Präanalytik und ihr Einfluß auf die Analytik

O. Sonntag

Scientific Affairs

Ortho Clinical Diagnostics GmbH

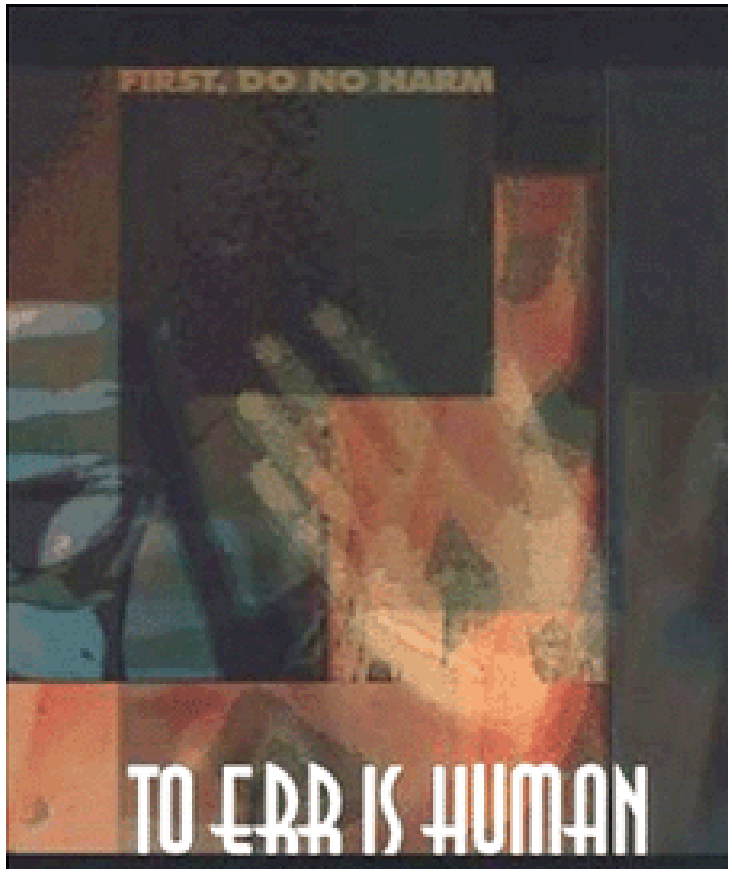
Neckargemünd

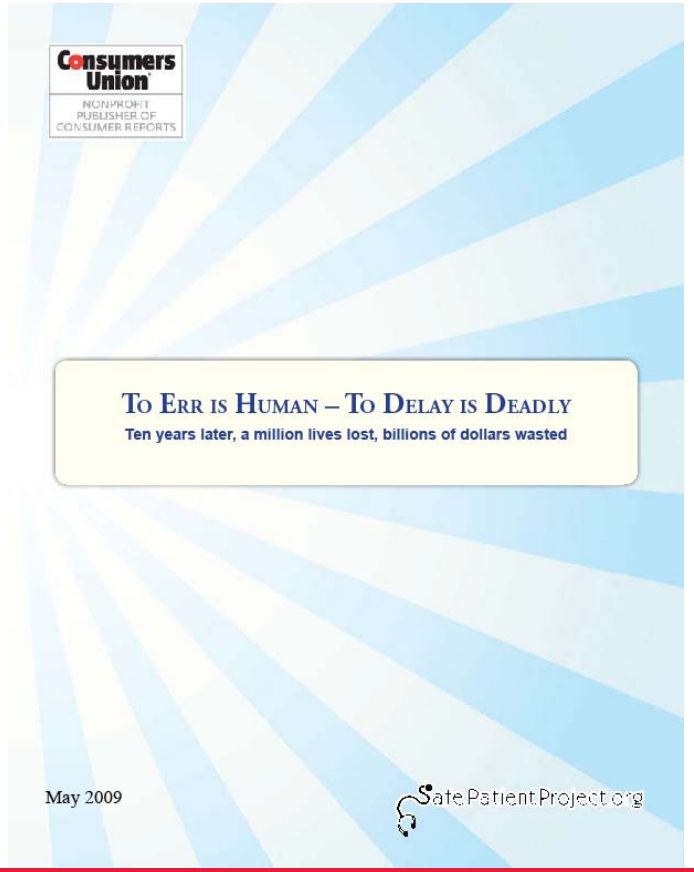
Laborfehler

Wenn das Laborresultat nicht die Erwartungen des behandelnden Arztes bestätigt,

wird es Laborfehler genannt!?

Irren ist menschlich





Medizinische Fehler

Institute of Medicine (IOM) errechnete die Zahl der durch Medical Errors verursachten Todesfälle mit 44.000 bis 98.000 jährlich in US-Krankenhäuser

Initiative zur Reduktion der Fehlerrate

Laboratorien sollen Fehlermöglichkeiten erkennen und abstellen

Sue Auxter, *Clin Lab News, 20, No 2 (*2000)

Einleitung

Probenahme

Zentrifugation

Arzneimittelinterferenzen

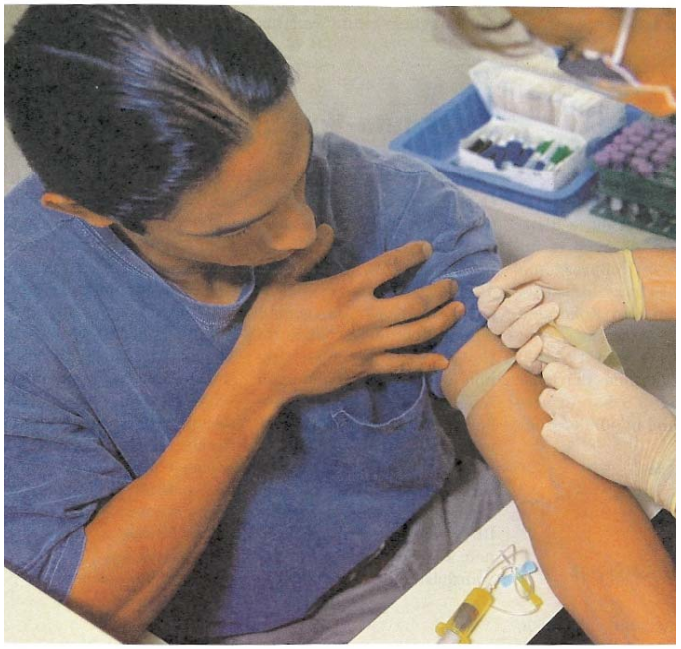
Diagnostische Maßnahmen

Qualität der Probe

Haltbarkeit – Aufbewahrung

Besonderheiten

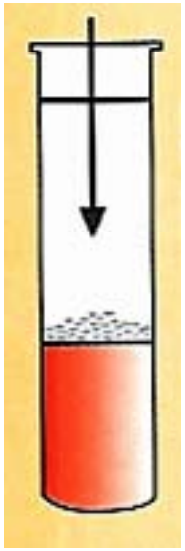
Probennahme



Beginnt das Thema “Präanalytik” hier oder schon davor?

Zentrifuge

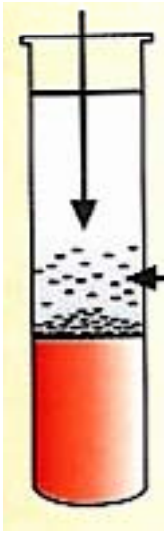
Serum ohne Zellen



Zentrifugation:

ausreichend

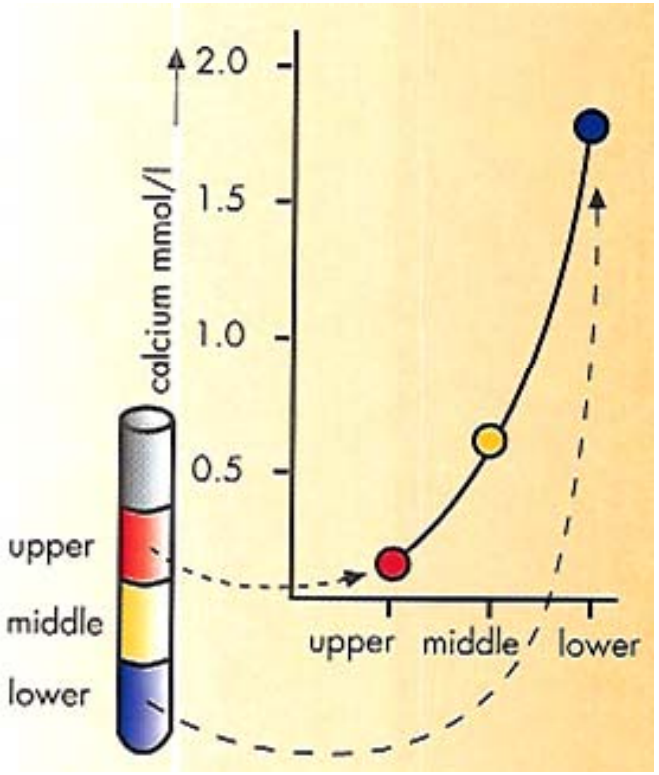
Serum mit Zellen



Zellen

zu kurz

Auftauen der Probe

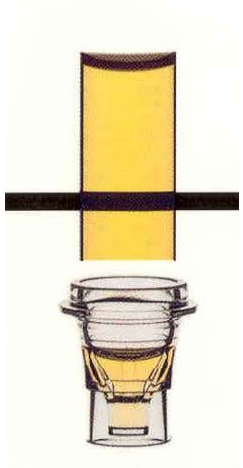


Gradientenbildung

Mischung immer erforderlich

Guder et al, Samples: From the Patient to the Laboratory, 3rd ed., Wiley-VCH, Weinheim/D

Qualität der Probe



normal

hämolytisch

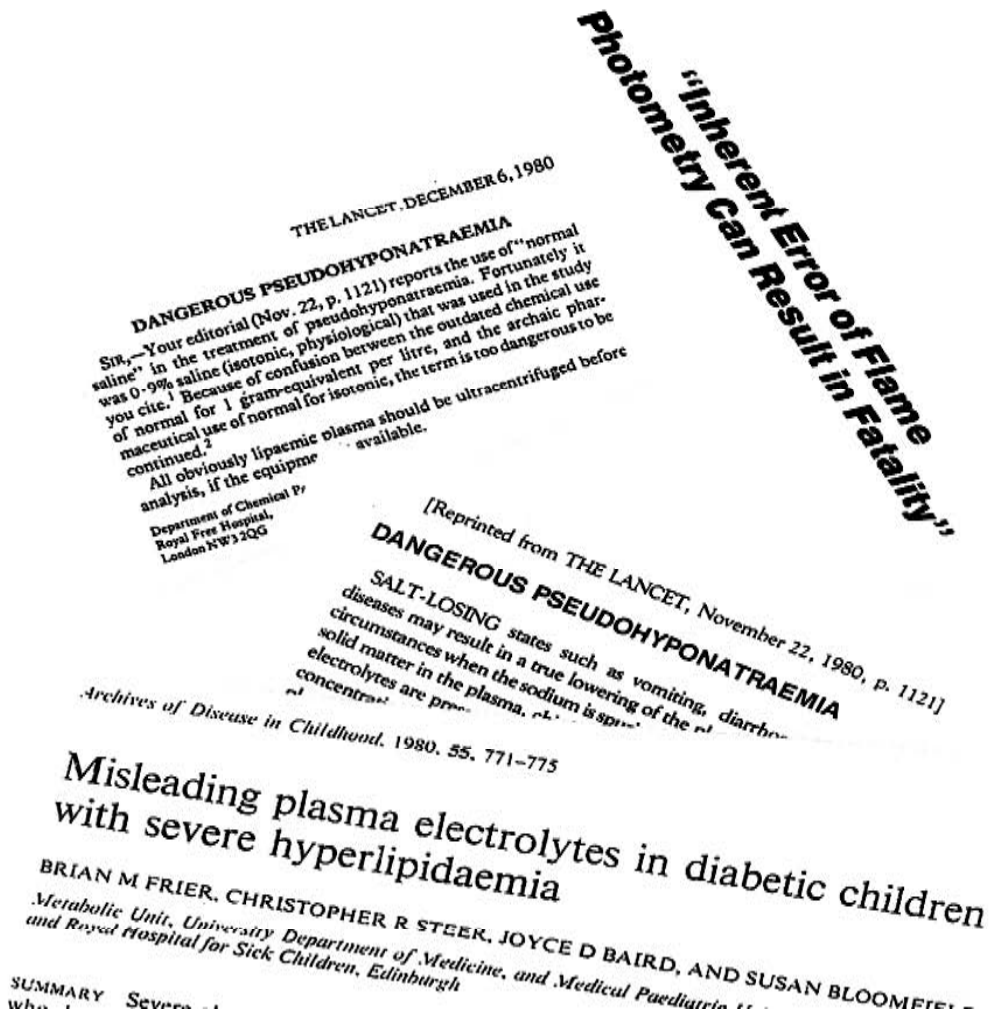
ikterisch

lipämisch, trüb

Elektrolyte

Elektrolyte

Bekannt seit den 1980



"Inherent Error of Flame Photometry Can Result in Fatality"

THE LANCET, DECEMBER 6, 1980

DANGEROUS PSEUDOHYPONATRAEMIA

SIR,—Your editorial (Nov. 22, p. 1121) reports the use of "normal saline" in the treatment of pseudohyponatraemia. Fortunately it was 0·9% saline (isotonic, physiological) that was used in the study you cite.[1] Because of confusion between the outdated chemical use of normal for 1 gram-equivalent per litre, and the archaic pharmaceutical use of normal for isotonic, the term is too dangerous to be continued.[2]

All obviously lipaemic plasma should be ultracentrifuged before analysis, if the equipme available.

Department of Chemical P
Royal Free Hospital,
London NW3 2QG

[Reprinted from THE LANCET, November 22, 1980, p. 1121]

DANGEROUS PSEUDOHYPONATRAEMIA

SALT-LOSING states such as vomiting, diarrh
diseases may result in a true lowering of the
circumstances when the sodium is spu
solid matter in the plasma.
electrolytes are pre
concentrat

Archives of Disease in Childhood, 1980, 55, 771–775

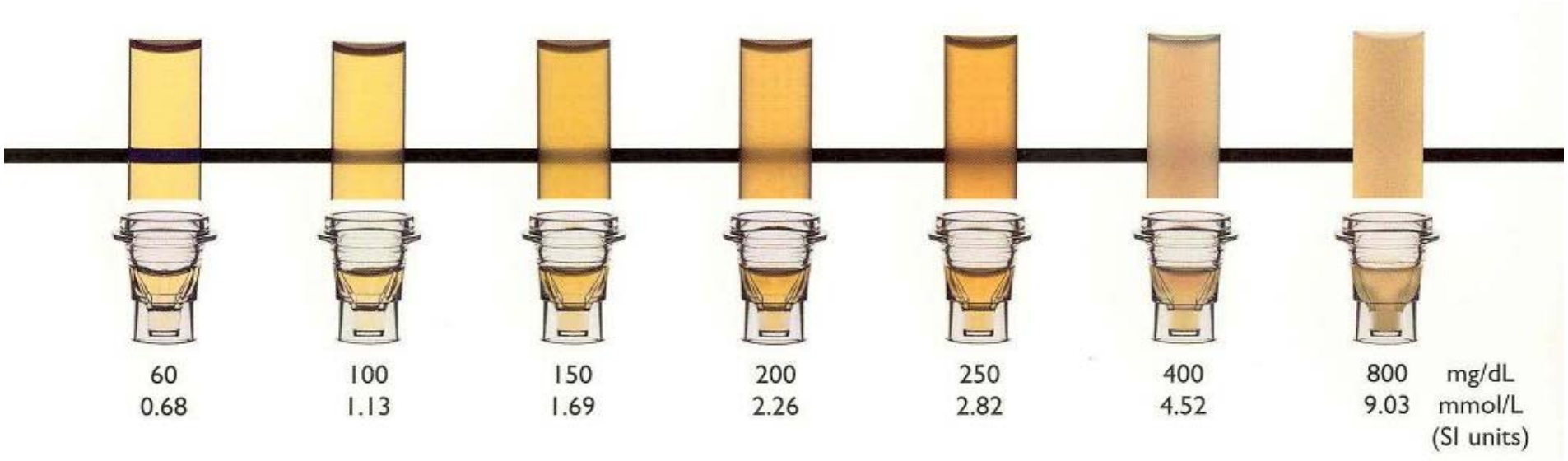
Misleading plasma electrolytes in diabetic children with severe hyperlipidaemia

BRIAN M FRIER, CHRISTOPHER R STEER, JOYCE D BAIRD, AND SUSAN BLOOMFIEL

Metabolic Unit, University Department of Medicine, and Medical Paediatric
and Royal Hospital for Sick Children, Edinburgh

SUMMARY Severe

Lipämie und Trübung



Elektrolyte

Flammenphotometer und ISE (indirekt) liefern erniedrigte Werte bei Proben von Patienten mit Fettstoffwechselstörungen oder erhöhter Protein-Konzentration.

Ursache: Probe muss vor Messung verdünnt werden.

Fehler: Volumenverdrängungseffekt

Volumenverdrängungseffekt

Serum besteht aus 93 % Wasser und 7 % Lipide und Proteine.

Lipide und Proteine verdrängen das Serumwasser in der Probe.

Wenn 100 µL Probe verwendet werden, entspricht dies einem Volumen von nur 93 µL in dem die Messung erfolgt.

Volumenverdrängungseffekt

Natrium

üblicherweise:

93 % Wasser + 7 % Lipide + Proteine

Flamme/ISE indirekt: 140 mmol/L ISE direkt: 140 mmol/L

Lipide/Proteine erhöht:

88 % Wasser + 12 % Lipide + Proteine

Flamme/ISE indirekt: 132 mmol/L ISE direkt: 140 mmol/L

Volumenverdrängungseffekt

A six-year-old boy with diabetes mellitus was admitted to the hospital in a coma after a two-week illness characterized by abdominal pain and vomiting. The initial laboratory assessment revealed: serum sodium 86, serum potassium 2.7, serum creatinine 63, serum glucose 37 (all mmol/liter). He was treated with 0.9 percent saline solution intravenously. Seven hours after admission, the patient's serum sodium remained low: 116 mmol/liter. The serum was lipemic; total serum lipids were 213 g/liter. When the lipids were chemically extracted from a sample of serum, the aqueous sodium concentration was found to be 222 mmol/liter. The patient died 33 hours after admission from intracranial hemorrhage.

Frier at al., Arch. Dis. Child. 55, 771-775 (1980)

Lipämische Probe

Analyt (Einheit)	Methode A Nasschemie	Methode B Trockenchemie	Differenz in %
AP (U/L)	186	288	55
ALT (U/L)	52	122	138
TBIL (mg/dL)	0,21	0,91	333
K (mmol/L)	3,89	4,40	13
Na (mmol/L)	126	143	13
Fe (µg/dL)	31	113	261
Mg (mmol/L)	0,95	0,57	- 40

TG 12.000 mg/dL – Chol 7.500 mg/dL

HAMA

HAMA = human anti mouse antibodies

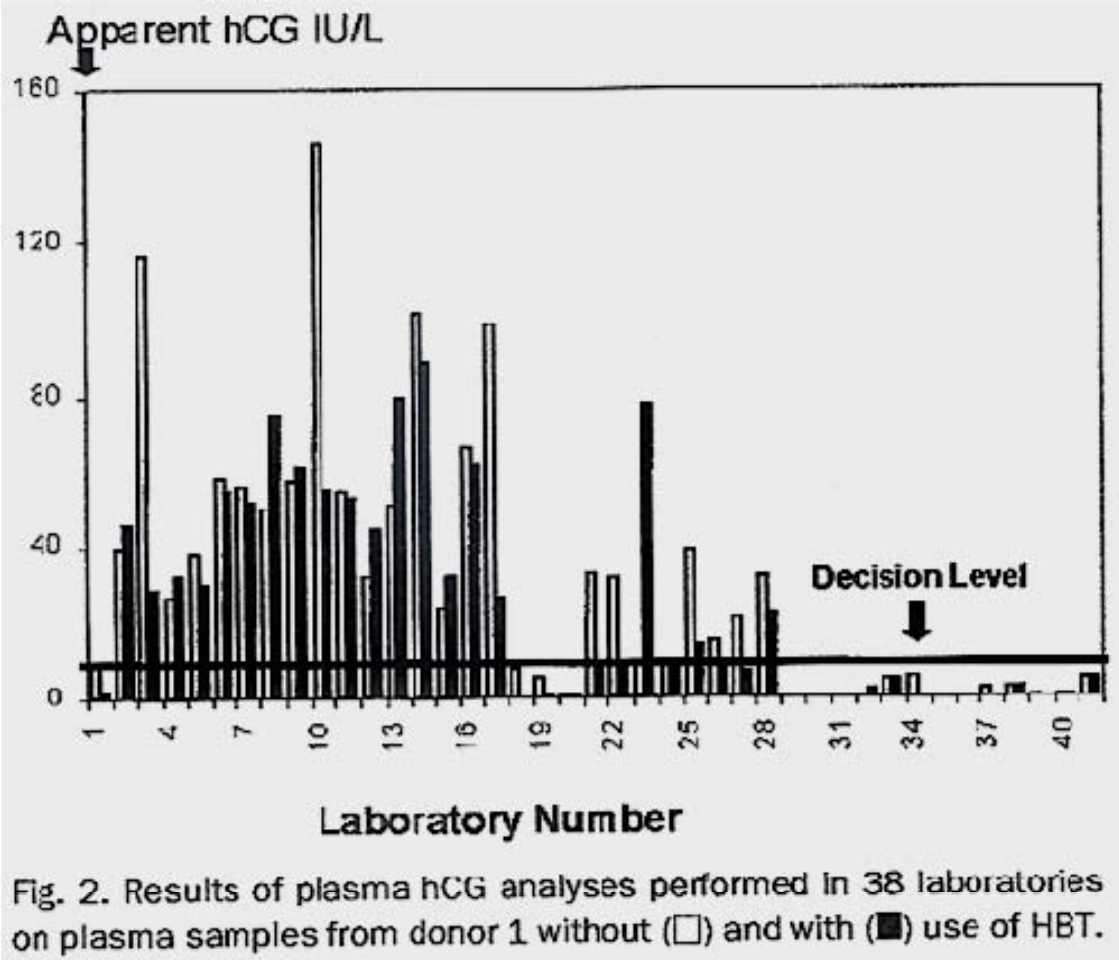


Fig. 2. Results of plasma hCG analyses performed in 38 laboratories on plasma samples from donor 1 without (□) and with (■) use of HBT.

Marks, M., Clin. Chem. 48, 2008 (2002)

Creatinin und Interferenzen

DG Klinische Chemie Mitteilungen 22 (1991) Heft 6 235

ÜBERSICHT

Die Bestimmung der Creatinin-Konzentration in Serum und Urin
Kritische Übersicht der Routine-Bestimmungsmethoden

O. Sonntag
Institut für Klinische Chemie I, Medizinische Hochschule Hannover

Jaffe-Methoden

Acebutolol, Acetoacetat, Aceton, Acetylaceton, Adrenalin, Arabinose, Ascorbinsäure, Cefaloridin, Cefazolin, Cefoxitin, Cephalotin, Cotrimoxazol, Creatin, Diketopiperazin, Ethylacetat, Fettsäuren, Fluorescein, Fructose, Galactose, Glucosamin, Glucose, Glucytosin, Glutathion, Glycocyamidin, Glycylglycinanhydrid, Guanidin-Komponenten, Hämolyse, Harnsäure, Harnstoff, Histidin, Homogentisinsäure, Hydantoin, Ketoglutarat, Lactose, Lävulinsäure, L-Dopa, Mannit, Methyldopa, Nitrofurantoin, Oxalacetat, Pyruvat, Sulfobromophthalein, Tryptophan.

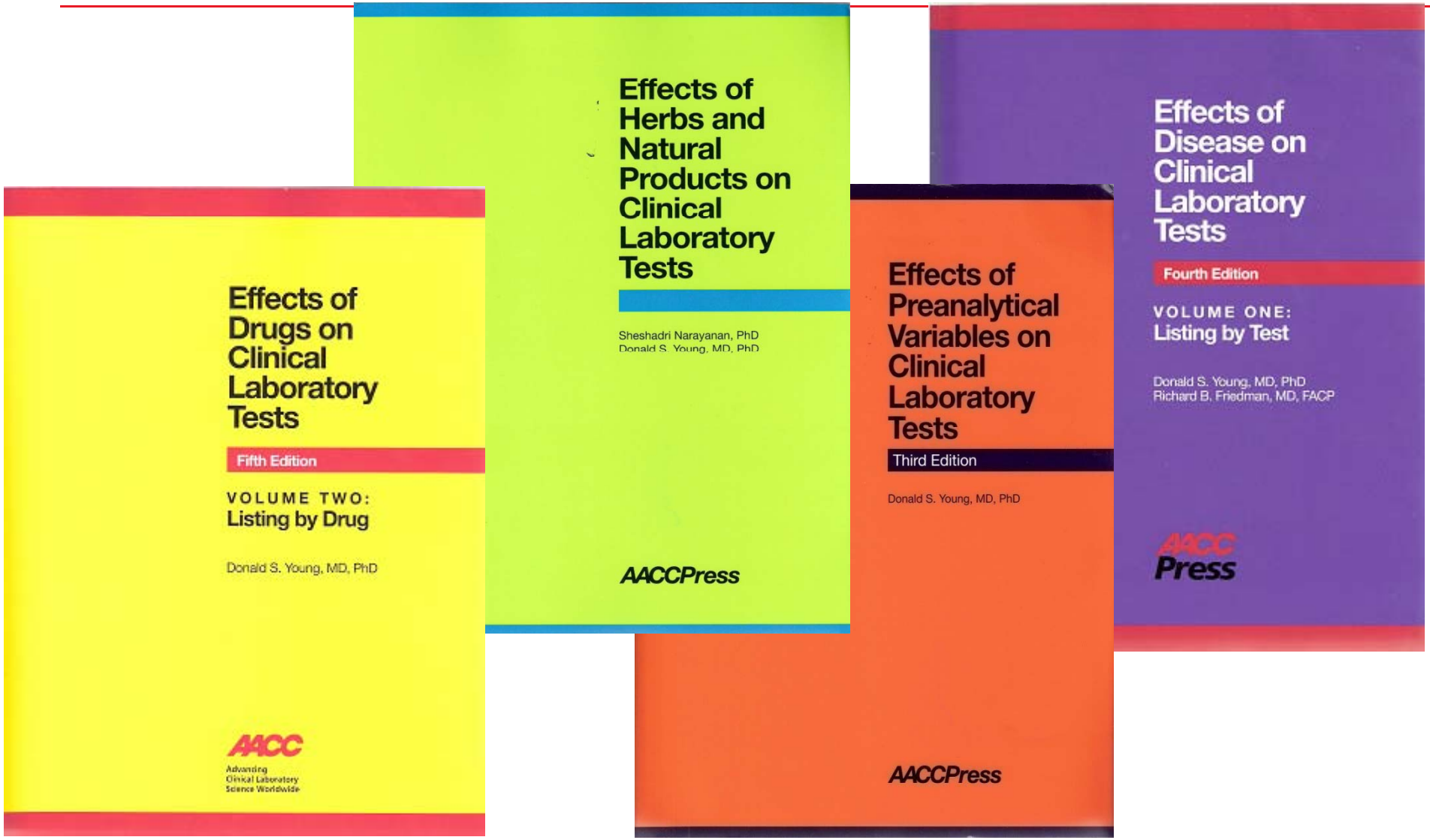
PAP-Methode

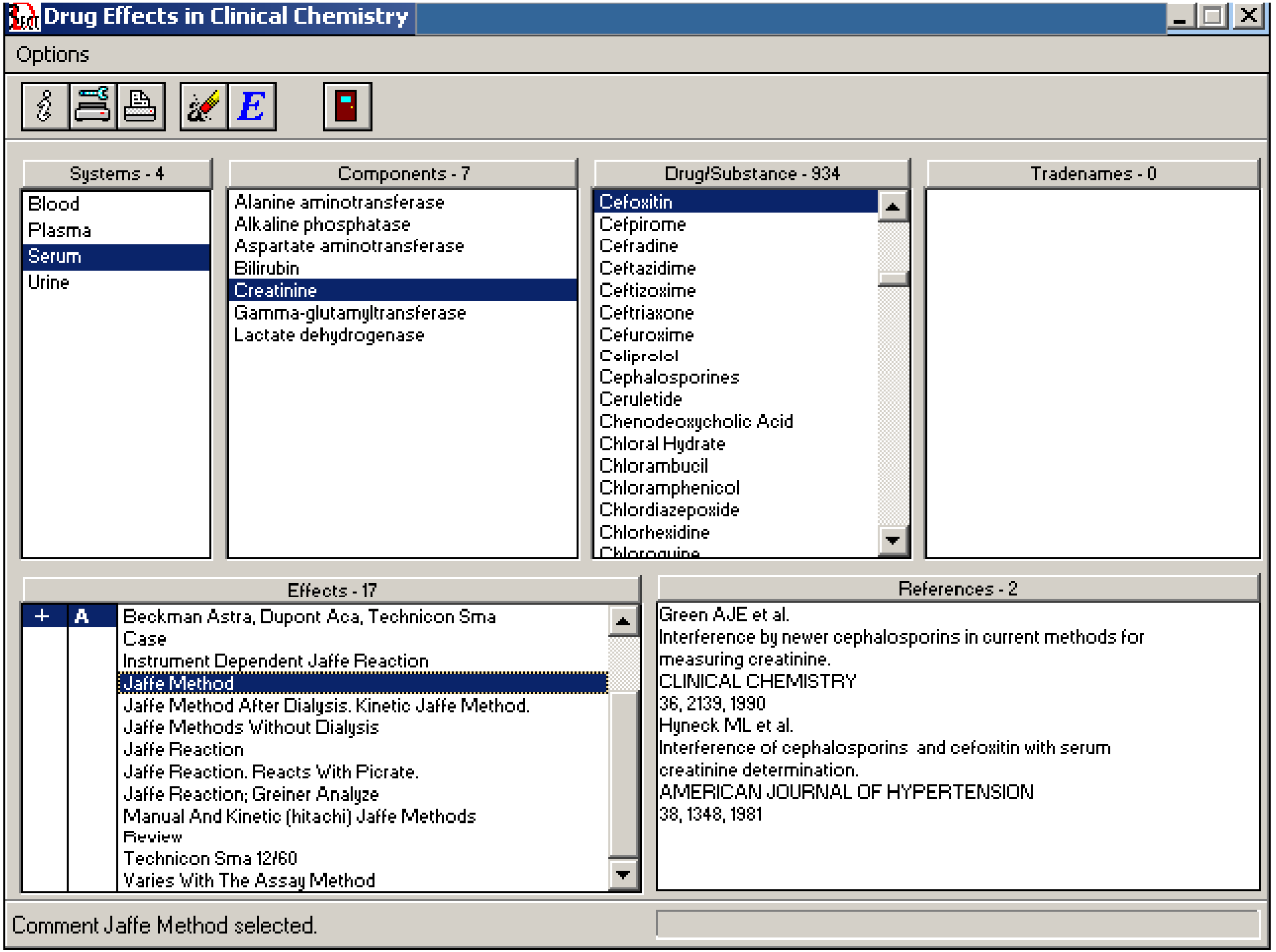
Bilirubin, Calciumdobesilat, Carbidopa, Dobutamin, Dopamin, Hämolyse, Levodopa, Methyldopa.

PAP-Methode am Ektachem

Acetat, Acetylcystein, Cystein.

Young´s Effects Bücher




Drug Effects in Clinical Chemistry
Options
Systems - 4
Blood
Plasma
Serum
Urine
Components - 7
Alanine aminotransferase
Alkaline phosphatase
Aspartate aminotransferase
Bilirubin
Creatinine
Gamma-glutamyltransferase
Lactate dehydrogenase
Drug/Substance - 934
Cefoxitin
Cefpirome
Cefradine
Ceftazidime
Ceftizoxime
Ceftriaxone
Cefuroxime
Celiprolol
Cephalosporines
Ceruletide
Chenodeoxycholic Acid
Chloral Hydrate
Chlorambucil
Chloramphenicol
Chlordiazepoxide
Chlorhexidine
Tradenames - 0
Effects - 17
+
A
Beckman Astra, Dupont Aca, Technicon Sma
Case
Instrument Dependent Jaffe Reaction
Jaffe Method
Jaffe Method After Dialysis. Kinetic Jaffe Method.
Jaffe Methods Without Dialysis
Jaffe Reaction
Jaffe Reaction. Reacts With Picrate.
Jaffe Reaction; Greiner Analyze
Manual And Kinetic (hitachi) Jaffe Methods
Review
Technicon Sma 12/60
Varies With The Assay Method
References - 2
Green AJE et al.
Interference by newer cephalosporins in current methods for measuring creatinine.
CLINICAL CHEMISTRY
36, 2139, 1990
Hyneck ML et al.
Interference of cephalosporins and cefoxitin with serum creatinine determination.
AMERICAN JOURNAL OF HYPERTENSION
38, 1348, 1981
Comment Jaffe Method selected.

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Specific Factor	insulin
Factor Type	☐ Disease ☐ Drug ☐ Prean ☐ Herb ☑ All
Effect	Choose...
Mechanism	☐ Analytical ☐ Physiological ☑ Both
Specimen	Serum, Skin, Sputum, Sweat
ICD-9-CM	
Interaction Explanation	

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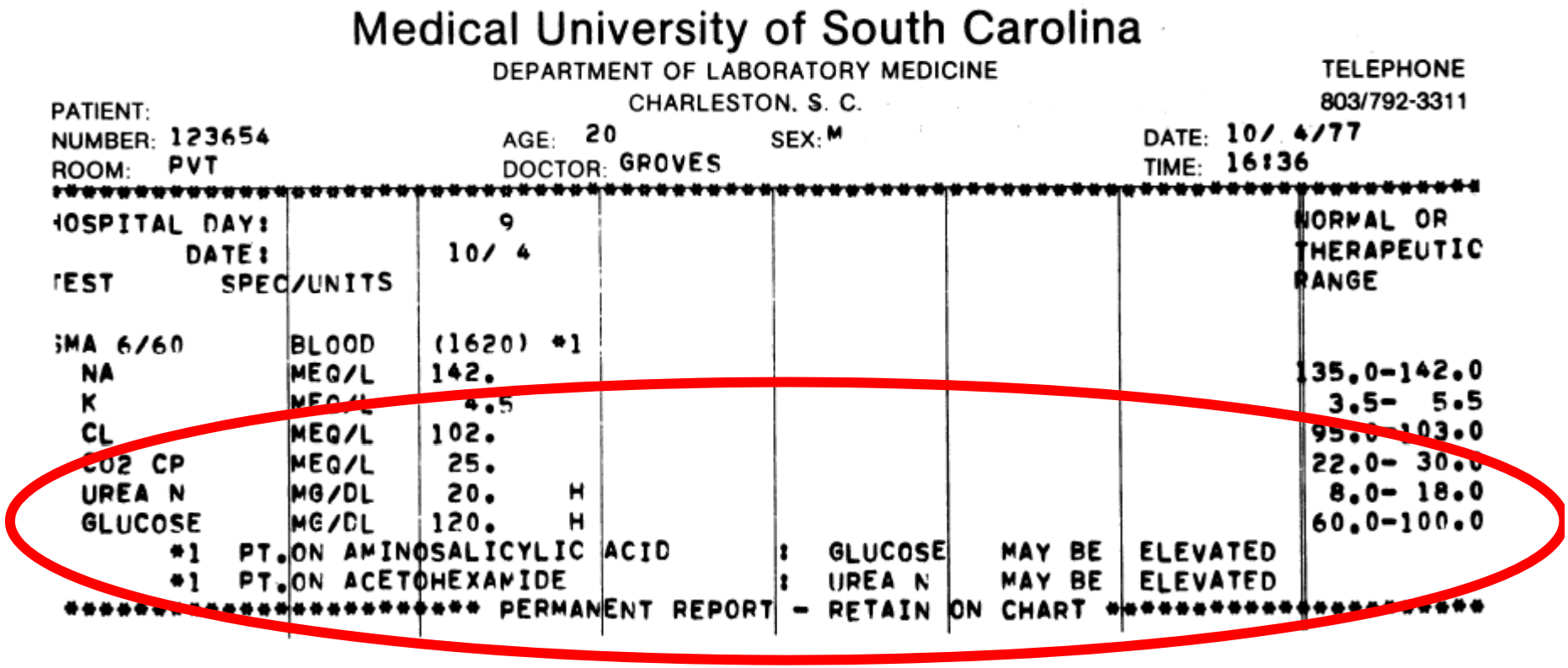
Author: **Donald S. Young**, M.D., Ph.D.(University of Pennsylvania) with contributions from **Richard B. Friedman**, M.D. (University of Hawaii) to the effects of diseases.

Information



Medical University of South Carolina

DEPARTMENT OF LABORATORY MEDICINE
CHARLESTON, S. C.

TELEPHONE
803/792-3311

PATIENT:
NUMBER: 123654
ROOM: PVT

AGE: 20 SEX: M
DOCTOR: GROVES

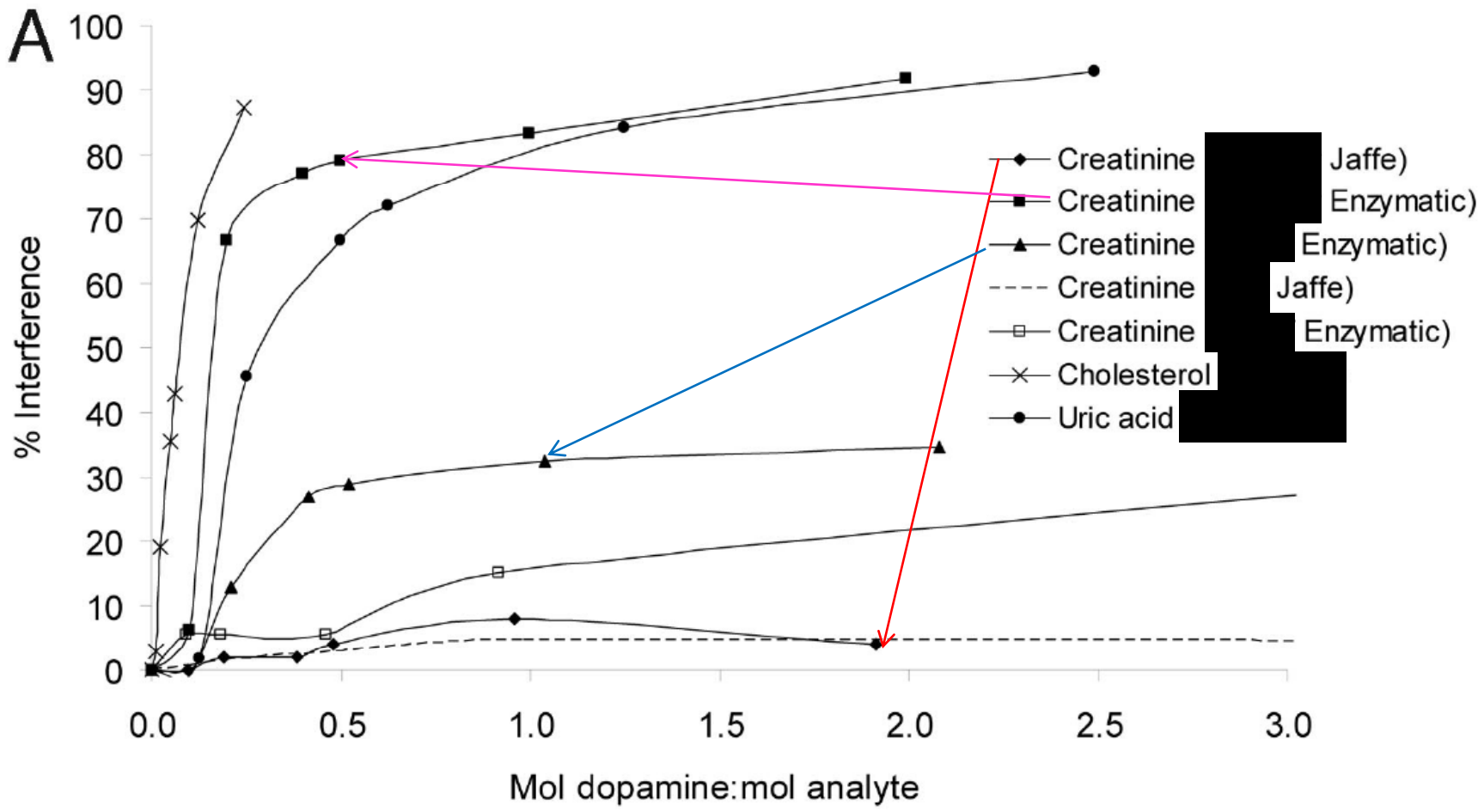
DATE: 10/ 4/77
TIME: 16:36

HOSPITAL DAY:		9					NORMAL OR THERAPEUTIC RANGE
DATE:		10/ 4					
TEST	SPEC/UNITS						
SMA 6/60	BLOOD	(1620) *1					
NA	MEQ/L	142.					135.0-142.0
K	MEQ/L	4.5					3.5- 5.5
CL	MEQ/L	102.					95.0-103.0
CO2 CP	MEQ/L	25.					22.0- 30.0
UREA N	MG/DL	20.	H				8.0- 18.0
GLUCOSE	MG/DL	120.	H				60.0-100.0
*1 PT. ON AMINOSALICYLIC ACID				: GLUCOSE	MAY BE	ELEVATED	
*1 PT. ON ACETOHEXAMIDE				: UREA N	MAY BE	ELEVATED	

********** PERMANENT REPORT - RETAIN ON CHART **********

Groves, W E + Gajewski, W H, Proc Annu Symp Comput Appl Med Care. 1978 November 9; 426 – 434.

Catecholamin Interferenz



Saenger A K et al Clin Chem 55, in press (2009)

Gadolinium Interferenz I

Interferenz durch Gadolinium bei Calcium

Gadolinium ist ein Kontrastmittel bei der Magnetresonanz-Untersuchung

Es kann bei Calcium-Bestimmungsmethode

(*o*-Cresolphthalein) stören

Erniedrigte Wiederfindung

Kang et al Clin Chem 50, 741 – 746 (2004)

Gadolinium Interferenz II

Interferenz wird über 2 Tage beobachtet

Länger als man aus der Halbwertzeit schließen würde

Kang et al Clin Chem 50, 741 – 746 (2004)

Mißinterpretation:

~~**Gadolinium ist kein gutes Kontrastmittel**~~

***o*-Cresolphthalein- Methoden sind „schlecht“**

Metabolite

Metamizol (Dipyron)

Sehr schnelle Metabolisierung

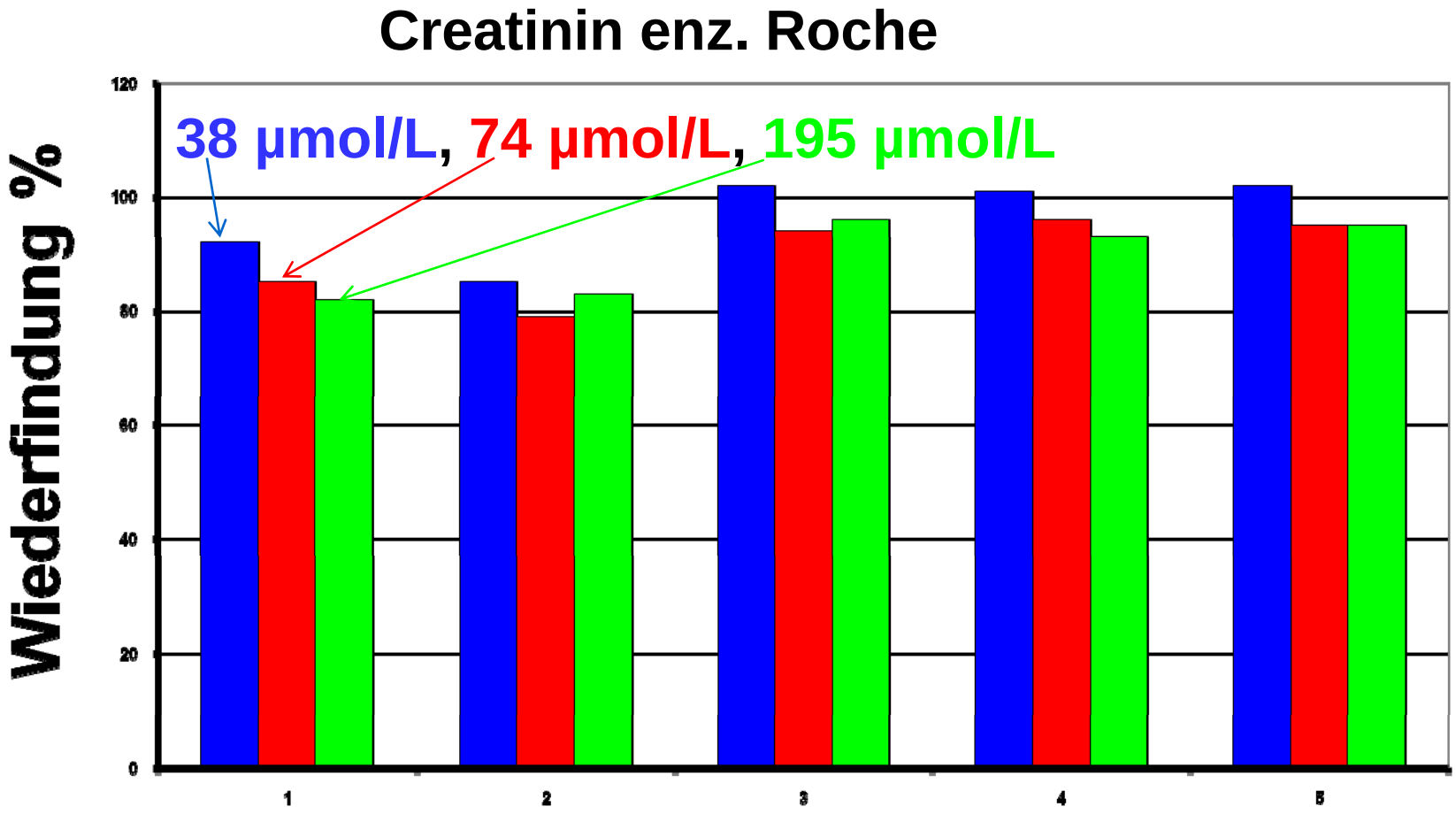
Interferenz durch Metabolismus des Medikaments

Muttersubstanz interferiert

Hauptmetabolite zeigen Interferenz

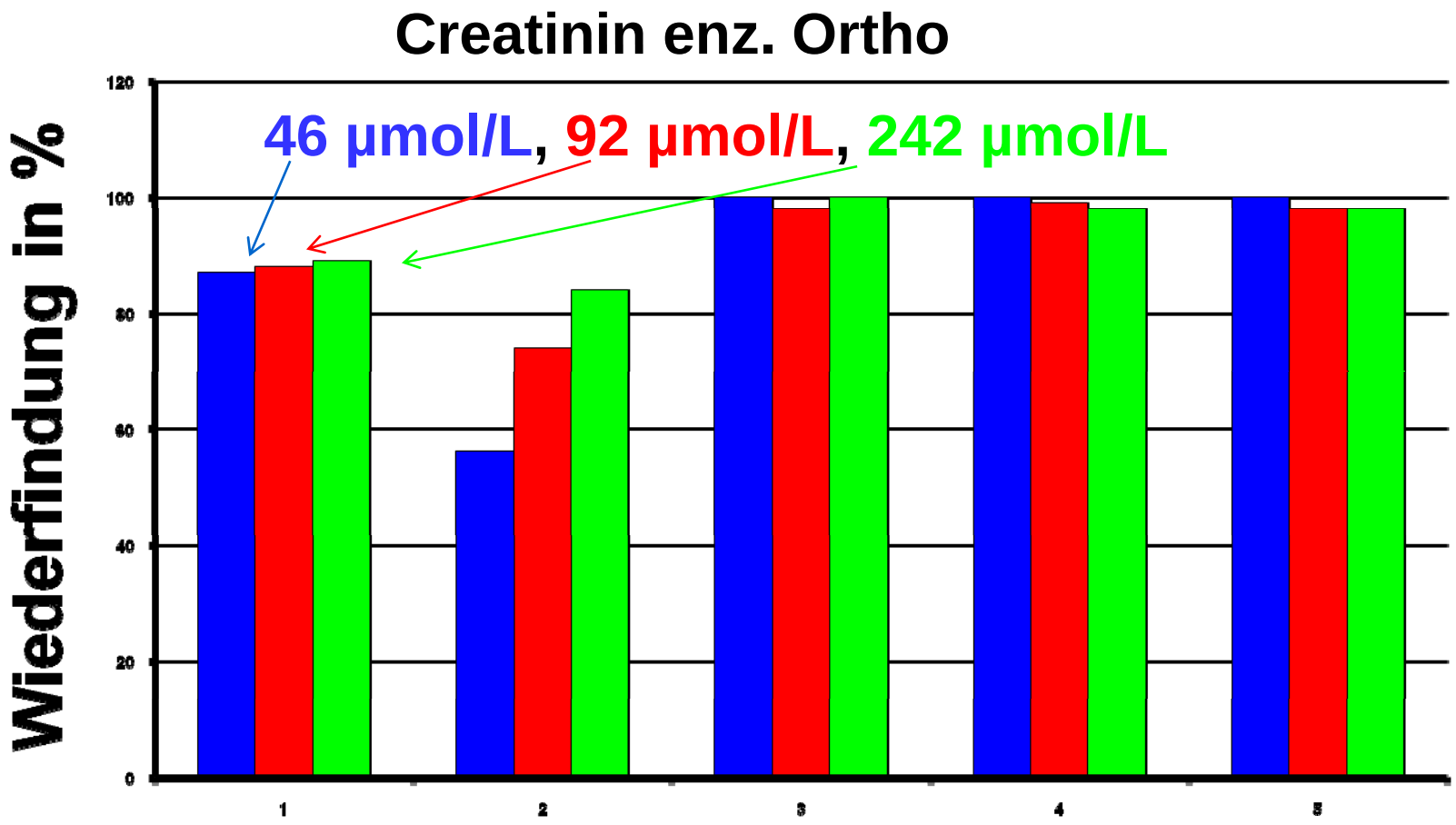
Bagnoud + Reymond, Eur J Clin Chem Clin Biochem 31, 753 - 757 (1993)

Metamizol Metabolite



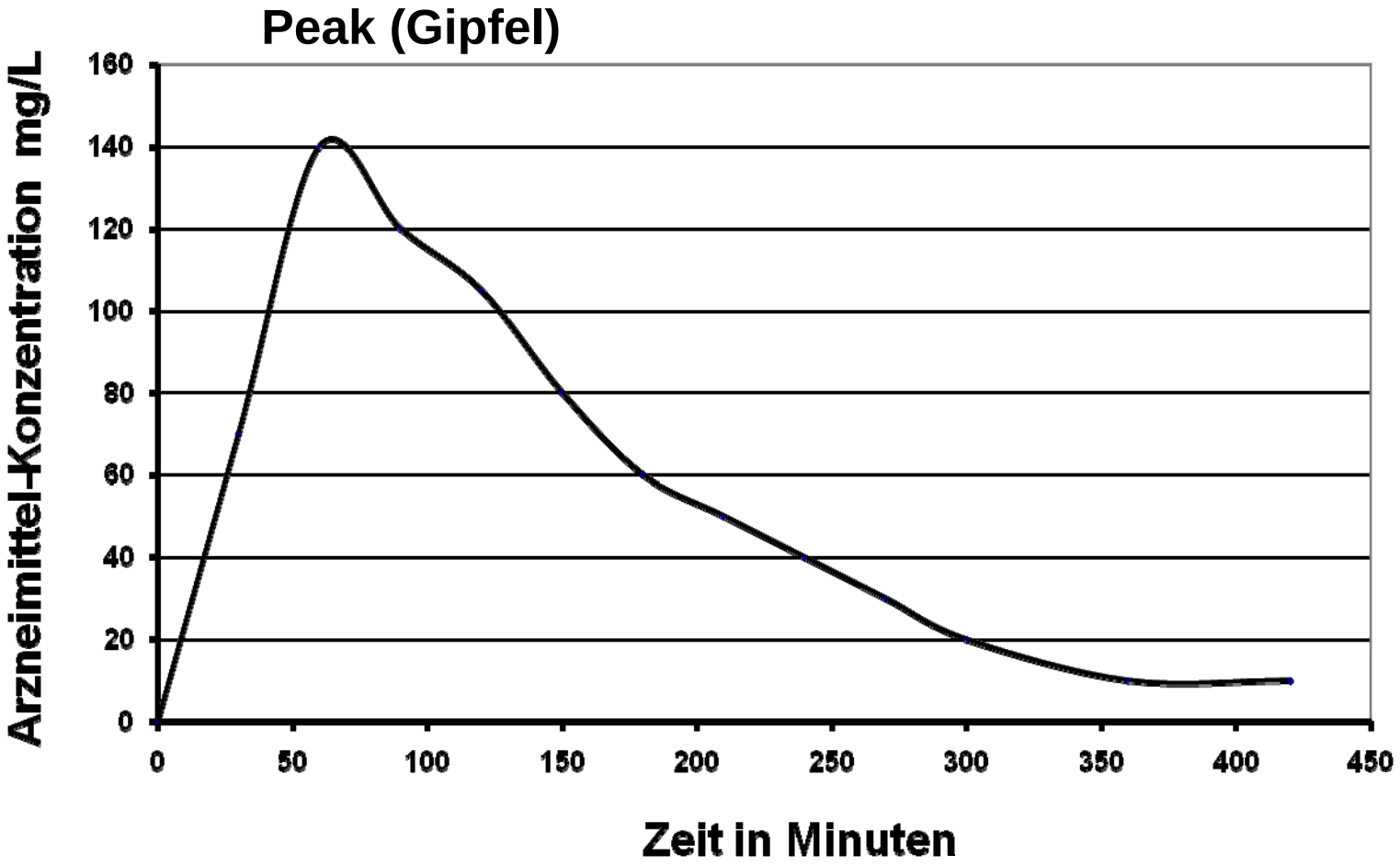
1 = Metamizol, 2 – 5 = Metabolite

Metamizol Metabolite



1 = Metamizol, 2 – 5 = Metabolite

Pharmakokinetik



Kräuter

Review of Abnormal Laboratory Test Results and Toxic Effects Due to Use of Herbal Medicines

Amitava Dasgupta, PhD

Key Words: Herbal medicine; Abnormal test result; Interference; Drug-herb interactions

Am J Clin Pathol 120, 127-137 (2003)

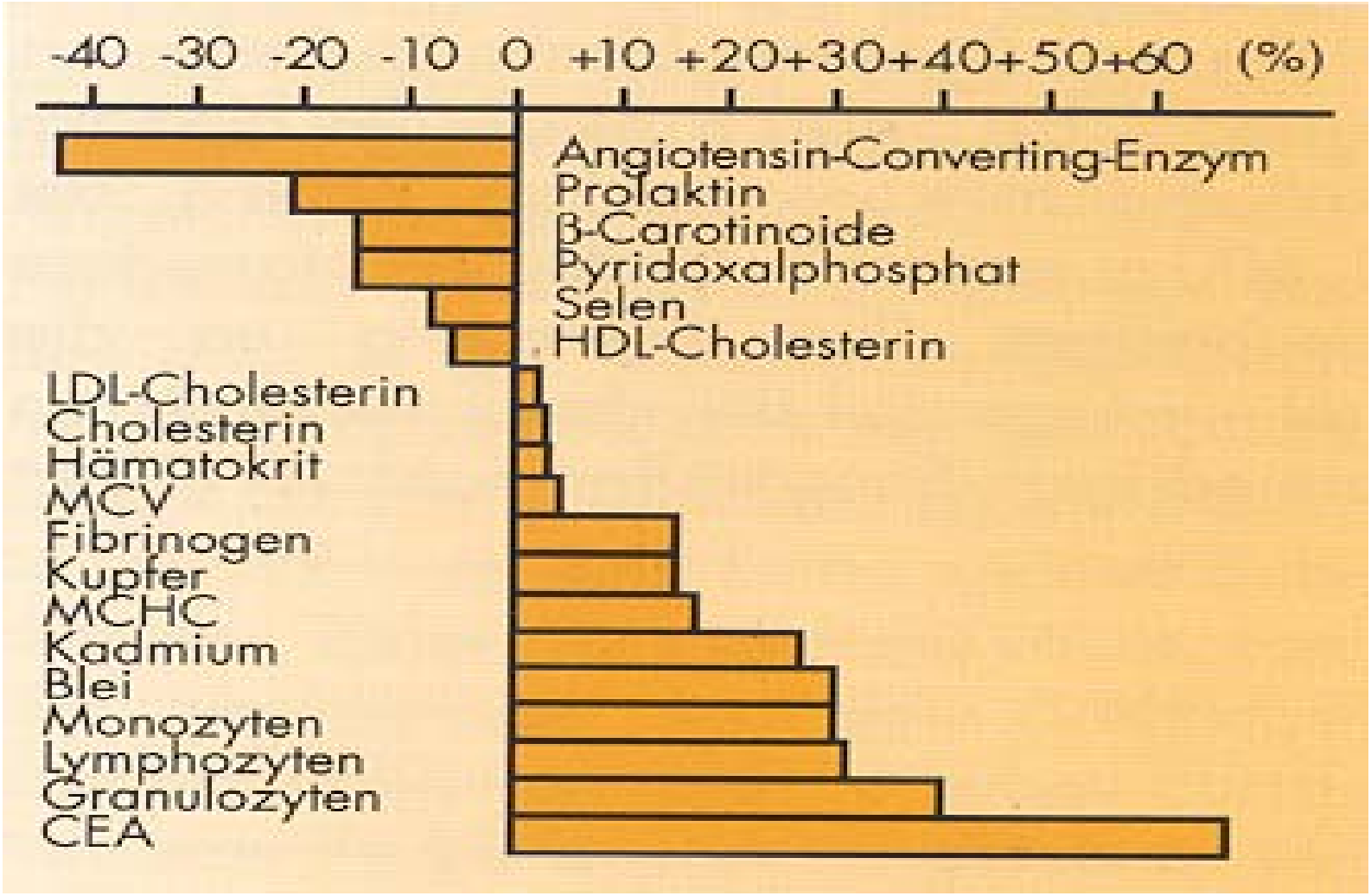
Kräuter

Mistletoe and Liver Damage

Mistletoe is a parasitic evergreen plant that lives on trees such as oaks, elms, firs, pines, and apple. Mistletoe was used in folk medicine as a digestive aid, heart tonic, and sedative. Mistletoe berries are poisonous. In a 49-year-old woman with nausea, general malaise, and dull abdominal pain, the results of liver function tests suggested hepatitis (ALT, 123 U/L; lactate dehydrogenase, 395 U/L; AST, 250 U/L). Liver biopsy also suggested hepatitis. However, all serologic tests for hepatitis were negative. The patient had drug-induced hepatitis probably due to mistletoe.[50]

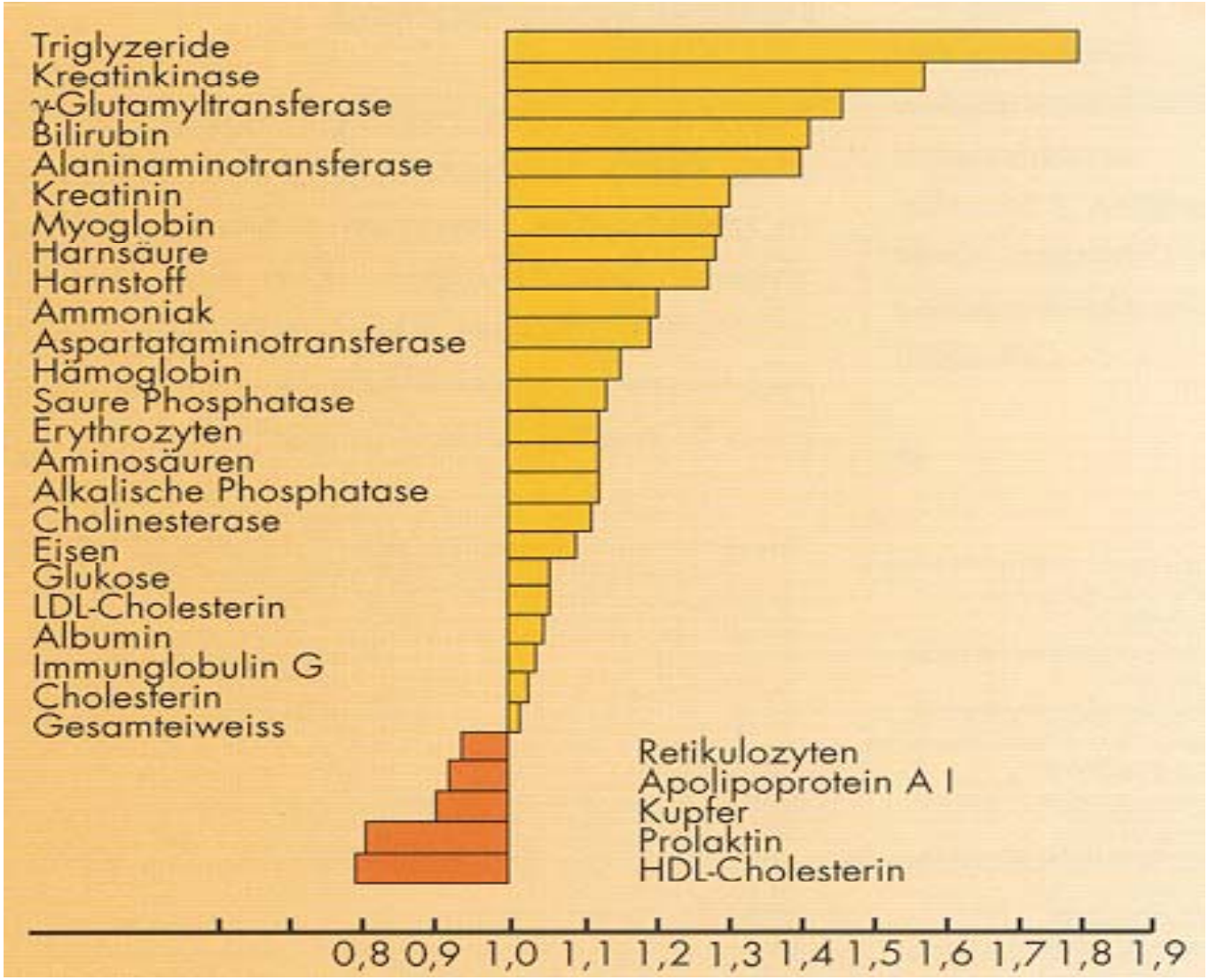
Dasgupta, A., Am J Clin Pathol 120, 127 – 137 (2003)

Raucher



Guder et al, Samples: From the Patient to the Laboratory, 3rd ed., Wiley-VCH, Weinheim/D

Unterschied ♂ ♀



Guder et al, Samples: From the Patient to the Laboratory, 3rd ed., Wiley-VCH, Weinheim/D

Alkohol

Goldberg, D. M. et al., Clin. Biochem. 32, 505 – 518 (1999)

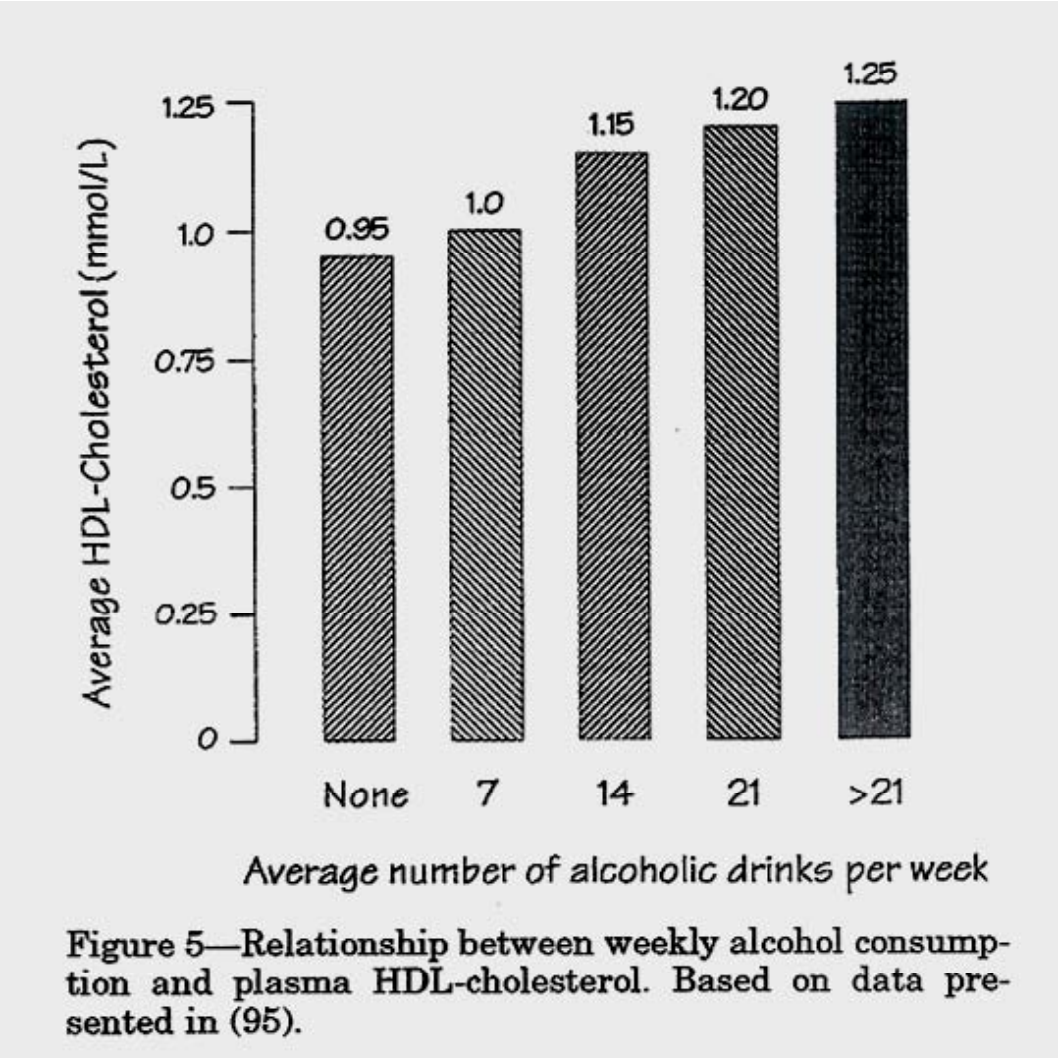


Figure 5—Relationship between weekly alcohol consumption and plasma HDL-cholesterol. Based on data presented in (95).

Ausblick

Präanalytik spielt bedeutende Rolle in der Analytik

Informationen vorhanden – werden jedoch nicht berücksichtigt

Befundung benötigt Interpretation

Konsultation nicht nur sinnvoll, sondern zwingend notwendig

Stellenwert des Labors aufzeigen

Motivation durch Rundversuch steigern