)  
HeliFAN plus (Germany)

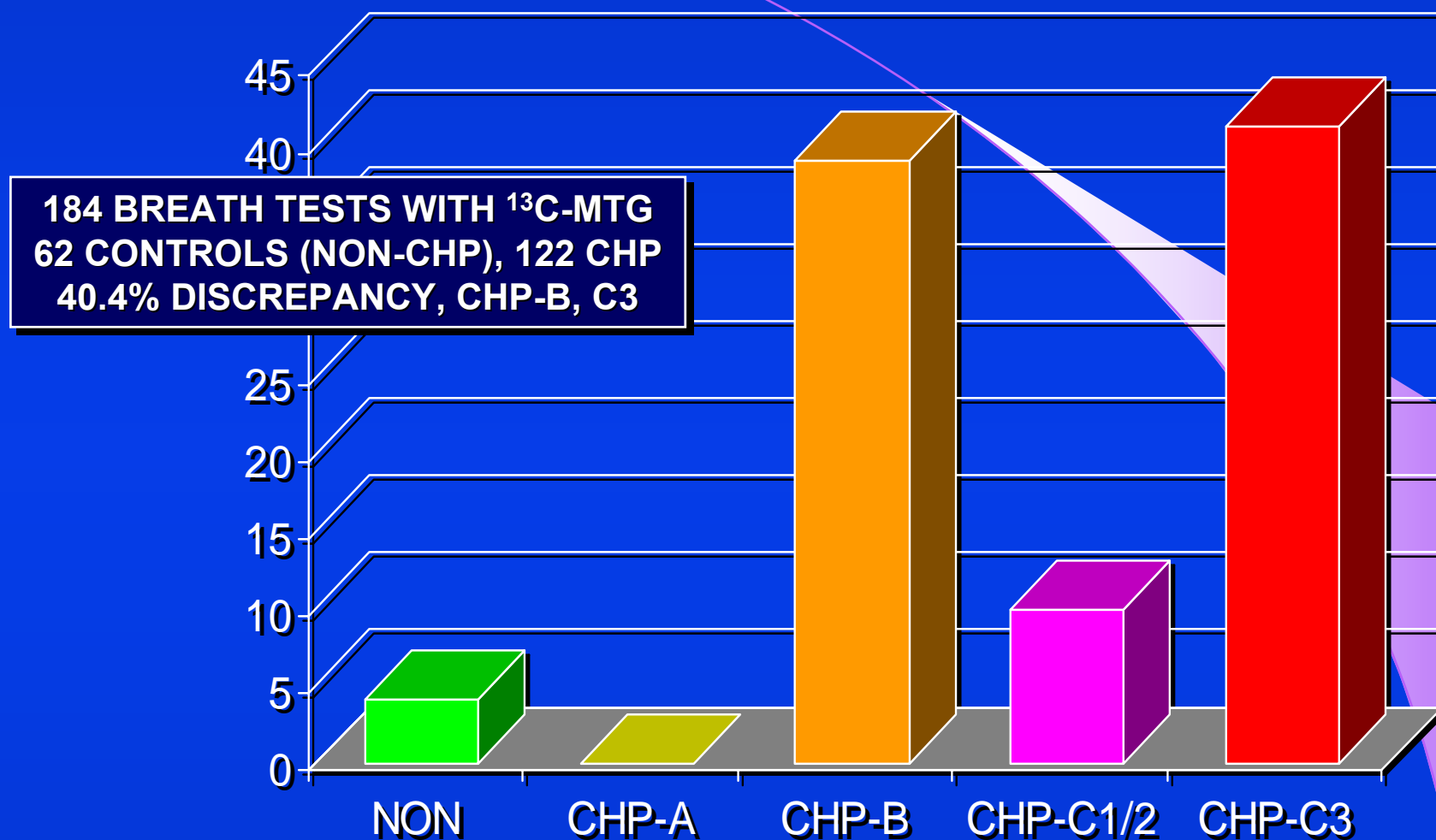




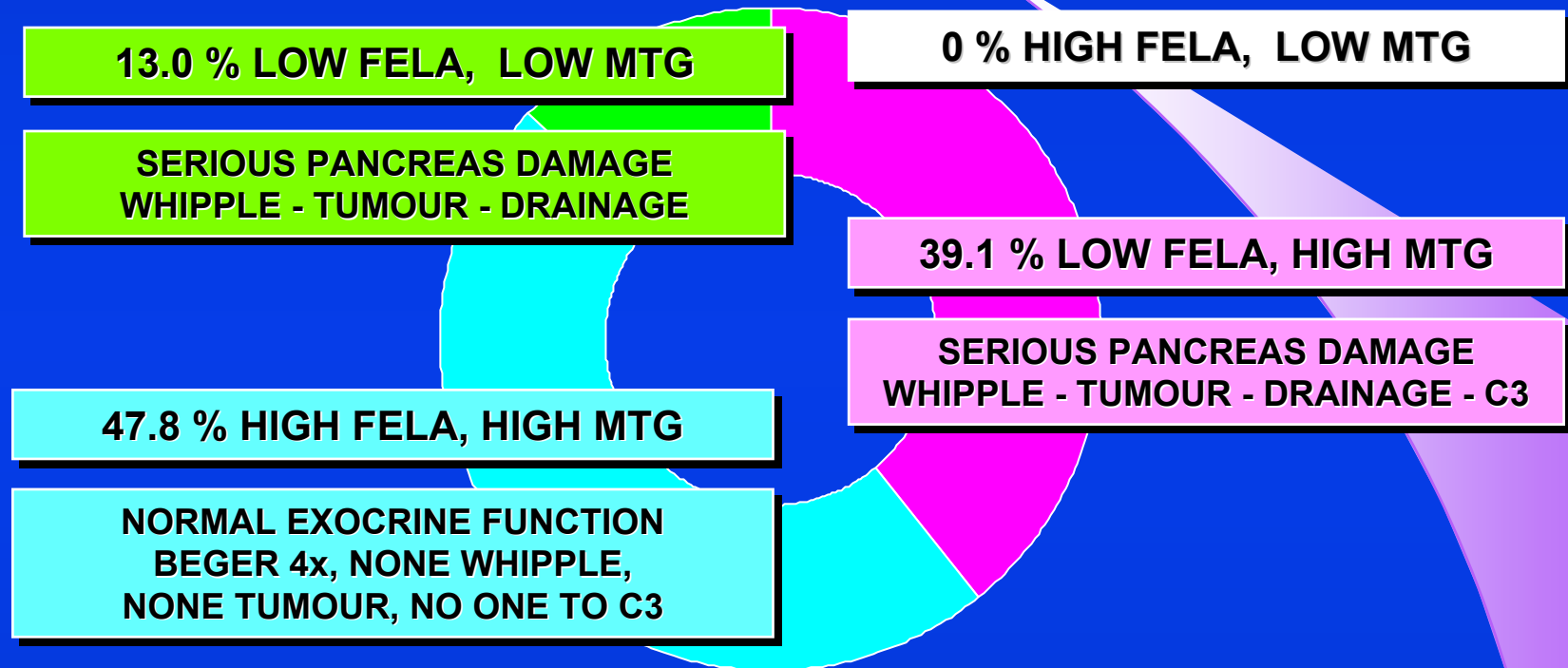
**$^{13}\text{C}$ -MTG BREATH TEST - KINETIC****DOB VALUES  $^{13}\text{CO}_2 : ^{12}\text{CO}_2$  in ‰ AFTER 250mg MTG**

**$^{13}\text{C}$ -MTG BREATH TEST - RECOVERY****CUMMULATIVE RECOVERY  $^{13}\text{CO}_2$  in %**

**$^{13}\text{C}$ -MTG BREATH TEST x FECAL ELASTASE**

**$^{13}\text{C}$ -MTG BREATH TEST x FECAL ELASTASE**

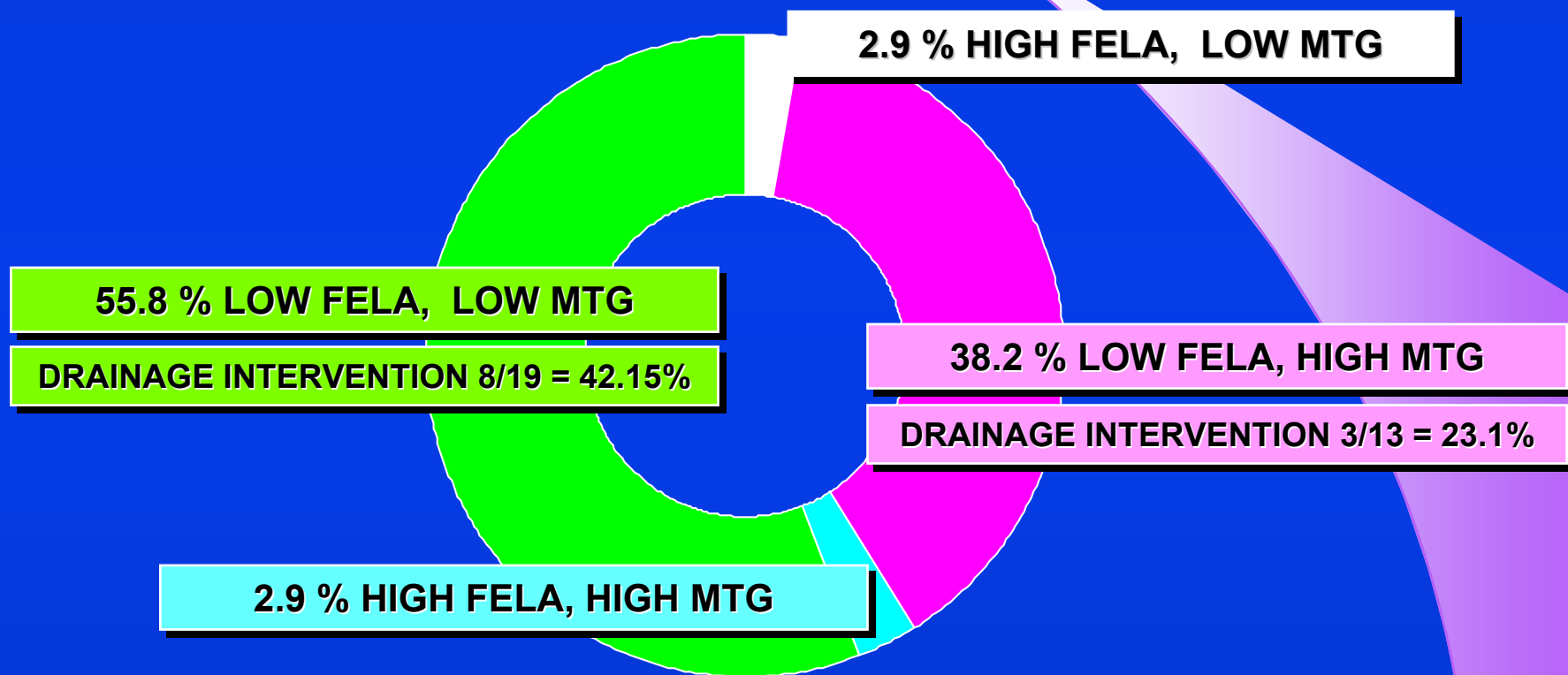
FREQUENCY OF CASES FELA < 100  $\mu\text{g/g}$  &  $^{13}\text{C}$ -MTG > 30%

**$^{13}\text{C}$ -MTG BREATH TEST x FECAL ELASTASE****CHRONIC PANCREATITIS  
GROUP B - WITH NORMAL FUNCTIONS**

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

**$^{13}\text{C}$ -MTG BREATH TEST x FECAL ELASTASE**

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



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

## EXOCRINE PANCREATIC FUNCTION

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

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

**$^{13}\text{C}$ -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  $^{13}\text{C}$ -MTG** in NON-CHP was 90.2%, as well as in **CHP-A/C1/C2** (without complications) - 89.5%

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

The **combination** of both tests, **FELA and  $^{13}\text{C}$ -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 &  $^{13}\text{C}$ -MTG BREATH TEST**  
are clinically efficient in combination*