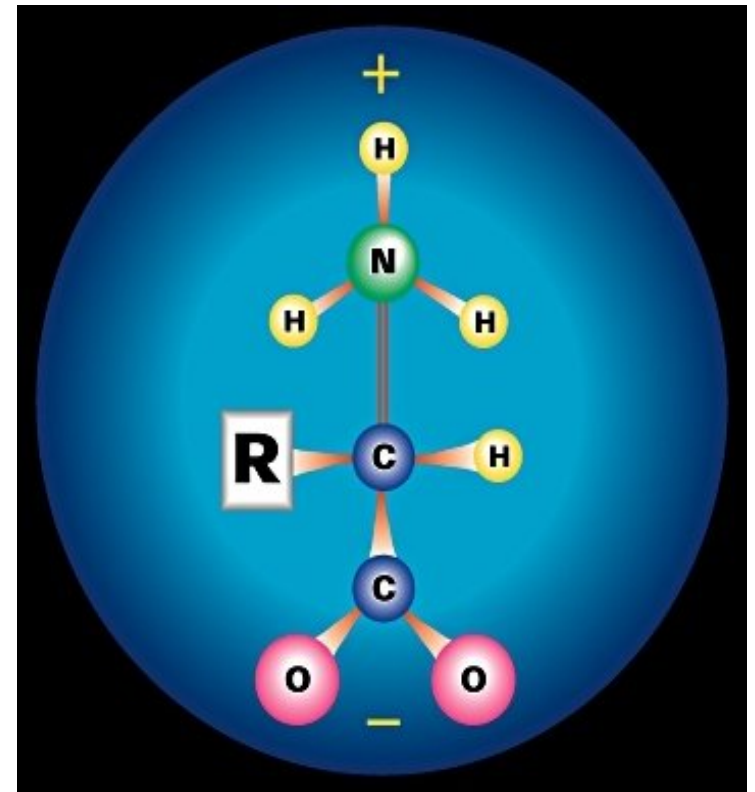


A Common Interest in Amino Acids and ERNDIM

Dr Mick Henderson

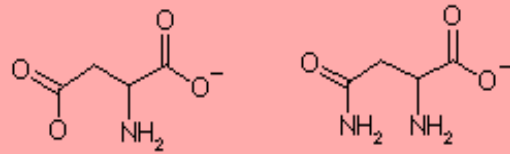
Biochemical Genetics

St James's University Hospital, Leeds



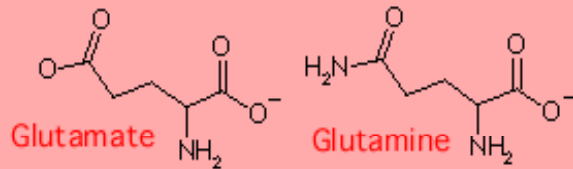


Acidic and amide side chains



Aspartate

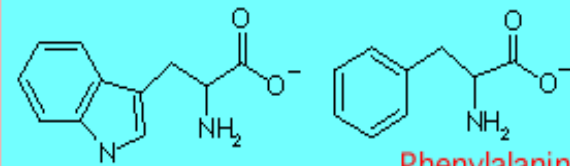
Asparagine



Glutamate

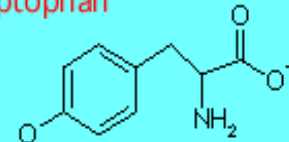
Glutamine

Aromatic side chains



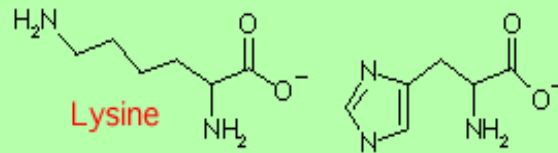
Tryptophan

Phenylalanine



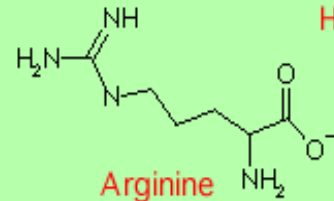
Tyrosine

Basic side chains



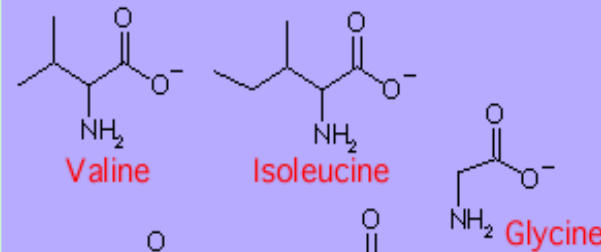
Lysine

Histidine



Arginine

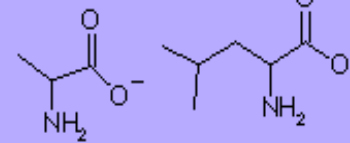
Aliphatic side chains



Valine

Isoleucine

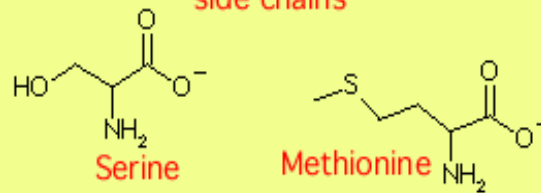
Glycine



Alanine

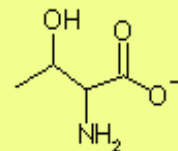
Leucine

Hydroxyl or sulfur-containing side chains

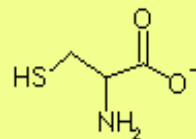


Serine

Methionine

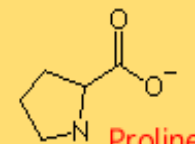


Threonine



Cysteine

Cyclic side chain



Proline



**‘Amino acids’ was the topic of the first
ETAC Academy Course**

Pre analytical problems

Material for workshop A

ERNDIM training day

Lisbon 2008

Specimen

- Contamination

ECF, sweat, haemolysis, skin cream, drip fluids.

- Delay

gln → glu
arg → orn;
loss of cys, hcys, tryp

Other

- Age
 - Infancy/feeds
- Diet / fasting / TPN

e.g. carn; ans; hcit; methyl his

- Drugs

antibiotics, anticonvulsants

- Bacterial metabolism, effects on urine samples

↓cys, ser↑

Homocystinuria Monitoring of Amino Acids

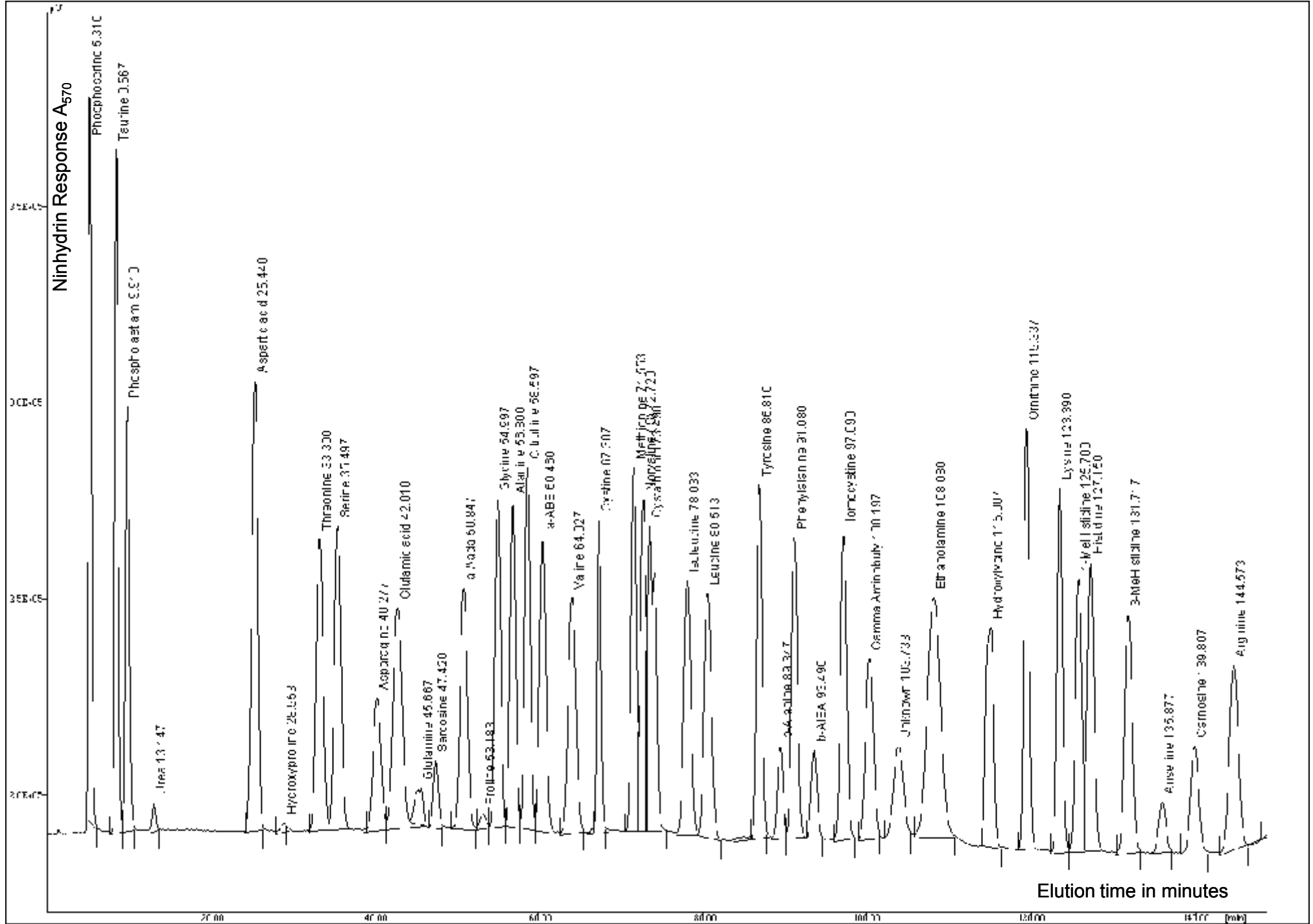
What to measure

Brian Fowler

Quantitative Amino acid analysis

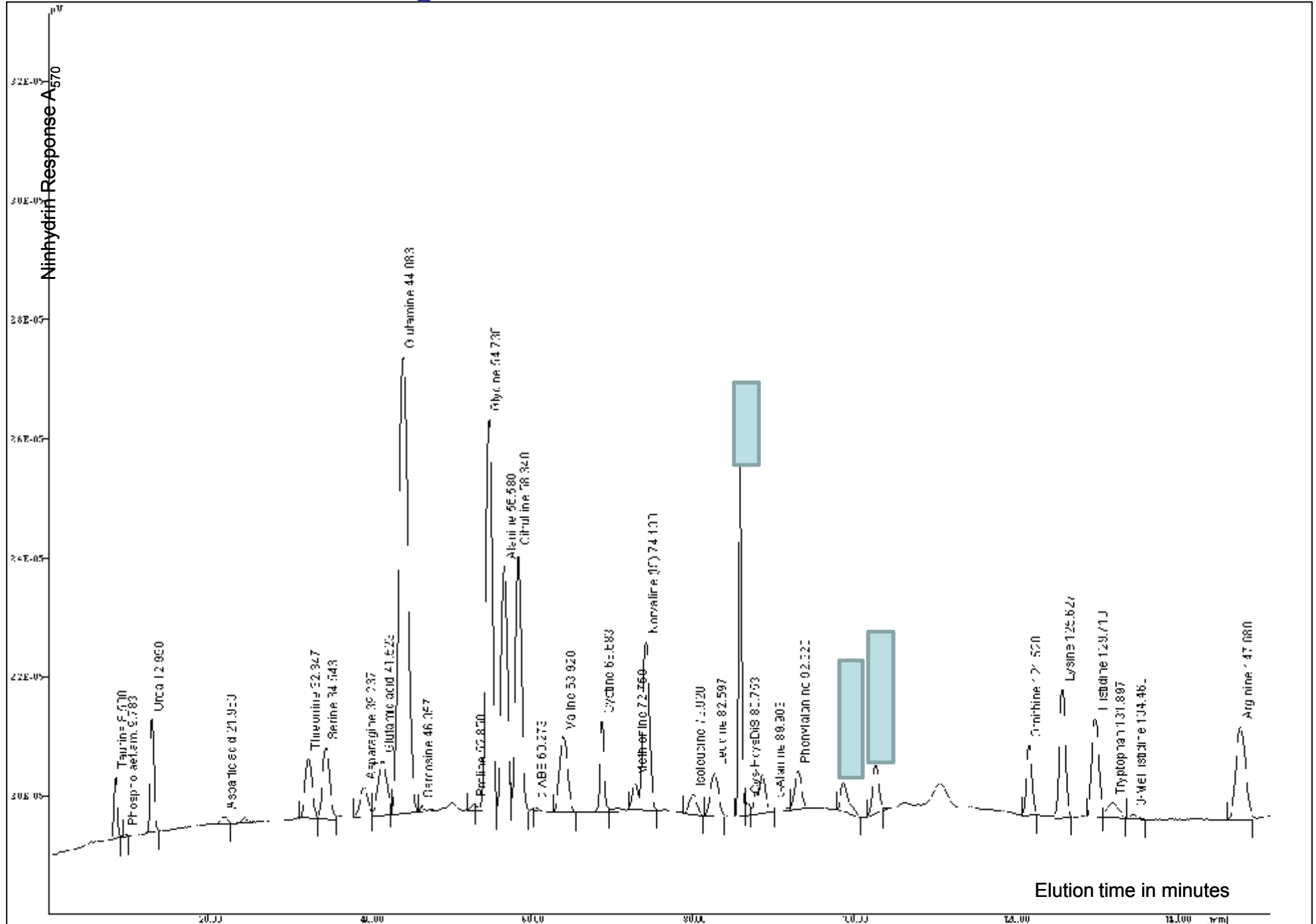
Reporting and Interpretation

Ion-exchange chromatogram: Standards

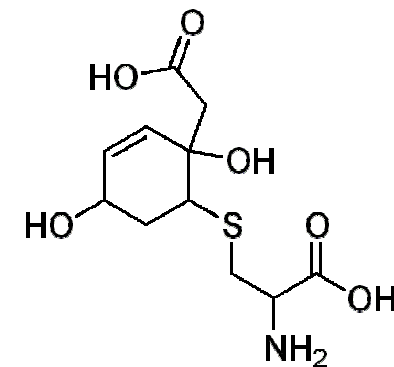
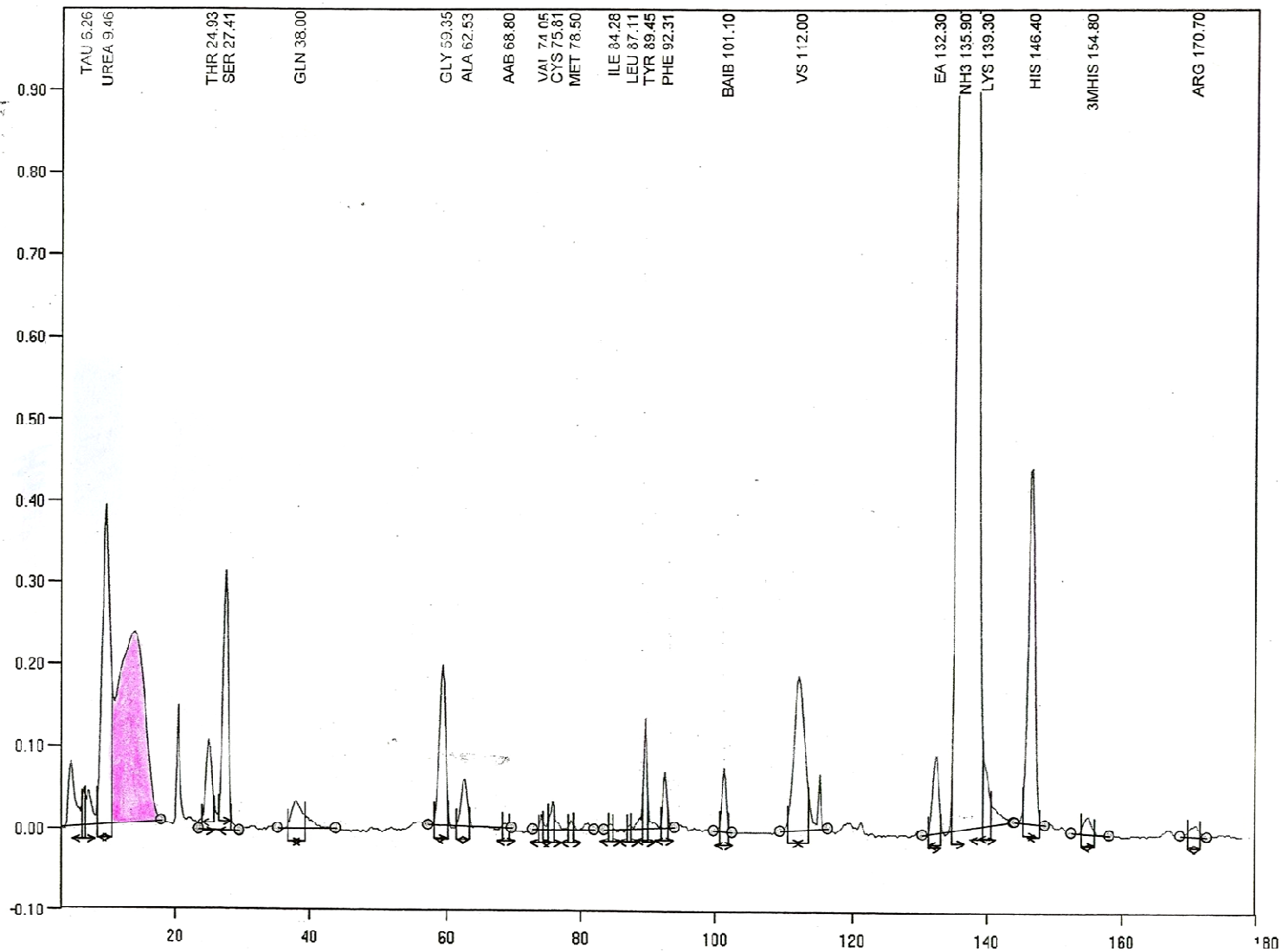


Ion-exchange chromatogram Plasma 5

Arginino-succinic aciduria



Ion-exchange chromatogram Urine Hawkinsinuria



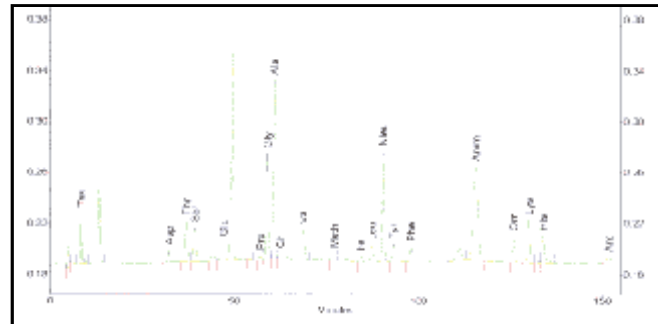
Hawkinsin

Why do clinical labs measure AA?

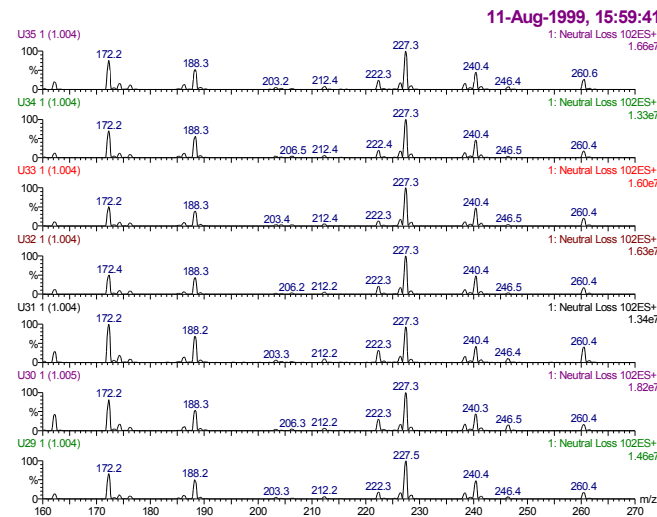
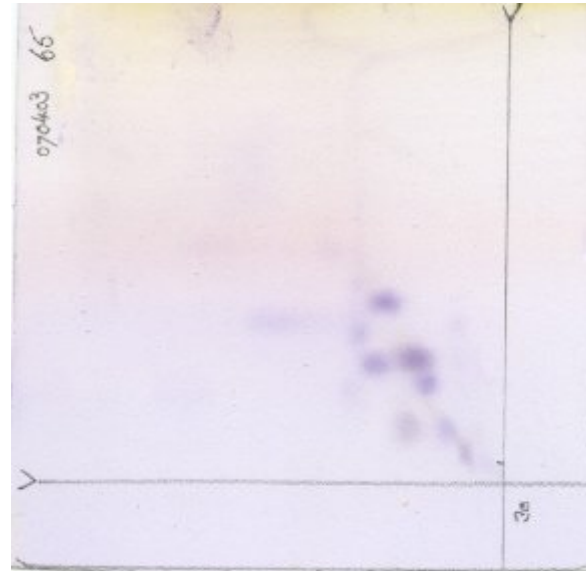
- Diagnosis of IEM
- Monitoring diets in IEM patients
- General nutritional monitoring
- Research

A Variety of Techniques

Automated ion exchange amino acid analyser and plasma chromatogram



TLC urine amino acids, normal pattern



Tandem mass spectrometer and bloodspot chromatograms

Annual workload summary from the Leeds Lab

- Qualitative amino acids
 - Urine TLC 1500
- Quantitative amino acids (ion exchange AAA)
 - Plasma 2000
 - Urine 1000
 - CSF 60
- Quantitative amino acids (TMS)
 - Plasma phe/tyr 2400
- Quantitative amino acids screening (TMS)
 - Bloodspot phe/tyr/met/leu; 47,000

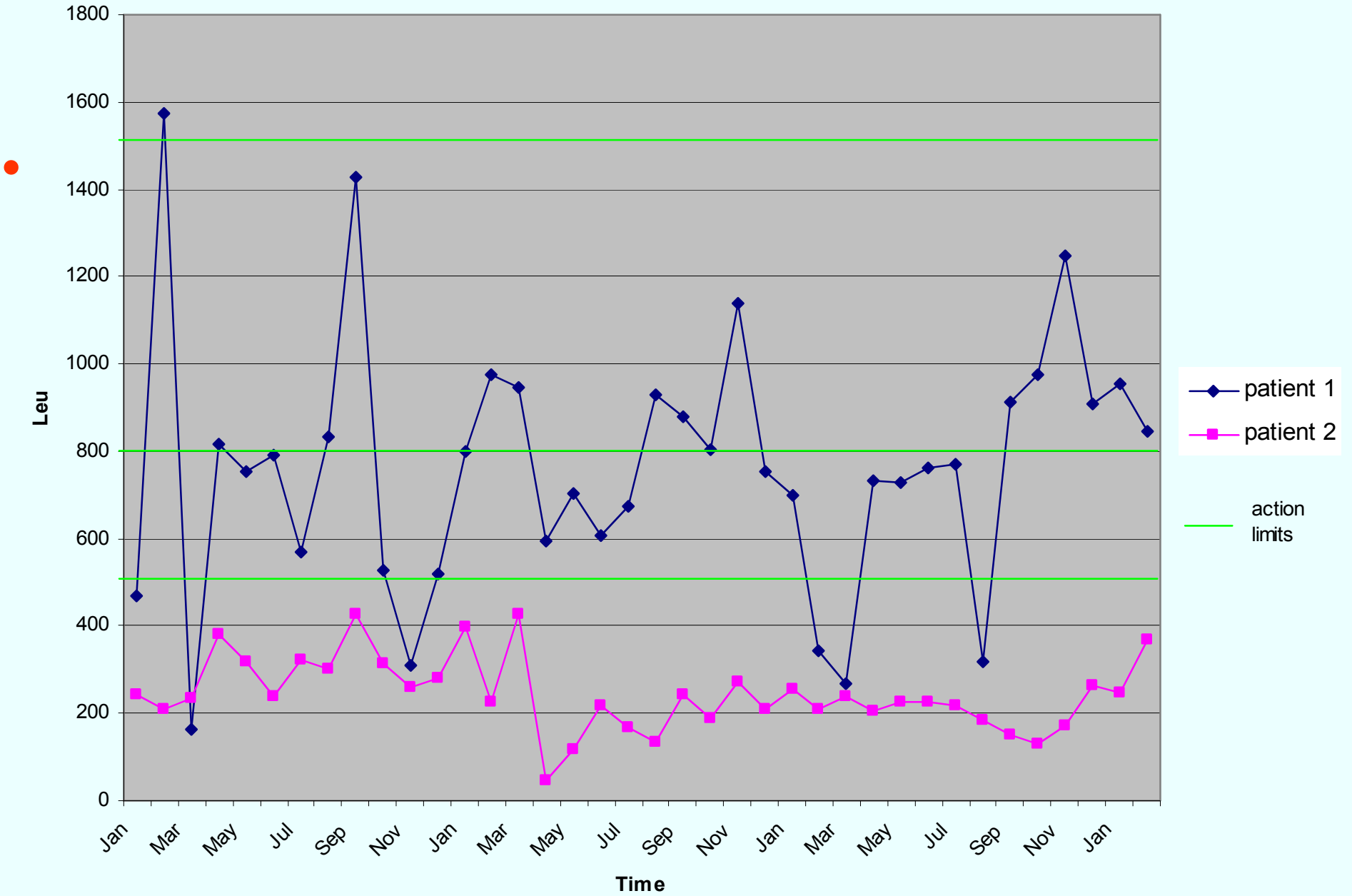
Dietary Monitoring Examples

Material for workshop C

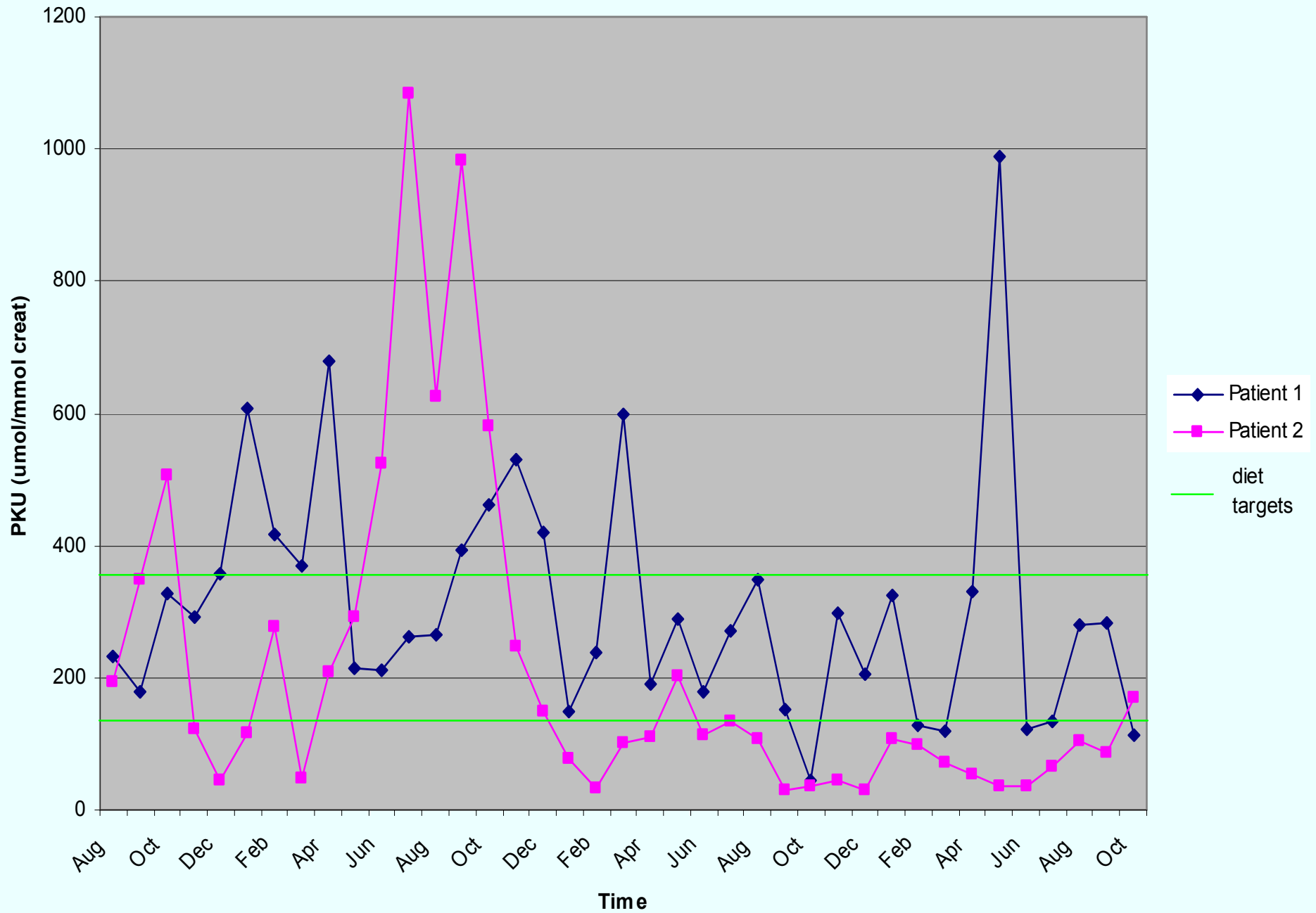
ERNDIM training day

Lisbon 2008

MSUD patients diet history



PKU patients diet history



Essential amino acids

Histidine, isoleucine, leucine, lysine,
methionine, phenylalanine, threonine,
tryptophan, valine

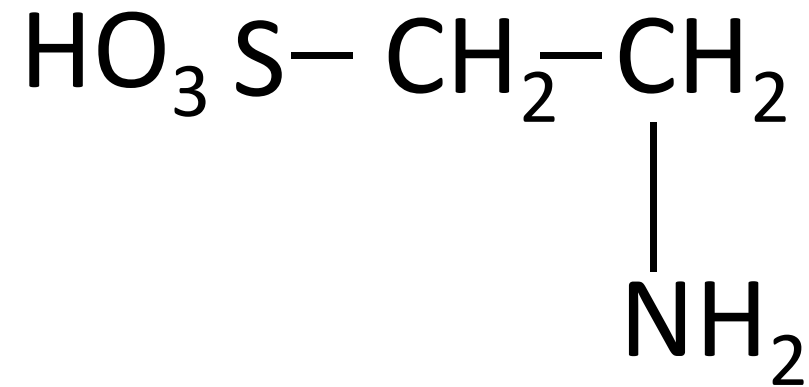
**conditionally essential for
neonates:**

cysteine, tyrosine, taurine,
arginine and glycine



Taurine

an honorary amino acid!



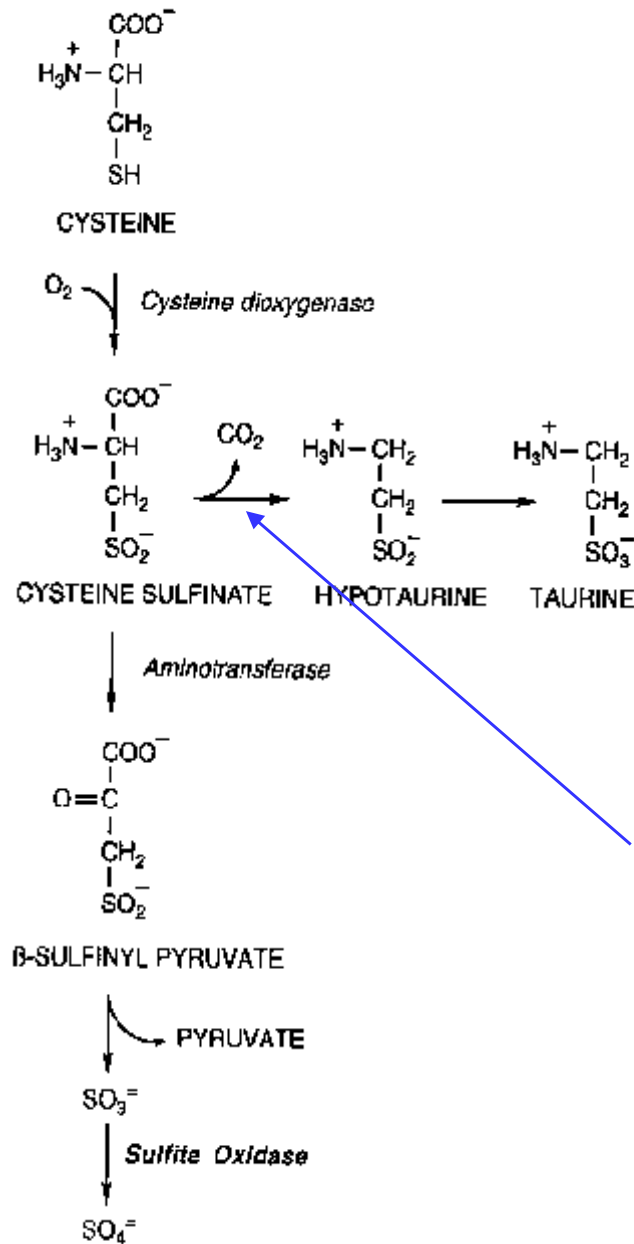
Essential for

Cats



And babies





Cysteine sulfinic acid
decarboxylase

Taurine

Vital for:

- Bile salt formation
- Vision
- Growth

Made from methionine and
cysteine

- Neonates have low CSAD activity
- Breast milk is rich in taurine

Taurine designated 'essential nutrient' by the FDA Expert Panel, 2002

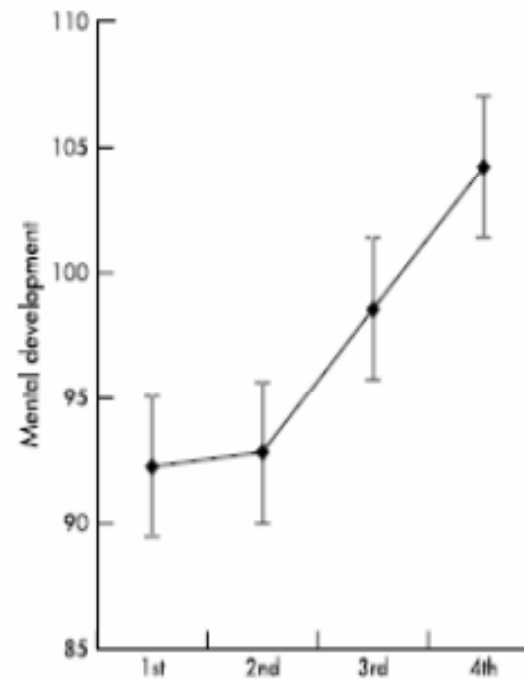
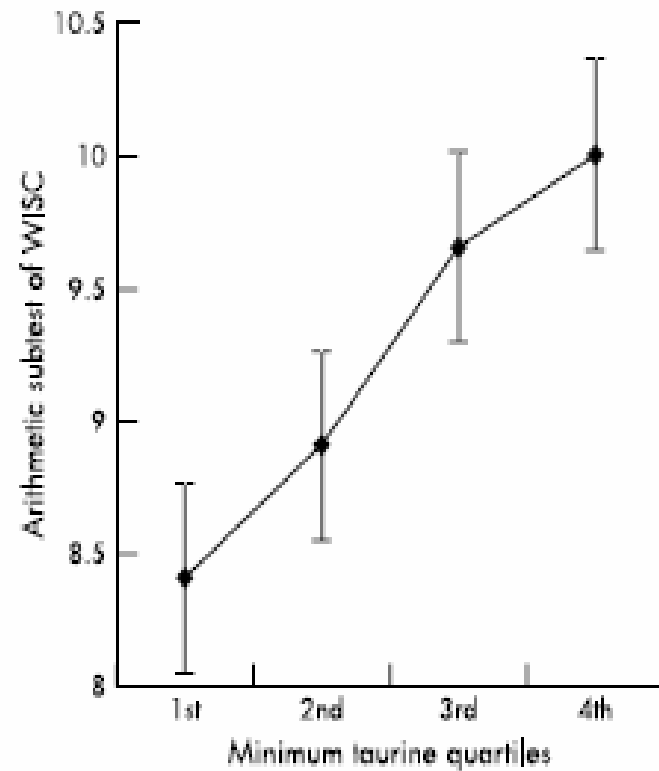


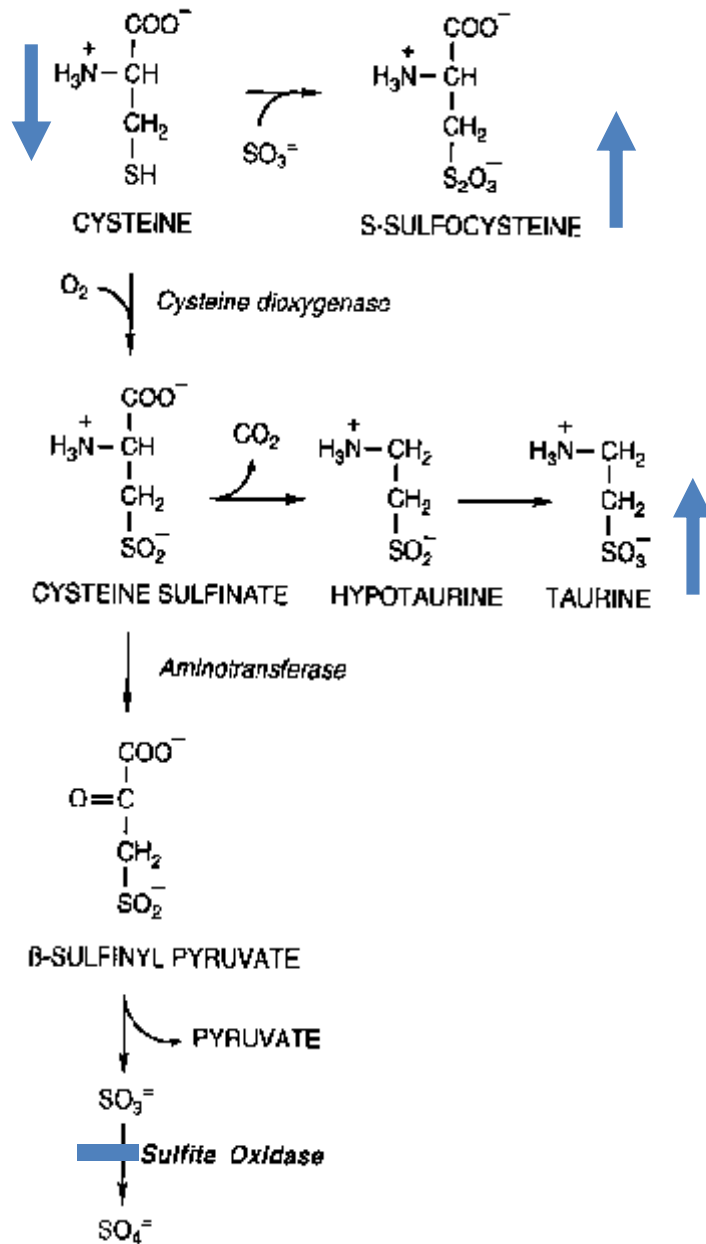
Figure 1 Bayley mental development index at 18 months, arithmetic subtest of WISC-R at 7 years, and minimum neonatal plasma taurine concentration ($\mu\text{mol/l}$). Taurine, 1st quartile, 20–43; 2nd quartile, 44–55; 3rd quartile, 56–67; 4th quartile, 68–180. Mental development index, mean (SE) 97 (2). Arithmetic score, mean (SE) 9 (0.3).

Wharton BA et al Arch Dis Child Fetal Neonatal Ed 2004;89:F497–F498.

Essential, Just like the SSIEM!

Brian was
Council member 1963-68
Secretary 1988-93
Chairman 1994-99





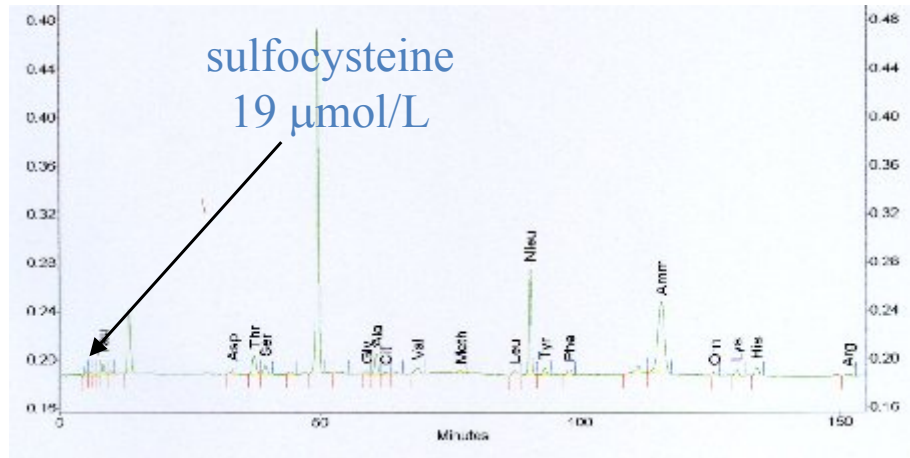
Sulfite Oxidase Deficiency

*Johnson and Wadman,
7th Edition, Scriver, MMBID*

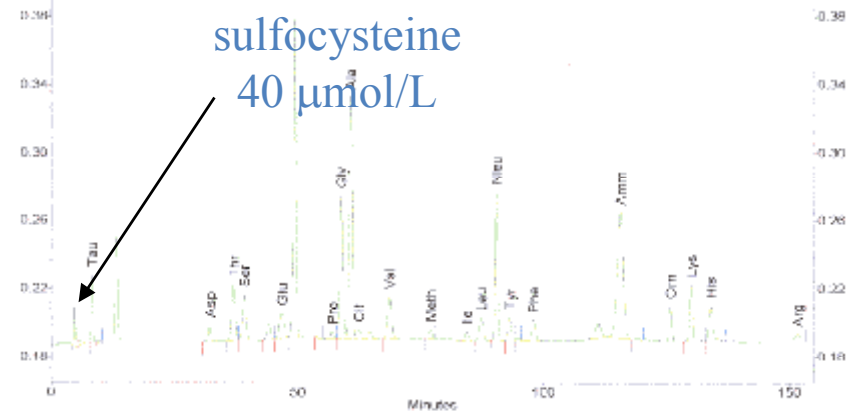
Female baby

unrelated parents
term baby, no recorded neonatal problems
severe persistent fitting from day 2
died at 3 weeks

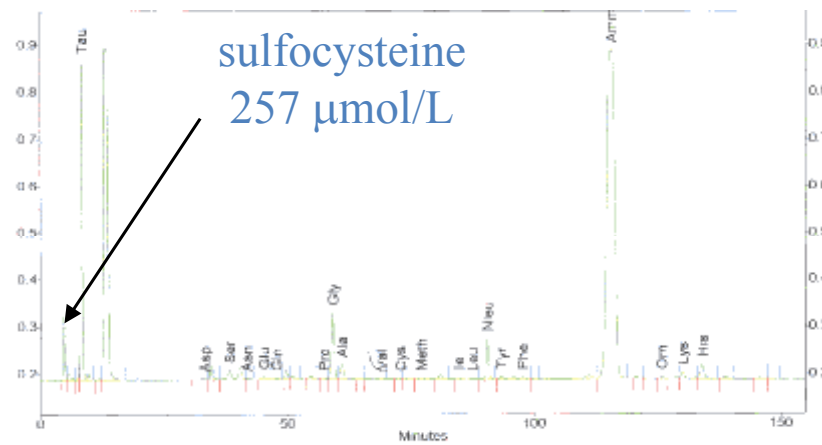
CSF



Plasma

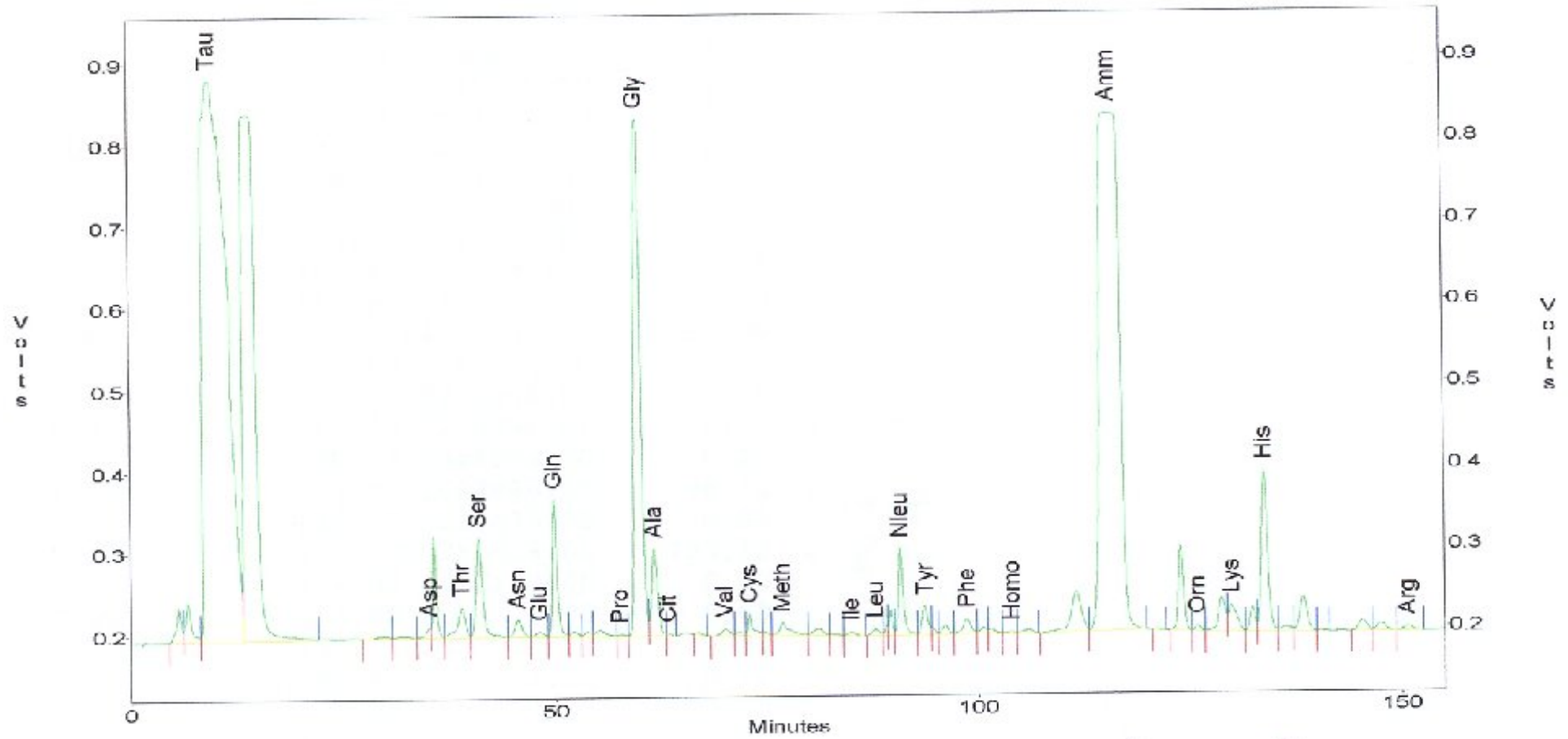


Urine



Red Bulluria!

c:\ezchrom\NOV\12nov.040 -- Channel A



Quality Assurance and Education are Vital

All laboratory processes must be subject to quality control procedures

- Internal QC

- *real time*

- *enables judgements of acceptability*

- External QA

- *retrospective*

- *independent verification of performance*

- *Sharing experience of rare materials*

- *who else but ERNDIM!*

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[QA Scheme](#)

[Meetings & Reports](#)

[Training](#)

[Newsletters](#)

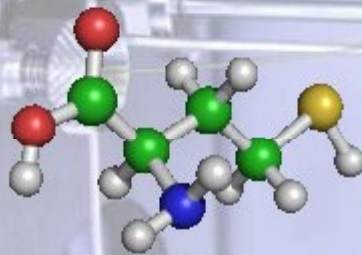
[Laboratories](#)

[Links](#)



Diagnosis
and Treatment

Welcome to ERNDIM



ERNDIM ...

is synonymous with quality control of laboratory measurements within the field of the study of inborn errors of metabolism.

[read more ...](#)

Current Newsletter



[Newsletter Spring 2011](#)

1-Apr-2011

We have now appointed a scientific administrator for ERNDIM. Dr Sara Gardner took up her position in February of this year. ...

News and Events



[Honorary Symposium to mark the retirement of Prof. Brian Fowler](#)

3rd. November 2011, Manchester Conference Centre, Manchester, UK

Organisers: Dr. Jim Bonham & Dr. Mick Henderson

Chair: Dr. Jim Bo . . .



[SSIEM Academy 2011](#)

Amsterdam, 22-24 November 2011



