

Workshop

Concept systems in laboratory medicine

The C-NPU coding scheme in
Laboratory Medicine

Properties and Units in the Clinical Laboratory Sciences

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April 2, 1805 – August 4, 1875

- HC A was forward-looking and future-orientated.
- It appears from his fairy-tale 'The two Maidens'.
- "I think you are unaware of something called European Standards"

Foreword and scope

- The standard systematic names for properties in clinical laboratory sciences are intended to serve as 'point d'appui' or 'bridge' for mapping and translation.
- Each property is structured according to IUPAC-IFCC syntax rules and the terms (semantic part) defining the property follow recommendations by international organisations.
- Standard systematic names and codes are to be used as a bridge between formats in different 'cultural' areas of language or local technical language, to ensure unambiguous and fully informative communication.

Bridge between local dialects

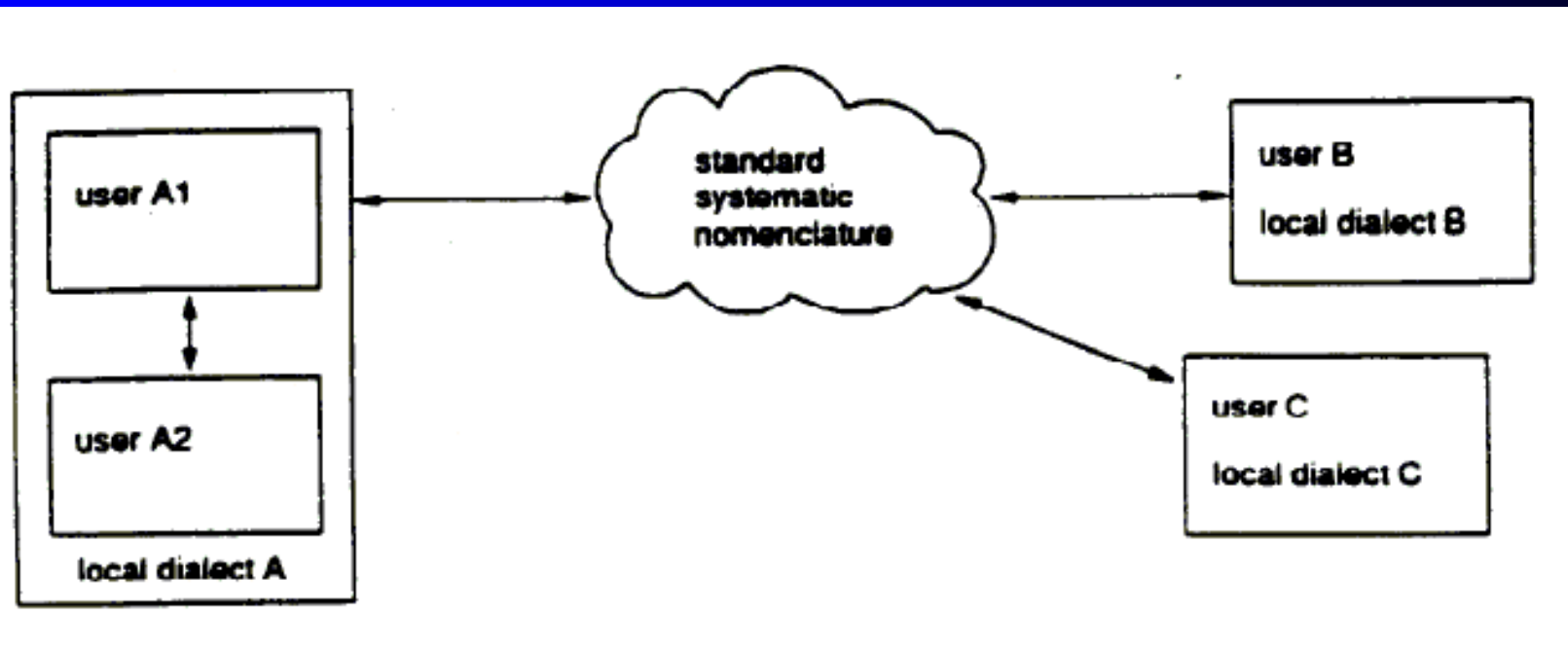
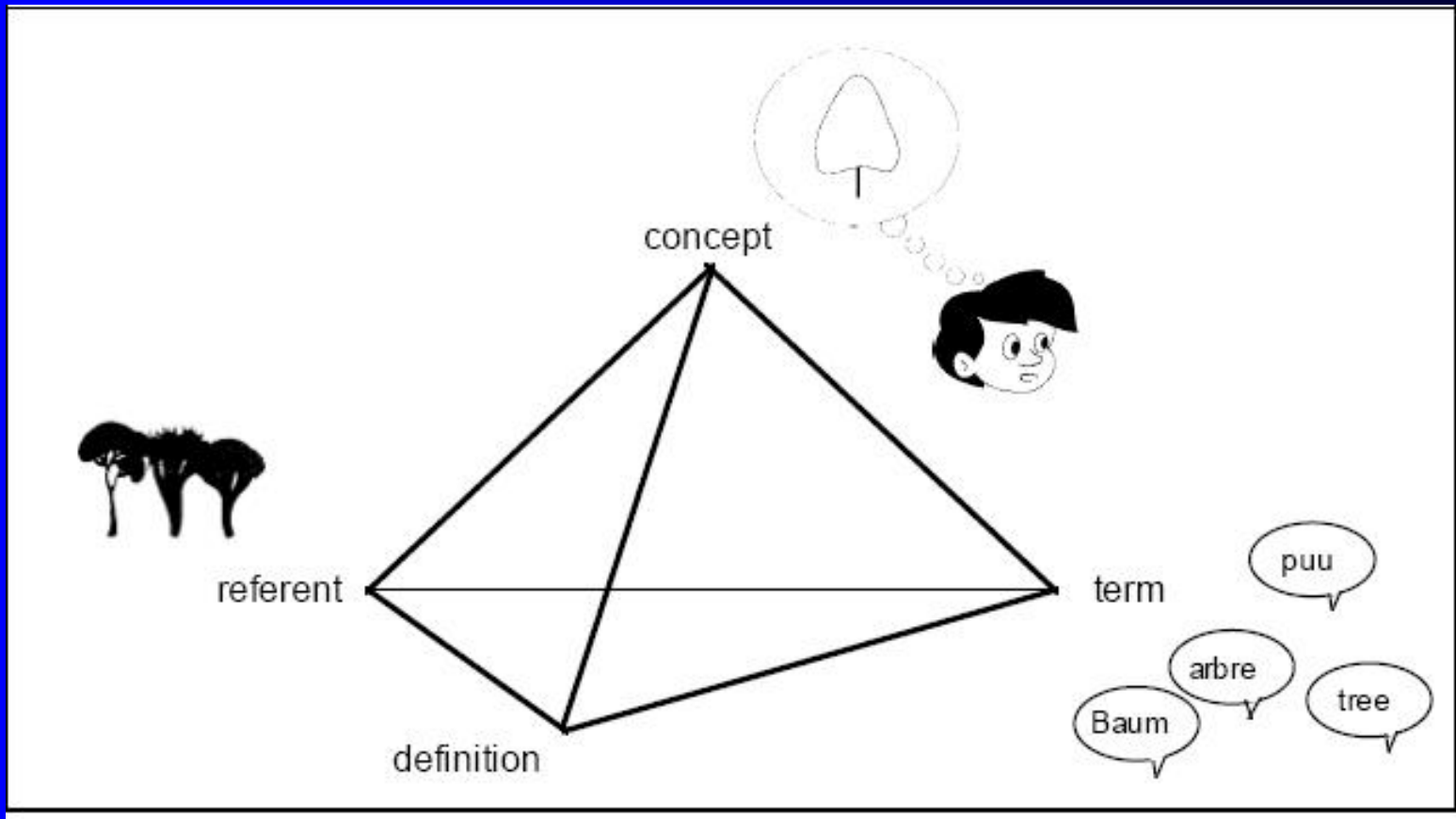


Figure 1 — Systematic nomenclature as the bridge between local dialects

Concept



Glossary of terms

Glossary of terms in quantities and units in clinical chemistry (IUPAC-IFCC Recommendations 1996)

Published in *Pure & Appl Chem* 1996; 68: 957-1000).

The goals are to ensure that such quantities and units are consistent with standards promulgated by authoritative international standards organizations in metrology e.g. International Organization for Standardization (**ISO**), the International Bureau of Weights and Measures (Bureau International des Poids et Mesures-BIPM) and the International Union of Biochemistry and Molecular Biology (**IUBMB**)

Examples of Glossary of terms

- amount-of-substance n mol
- becquerel Bq
- catalytic activity concentration b kat m⁻³
- osmolality m mol kg⁻¹

Concepts and definitions

- A **measurement** is a description of a property of a system.
- **System:** demarcated arrangement of a set of elements and a set of relationships between these elements
- **Component:** definable part of a system
- **kind-of-property:** attribute of phenomena, bodies or substances that may be distinguished qualitatively

SYNTAX AND SEMANTIC RULES

Syntax:

**System(specification)—
Component(specification);
kind-of-property(specification)**

Semantic rules:

The terms used spelled out in full. However, abbreviations is unavoidable. But kept to a minimum.

Example

Blood—

Haemoglobin(Fe);

substance concentration

millimole/litre

$M = 16\,500$ g/mol

NPU02319

B—Haemoglobin(Fe); subst.c. = ? mmol/l

Example 1 with codes

NPU02319

B—Haemoglobin(Fe); subst.c. = 8,5 mmol/l

Code string

QU59901:MSHD001769:QU59903:MSHD006454:QU59904:QU70071:
QU59905:QU50003:QU59907:=8,5:QU59909:QU09408:QU59910:QU99999

NPU02319 = 8,5

Another Example

**Patient(Urine)—
Alanine;
substance rate(procedure)
micromole/day
NPU17753**

**Pt(U)—Alanine; subst.rate(proc.) = ?
 $\mu\text{mol/d}$**

procedure

Example 2 with codes

NPU17753

Pt(U)—Alanine; subst.rate(proc.) = ? $\mu\text{mol/d}$

QU59901:MSHD010361:QU59902:MSHD014556:QU59903:
CAS56-41-7:QU59905:QU50011:QU59906:QU70500:QU59907:
= 8,5:QU59909:QU10409:QU59910:QU99999

NPU17753 = 8,5

procedure(94-08-10 09:30; 11:15)

Example 3 with codes

NPU08758

U—Amoxicillin; arb.c.(proc.) = ?

QU59901:MSHD014556:QU59903:CAS26787-78-0:
QU59905:QU50081:QU59906:QU70500:QU59907: = ?:QU59910:QU99999

NPU08758 = 1 :

procedure(0 1 2)

Example in different languages

| | |
|---|-----|
| P—Angiotensinogen; subst.c. µmol/l | GBR |
| P—Angiotensinogen; stofk. µmol/l | DNK |
| P—Angiotensinógeno; c.sust. µmol/l | ESP |
| P—Angiotensinogène; c.mat. µmol/l | FRA |
| P—Angiotensinogênio; conc.subst. µmol/l | PRT |

| | | |
|----------------------------|-----------------|-----|
| substance concentration | micromole/litre | GBR |
| stofkoncentration | mikromol/liter | DNK |
| concentración de sustancia | micromol/litro | ESP |
| concentration de matière | micromole/litre | FRA |
| concentração de substância | micromol/litro | PRT |

QU59901:MSHD010949:QU59903:CAS11002-13-4:QU59905:QU50003:QU59907: =
2,4:QU59909:QU10408:QU59910:QU99999

NPU01258 = 2,4

Now to the codestring

| | | |
|---------------------|----------------------------|----------------|
| QU59901:MSHD010361: | System is | Patient |
| QU59902:MSHD014556: | Specification to system is | Urine |
| QU59903:CAS56-41-7: | Component is | Alanine |
| QU59905:QU50011: | kind-of-property is | substance rate |
| QU59906:QU70500: | specification is | procedure |
| QU59907: = 8,5: | Value is | 8,5 |
| QU59909:QU10409: | Unit is | micromole/day |
| QU59910:QU99999 | Endcode is | End-of-message |

Sources of codes and elements

| Codeprefix | Organization | Number of codes April 2005 |
|-------------------|---|-----------------------------------|
| ATCC | The American Type Culture Collection | 1689 |
| CAS | Chemical Abstracts Service | 4566 |
| EC | Enzyme nomenclature database | 2493 |
| Hugo | Human genome database | 15734 |
| ISBT | International Society of Blood Transfusion | 682 |
| MSH | Medical subjects headings | 970 |
| NCCLS | The national committee for Clinical Laboratory Standards(Allergen codes) | 529 |
| UMLS | Unified Medical Subject Headings | 17 |
| WHO | World Health Organization | 149 |
| QU | Quantity and unit, element not found elsewhere | 4070 |

Part of Main table

| | | |
|--------------|---------|------------|
| 17753NPU | QU59901 | MSHD010361 |
| 17753NPU | QU59902 | MSHD014556 |
| 17753NPU | QU59903 | CAS56-41-7 |
| 17753NPU | QU59905 | QU50011 |
| 17753NPU | QU59906 | QU70500 |
| 17753NPU | QU59907 | = ? |
| 17753NPU | QU59909 | QU10409 |
| 17753NPU 999 | QU59910 | QU99999 |

Pt(U)—Alanine; subst.rate(proc.) = ? $\mu\text{mol/d}$

Example of a list

Cobalamin(Plasma)—

Cobalamin type;

substance fraction(list; procedure)

NPU01701

Cobalamin(P)—Cobalamin type; subst.fr.(list; proc.)

NPU04956 Cobalamin(P)—Aquocobalamin; subst.fr. = ?

NPU04954 Cobalamin(P)—Cyanocobalamin; subst.fr. = ?

NPU04959 Cobalamin(P)—Deoxycobalamin; subst.fr. = ?

NPU04955 Cobalamin(P)—Hydroxocobalamin; subst.fr. = ?

NPU04958 Cobalamin(P)—Methylcobalamin; subst.fr. = ?

NPU04957 Cobalamin(P)—Sulfitocobalamin; subst

Part of Main table of list

| | | | | |
|------|-----|------|---------|------------|
| 1701 | NPU | | QU59901 | MSHD014805 |
| 1701 | NPU | | QU59902 | MSHD010949 |
| 1701 | NPU | | QU59903 | QU60800 |
| 1701 | NPU | | QU59905 | QU50010 |
| 1701 | NPU | 1 | QU59906 | QU70691 |
| 1701 | NPU | 2 | QU59906 | QU70500 |
| 1701 | NPU | 6 | QU59918 | 4956 |
| 1701 | NPU | 7 | QU59918 | 4954 |
| 1701 | NPU | 8 | QU59918 | 4959 |
| 1701 | NPU | 9 | QU59918 | 4955 |
| 1701 | NPU | 10 | QU59918 | 4958 |
| 1701 | NPU | 11 | QU59918 | 4957 |
| 1701 | NPU | 9999 | QU59910 | QU99999 |

Cobalamin(P)—Cobalamin type; subst.fr.(list; proc.)

Literature published by the C-NPU

- I. SYNTAX AND SEMANTIC RULES (1995)**
- II. KINDS-OF-PROPERTY (1996)**
- III. ELEMENTS (OF PROPERTIES) AND THEIR CODE VALUES (1997)**
- IV. PROPERTIES AND THEIR CODE VALUES (1997)**
- V. PROPERTIES AND UNITS IN THROMBOSIS AND HAEMOSTASIS (1996)**
- VI. PROPERTIES AND UNITS IN IOC PROHIBITED DRUGS (1996/97)**
- VIII. PROPERTIES AND UNITS IN CLINICAL MICROBIOLOGY (1999)**

Literature published by the C-NPU

- IX. PROPERTIES AND UNITS IN TRACE ELEMENTS (1997)**
- X. PROPERTIES AND UNITS IN GENERAL CLINICAL CHEMISTRY (2000)**
- XI. CODING SYSTEMS - STRUCTURE AND GUIDELINES (1997)**
- XII. PROPERTIES AND UNITS IN CLINICAL PHARMACOLOGY AND TOXICOLOGY (1997)**
- XIII. PROPERTIES AND UNITS IN REPRODUCTION AND FERTILITY (1997)**
- XVI. PROPERTIES AND UNITS IN CLINICAL ALLERGOLOGY (1999)**
- XVIII. PROPERTIES AND UNITS IN CLINICAL MOLECULAR BIOLOGY (2004)**
- XIX. PROPERTIES AND UNITS FOR TRANSFUSION MEDICINE AND IMMUNOHEMATOLOGY (2003)**

Where to find:

www.labinfo.dk/English/litterature_uk.asp

www.labinfo.dk/English/download_uk.asp

The collection of internationally defined properties (NPU codes) and elements can be downloaded as worksheets (MS Excel).

As the worksheets are rather large (hence the nickname 'Elephants'), they are compressed as .zip files.

<http://dior.imt.liu.se/cnpu/>

Danish national version

Examples of special danish codes:

DNK35900 P—Tetraiodothyronine-reaction; arb.sat.(proc.) = ? arb.unit

DNK05226 Pt—Electrocardiography(work); K-o-p = ?

DNK05473 Arm—Bloodpressure(diastolic); pr. = ? mm Hg

DNK05429 P—Basisk phosphatase, tarmltype; arb.kat.k.(0 1 2) = ?

DNK05429 P—Alkaline phosphatase, intestinal type; arb.cat.c.(0 1 2)
= ?

Acknowledgements



Henrik Olesen has been the promotor for starting the C-NPU project