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PROPERTIES AND UNITS IN THE CLINICAL LABORATORY SCIENCES:
Part XI. Coding systems—structure and guidelines

(Technical Report)
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Properties and units in the clinical laboratory sciences: Part XI. Coding systems—structure and guidelines (Technical Report)

Synopsis

In ENV1614:1995 the system of concepts for properties in the clinical laboratory sciences has been elaborated and in part I of this series the syntax and semantic rules are presented.

The present document deals with the procedures for assembling the elements of a term for a property into a string of code values representing the intensional definition of a property. This is done by use of semantic links that ensure the correct localisation of the elements according to the syntax rules.

Further some special features needed as extensions to the general structure are presented.

Preface

The present document is the eleventh part (XI) of a series on properties examined in the clinical laboratory sciences, initiated in 1987.

The series will comprise the five general parts (I-IV and XI) and a series of special parts (in various stages of appearance in various media):

I	Syntax and semantic rules [1]
II	Kinds-of-property [2]
III	Elements (of properties) and their code values
IV	Properties and their code values
V	Properties and units in Thrombosis and Haemostasis [3]
VI	Properties and units in IOC prohibited drugs
VII	Properties and units in Inborn Errors of Metabolism
VIII	Properties and units in Clinical Bacteriology
IX	Properties and units in Trace Elements
X	Properties and units in General Clinical Chemistry
XI	Coding systems - structure and guidelines *(this document)*
XII	Properties and units in Clinical Pharmacology and Toxicology
XIII	Properties and units in Reproduction and Fertility
XV	WWW databases
XVI	Properties and units in Clinical Allergology

The size and complexity of part III, IV and XV are such that their lists will be presented in electronic format only.

The overall aim is access by electronic media of:
"Compendium of terminology and nomenclature of properties in clinical laboratory sciences" [4].
"Glossary of terms in quantities and units in clinical chemistry".
"Properties and units in the clinical laboratory sciences" .

FOREWORD AND SCOPE

The hardware and software facilities for electronic storage, transfer and handling of data are such that multipurpose databases can be made accessible at low cost without geographic restriction. The versatile and flexible underlying structures allow for ease of access and retrieval of data and gives presentation formats fully comparable to printed counterparts.

Because of ease of use and because of the wider distribution of the information, misinterpretation is more likely to occur than in oral or written presentation for more restricted and culturally more homogeneous audiences. This necessitates some harmonisation/standardisation of data on transfer, while allowing local expression forms at sender and receiver ends (Fig. 1; from [5]). This in particular applies when specific concepts are to be expressed in different languages and different scripts.

This document is part of an ongoing international effort to agree on some sort of "standardisation" of the transmission of "laboratory results". It centres on the description of two coding schemes developed for that purpose and gives guidelines and rules for their use.

The two coding schemes pertain to:

1. Coding scheme 1: code values for elements (of properties)
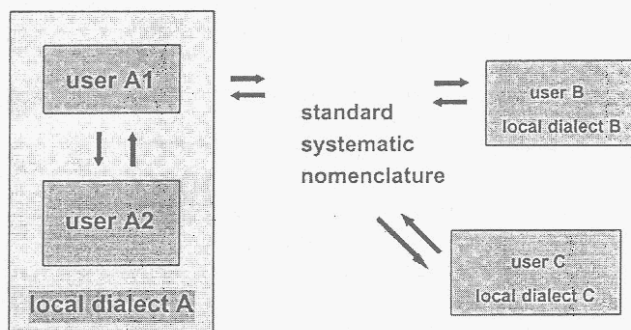2. Coding scheme 2: code values for properties and their units

Fig. 1 from ENV 1614:1995 [5]

INTRODUCTION

In the clinical laboratory sciences, much effort has been given to the presentation of the outcome of analytical efforts. Thus a report from a laboratory may be presented as an equation:

Property = Result

The general rules for the left side of this equation are given in ENV1614:1995 [5] and for the right side in ENV12435:1996 [6].

Further details on formats for request and report are dealt with in the documents on syntax and semantic rules [1], and kinds-of-property [2] and an extensive survey is in "Compendium of terminology and nomenclature of properties in clinical laboratory sciences" [4].

These recommendations, standards and conventions as listed have been followed systematically in the coding schemes developed.

Although the formats apply to the majority of properties examined, some extensions and special features are needed in the daily routine application.

In the following a description of the coding schemes for properties and their elements are presented, with emphasis on special features, as are some guidelines for their use.

DEFINITIONS

characteristic: mental representation of a property of an object serving to form and delimit its concept [ISO1087:1990; 7]

code value: result of applying a coding scheme to an element in a coded set [ISO7826-1:1994; 8]

coded set: set of elements which is mapped on to another set according to a coding scheme [ISO7826-1:1994; 8]

coding scheme: collection of rules that maps the elements of one set on to the elements of a second set [ISO7826-1:1994; 8]

concept: unit of thought constituted through abstraction on the basis of properties common to a set of one or more objects [modified ISO1087:1990; 7]

conversion: <terminology> change in the representation of a concept within one terminological system NOTE: Conversion regards the change of the representation of the same concept, from a term or terminological phrase to one of its systematic intensional definitions or vice versa, in the same system of concepts. In particular, it includes changes from a systematic name to a trivial name [ENV12264:1996; 9]

intension: set of characteristics which constitutes a concepts [ISO1087:1990; 7]

intensional definition: definition based on the intension of a concept [ISO1087:1990; 7]
NOTE: for this purpose it is necessary to state the closest superordinate generic concept that has already been defined or can be assumed to be generally known, and to add the restricting characteristics that delimit the concept to be defined.

international coding scheme identifier, ISCI: identifier assigned to uniquely identify a registered coding scheme for use in information interchange [ISO7826-1:1994; 8]

kind-of-property; property in a general sense: attribute of a phenomenon, body or substance that may be distinguished qualitatively [modified ENV 1614:1995; 5]
EXAMPLES: Colour; clarity; length; amount of substance

mapping: <terminology> change in the representation of a concept from one terminological system into the most similar concept in another system [ENV12264:1996; 9]
NOTE: Mapping is the most general term, and includes 'transformation' as a special case.

nomenclature: system of terms which is elaborated according to pre-established naming rules [ISO1087:1990; 7]

particular property: property of a given object (phenomenon, body or substance) [ENV 1614:1995; 5]

superordinate concept: concept that in a hierarchial relation is ranked on a higher level [ISO1087:1990; 7]
EXAMPLES: kind-of-property; component; unit; specification to system.

semantic link: unidirectional part of an associative relation from one concept to another [ENV12264:1996, modified; 9]
NOTE: A semantic link may be also used between semantic categories (which are a particular kind of concepts).

subject field: section of human knowledge, the border lines of which are defined from a purpose-related point of view [ISO1087:1990; 7]
NOTE: In terminology science and its practical applications the subject field is determined through the establishment of systems of concepts

system of concepts: structured set of concepts established according to the relations between them, each concept being determined by its position in this set [ISO1087:1990; 7]

systematic name: terminological phrase created according to pre-established rules. [ENV12264:1996, modified; 9]
NOTE: In common practice, a working name is typically used in place of the systematic name.

term: designation of a defined concept in a special language by a linguistic expression [ISO1087:1990; 7]

term list: collection of terms to be subjected to further terminology work [ISO1087:1990; 7]

terminology: set of terms representing the system of concepts of a particular subject field [ISO1087:1990; 7]

transcription: <terminology> operation representing the characters of one writing system by characters of another writing system taking into account the pronunciation of the characters converted [ISO1087:1990; 7]

transformation: <terminology> change in the representation of a concept from one terminological system into the corresponding concept in another compatible system [ENV12264:1996; 9]
NOTE: The involved terminological systems must be built on the same essential characteristics, in order to allow exact matching of the representations.

SYSTEM OF CONCEPTS

The outcome of a laboratory examination may be schematised as:

Property = Result

or more specified

System--; kind-of-property = value · unit

or preferred in the Clinical Laboratory Sciences

System----Component; kind-of-property = value · unit

The concept diagram, Fig. 2 modified from ENV 1614:1995 [5] identifies the elements of a report from a clinical laboratory, except for the patient identification, the date of sampling and the result. The elements in the large shaded area are those subject to standardisation according to ENV1614 and relate to the left hand side of the above equations. To each of these may be added a specification.
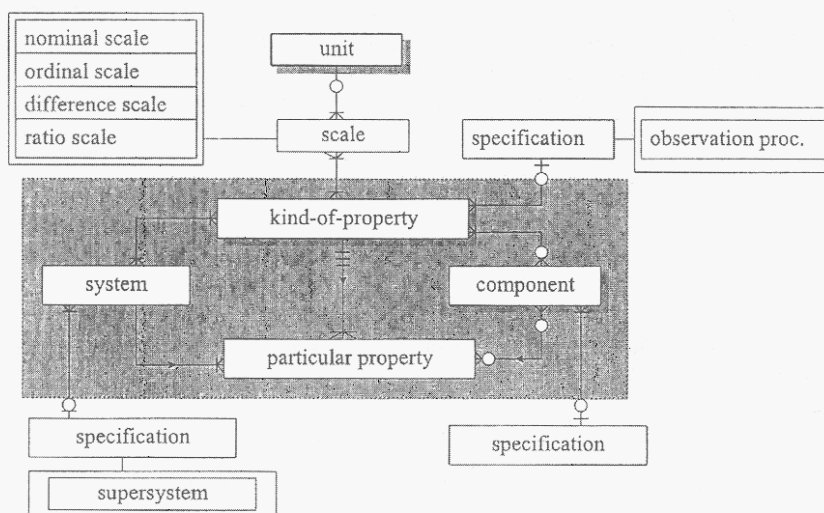

Fig.2

The present system of concepts thus comprises six superordinate concepts for the term of the property and a further two for the result of a measurement:

Equation 1:

System(specification to system)----Component(specification to component); kind-of-property(specification to property) = value · unit

   Details on syntax rules are given in [1].

EXAMPLES
Plasma—Potassium ion; substance concentration = 5,1 millimole/litre
or abbreviated:
P—Potassium ion; subst.c. = 5,1 mmol/l

Blood(capilllary Blood; fasting Patient)—Glucose; substance concentration = 9,8 millimole/litre
or abbreviated:
B(cB; fPt)—Glucose; subst.c. = 9,8 mmol/l

CODING SCHEME 1: CODE VALUES FOR ELEMENTS

This coding scheme (term list) comprises the elements (terms, building blocks) used in the systematic names of properties and their results.

EXAMPLES
Glucose; plasma; mmol/l; substance concentration; capillary blood; fasting.

The elements are assembled in one coding scheme. They are not subdivided into coding schemes for each of the eight superordinate concepts. This is because most elements may occur in more than one superordinate concept in the system of concepts for systematic terms.

Blood(capilllary **Blood**; fasting Patient)—Glucose; substance concentration = 9,8 millimole/litre

Patient—**Blood**; volume(procedure) = 4,5 litre

The code values for elements have been selected preferably from authoritative coding schemes. The coded sets (ISCI code value and meaning) are listed in part III of this series. It contains about 11 000 sets out of which 2 500 are used in the properties listed in part IV. The remainder are mostly for an eventual result of an examination. Further coded sets are added as need arises. For elements not found in a pre-existing coding scheme, a code value prefixed by QU has been added.
    The coding scheme for elements has a core function in the system developed:
1. It ensures that the concept represented by an ICSI + a particular code value are defined.

EXAMPLES
ATCC
CAS
EC
MSH
QU

2. Once expressed in a particular language or local idiom, it assures uniformity of spelling throughout the coding scheme for properties and units.

EXAMPLES
CAS57-43-2:
amobarbital (INN); amylobarbitone (BP; INDP), barbamylum (USSRP); pentymal (outdated)
MSH94D001769:
blood; sangue; sangre; blod; Blut

CODING SCHEME 2: CODE VALUES FOR PROPERTIES AND THEIR UNITS

Because an element can be localised at different positions in the system of concepts, the correct position is ensured by a semantic link for each of the eight superordinate concepts in equation 1.

EXAMPLE in table 1

Table 1			
Semantic link		Element (example)	
Code value	*Meaning* Now follows a code value of a:	*Code value*	*Meaning*
QU59901	System	MSH94D010949	Plasma
QU59902	Specification to a system		
QU59903	Component	CAS50-99-7	Glucose
QU59904	Specification to a component		
QU59905	Kind-of-property	QU50003	substance concentration
QU59906	Specification to a property		
QU59907	Numerical value	=	5,6
QU59909	Unit	QU09408	millimole/litre
QU59910	End code	QU99999	End

or as a code value string:

QU59901:MSH94D010949:QU59903:CAS50-99-7:QU59905:QU50003:QU59907: =
5,6:QU59909:QU09408:QU59910:QU99999:

The code value string thus constructed represents one intensionally defined property. For ease of handling it is identified by the NPU code value.

NPU02192 ∆ QU59901:MSH94D010949:QU59903:CAS50-99-7:QU59905:QU50003:QU59907: ▬
5,6:QU59909:QU09408:QU59910:QU99999:

The coding scheme for properties thus is based on a series of code value strings representing systematic terms for properties, possibly with an adhering unit.

Each coded set comprises:

1. NPUXXXXX: a coding scheme identifier and a unique code value.
2. Code meaning: a code value string representing the concept of a property (and unit).

The coding scheme for properties comprises about 8 000 coded sets. These are the basis of the intensional definitions of the list of properties (part IV of this series).

EXAMPLE in English

Blood(capillary Blood; fasting Patient)—
Glucose;
   substance concentration
   millimole/litre
   M = 180,2 g/mol
   Authority: CAS50-99-7
   [NPU02188]
   B(cB; fPt)—Glucose; subst.c. = ? mmol/l

Terms originating in the code value string are given in bold. The basic principle is that each NPU code value identifies one unique type of property, except for patient identification and result.

EXAMPLE
[NPU03429]
Plasma—Sodium ion; substance concentration = ? millimole/litre
is for the substance concentration of sodium ion in plasma, regardless of the procedure used for its measurement.
   In contrast the measurement of the coagulation factor VIII by an immunological, an enzymatic or a coagulation procedure aims at three different properties of coagulation factor VIII and hence is given three different NPU code values [3].
   The NPU code values, representing the concepts of properties, carry no information per se.
   Values 1001 to 4999 and 6000 to 19999 are for NPU concepts. Once used for a concept, a code value is given a date of entry. It cannot be reused for another concept, even if the initial one becomes obsolete. Also, even if obsolete, it is not deleted or discarded.
   The values 1 to 999 are for the individual laboratory in transmission of "3 samples for project xx" or "electrocardiogram with 12 leads", etc.
   Values 5000 to 5999 and 20000 to 29999 are for nationally defined concepts outside the recommended scheme. These are prefixed by the national identifier.

EXAMPLE
[DK05051]
Plasma-Alanine aminotransferase; catalytic concentration(37 °C; procedure) = ? Unit/litre

The recommended unit is microkatal/litre.

SPECIAL FEATURES

In some subject fields there are special requirements necessitating extensions to the general structure. These and the definitions of properties have been prepared in formal consultation with specialists in the subject field.

Taxon

Nominal scale results occur in most subject fields. Several terms for the corresponding kind-of-property have been considered such as "found", "detected", "present", "type", and "class". Most of these have other connotations.

In clinical bacteriology the term "taxon" relates to all of the hierarchical classifications in microbiology. It is from Greek "tassein" (to arrange). It seems appropriate also for other subject fields and has been adopted in the documents on properties and units in the clinical laboratory sciences.

EXAMPLE - Clinical bacteriology
[NPU06074]
Abscess(specification)—Bacterium; taxon(procedure) = *Staphylococcus aureus*

EXAMPLE - Clinical chemistry
[NPU02642]
Plasma—M-Component; taxon = Immunoglobulin G kappa

EXAMPLE - IOC prohibited drugs
[NPU04763]
Urine—Anabolic steroid; taxon(IOC 95 Screen) = Metandienone, Nandrolone, Oxymetholone

EXAMPLE - Clinical pharmacology and toxicology
[NPU04062]
Urine—Benzodiazepines; taxon(procedure) = Lorazepam

EXAMPLE - Inborn errors of metabolism
[NPU03988]
Blood—Haemoglobin, unusual; taxon(procedure)= Haemoglobin SS

Mandatory specification to property

In special cases, in particular in "thrombosis and haemostasis", a special characteristic of the component investigated is aimed at and is reflected in the procedure used. When relevant for the outcome and its clinical use this characteristic is specified as the first parenthetic entry after the kind-of-property.

EXAMPLES
[NPU01664]
Plasma—Coagulation factor XI; relative substance concentration(immunological; actual/norm; procedure) = 1,2

[NPU04040]
Plasma—Coagulation factor XI; arbitrary substance concentration(enzymatic.; procedure) = ? arbitrary unit/litre

[NPU10404]
Plasma—Coagulation factor XI; relative substance concentration (coagulation; actual/norm; procedure) = 0,15

arbitrary concentration and arbitrary substance concentration

The kind-of-property "arbitrary concentration" is in the sense arbitrary amount of component divided by volume of system and denote that ordinal scales of the type 0 1; 0 1 2 3; 0 1 2 3 4 are used to indicate order of magnitude of concentration.

EXAMPLE
[NPU01643]
Plasma—Coagulation factor V antibody; arbitrary concentration(coagulation; 1 2 3 4) = 3

The kind-of-property "arbitrary substance concentration" applies to properties where the value is from a ratio scale, but where the unit is not traceable to SI.

If or when clarified the values can be recalculated and given SI units.

EXAMPLE
[NPU04009]
Plasma—Coagulation factor VIII; arbitrary substance concentration(immunological; IS 87/718; procedure) = ? × 10^3 international units/litre

Cells and units

The concept "mole" corresponds to about $6,02 \times 10^{23}$ chemical entities.

This relationship may be used to indicate the number of molecules in biological fluids, both extra- and intracellular.

When it comes to sites or molecules on a surface of a cell, the number is up to 1 000 000 per cell, and in a reaction (for example erythrolysis by complement factors) just a few sites or molecules may be involved.

On the assumption of 60 000 sites of a particular type on an erythrocyte, e.g. i-sites, three forms of presentation could be chosen:
1. Erythrocytes—i-Sites; entitic amount of substance = $0,1 \times 10^{-18}$ mol
2. Erythrocytes—i-Sites; areic number = $0,4 \times 10^9/m^2$
3. Erythrocytes—i-Sites; entitic number = 60 000

The example illustrates case three.

EXAMPLE
[NPU03885]
Erythrocytes(Blood)—Complement C3 fragment; entitic number(procedure) = ?

Several elements in a system, component, result or specification

In some properties more than one part occurs in the system, component, result and/or specification. In these cases, they are localised by the same semantic link.

Table 2			
Semantic link		Element (example)	
Code value	Meaning Now follows a code value of a:	Code value	Meaning
QU59901	System	MSH94D010949	Plasma
QU59902	Specification to a system		
QU59903	Component	CAS51-43-4+CAS51-41-2	Adrenalinium+noradrenalinium
QU59904	Specification to a component		
QU59905	Kind-of-property	QU50003	substance concentration
QU59906	Specification to a property	QU70543	0 minute after challenge
QU59907	Numerical value	=	5,6
QU59909	Unit	QU10408	micromole/litre
QU59910	End code	QU99999	End

EXAMPLE
[NPU10542]
Plasma—Adrenalinium+noradrenalinium; substance concentration(0 minute after challenge)= 5,6 micromole/litre

Transposed names

For collation in alphabetic listings some parts of names of components are transposed, for example "Cholesterol+ester, in HDL".

Related properties

Some requests elicit a series of related properties that may be grouped under a common heading in a report.

The heading is for requesting and the list of properties presented is for selection by the individual laboratory.

EXAMPLES

[NPU04827]
U—Benzodiazepines; arb.c.(list; proc.)
   [NPU01402] U—Bromazepam; arb.c.(proc.) = ?
   [NPU01534] U—Chlordiazepoxide; arb.c.(proc.) = ?
   [NPU01880] U—Diazepam; arb.c.(proc.) = ?
   [NPU02062] U—Flunitrazepam; arb.c.(proc.) = ?
   [NPU02614] U—Lorazepam; arb.c.(proc.) = ?
   [NPU02916] U—Nitrazepam; arb.c.(proc.) = ?
   [NPU02975] U—Oxazepam; arb.c.(proc.) = ?

Laboratory NN:
[NPU04827]
U—Benzodiazepines; arb.c.(list; 0 1)
   [NPU01534] U—Chlordiazepoxide; arb.c.(proc.) = 0
   [NPU01880] U—Diazepam; arb.c.(proc.) = 1
   [NPU02062] U—Flunitrazepam; arb.c.(proc.) = 0
   [NPU02975] U—Oxazepam; arb.c.(proc.) = 0

Alternatively the request and report in these cases may be reduced to a single entry using the kind-of-property taxon and nominal results if the actual list of properties looked for in the procedure is part of the general information from the laboratory.

EXAMPLE
[NPU08958]
U—Benzodiazepines; taxon(proc.) = Diazepam

Deduced from and calculated from

In some cases the requester wishes information on the properties used to derive the actual result. If so the terms "deduced from" and "calculated from" apply.

EXAMPLE
[NPU02713]
U—Metandienone; arb.c.(IOC 95 Confirm; 0 1) = 1
  deduced from
  [NPU08597] U—6β-Hydroxymetandienone; arb.c.(0 1) = 1
  [NPU08598] U—3'-Hydroxystanozolol; arb.c.(0 1) = 1

In some laboratories it is customary to report on the properties used for calculation of clearance or other rate kind-of-property.

EXAMPLE
[NPU02485]
Cns—Immunoglobulin G secretion; arb. subst. rate(proc. 63) = 0,92
  calculated from $(a \times d)/(b \times c)$
  a: [NPU01132] P—Albumin; subst.c. = ? µmol/l
  b: [NPU01130] Csf—Albumin; subst.c. = ? µmol/l
  c: [NPU02481] P—Immunoglobulin G; subst.c. = ? µmol/l
  d: [NPU04099] Csf—Immunoglobulin G; subst.c.= ? µmol/l

or simply:

[NPU02485]
Cns—Immunoglobulin G secretion; arb.subst.rate(proc. 63) = 0,92

EXAMPLE
[NPU01809]
Kidney—Creatininium clearance; vol. rate(97-11-05T08--11-08T08)) = 0,77 ml/s
   calculated from (b × c)/(a × d)
   a: [NPU01807]P—Creatininium; subst.c. = 0,100 mmol/l
   b: [NPU01808]U—Creatininium; subst.c. = 10 mmol/l
   c: [NPU03695]Pt—Urine; vol. = 2 000 ml
   d: [NPU10380]U—Sampling period; time = 3 d

or simply:

[NPU01809]
Kidney—Creatininium clearance; vol.rate(proc. 55) = 0,77 ml/s
NOTE: Sampling start date and time of day is part of the information on the request.

Dynamic function tests: absorption, secretion and tolerance

Absorption, secretion and tolerance tests comprise a heading and a series of related properties. The header is indicative of the scope and is used for requesting.

Header:

System

When possible and reasonable, the "target" of the dynamic function test is given as the system. For example "Hypophysis", "Jejunum", "Adrenal cortex". Often the "target" is multiple and is given as "Patient".

Component

The name of the component refers to the function under investigation, not to the name of any stimulus applied. An indication of function may be either "absorption", "excretion", "secretion", "tolerance", or other.

Specification to property

The parenthetic specification gives information on the name of the substance used as the stimulus or other stimulus for example "fasting", "water deprivation", "overnight sleep". For substances it includes route of administration. It further indicates that the report includes a list of properties, and if needed, informs on specifics of the procedure.

EXAMPLES
[NPU02196]
Pt—Glucose tolerance(glucose p.o.; list; proc.)

[NPU10686]
Adrenal cortex—Aldosterone secretion(furosemide p.o.; list; proc.)

List of properties:

Expressed by

Most often the request aims at measuring a substance rate under the influence of a stimulant or an inhibitor. When this cannot be directly calculated, the report is indirect and offers a list of properties preceded by "expressed by".

   After the "expressed by" (which can be omitted) follows a list of properties, from which a selection is made by the individual laboratory, so as to fit into its routine procedure.

Challenge dose

The first entry(ies) of the list may inform about the challenge dose given, usually as a fixed amount or an amount per body mass. The route of administration is here given as a parenthetic specification.

Properties examined

This part of the list encompasses in principle all the possible properties examined for that particular examination procedure and hence it is quite extensive.

Time indication of property

Time indication is expressed as minute if the test is not exceeding 1 440 minutes (24 h). Above that it is expressed in days.

EXAMPLE
[NPU02196]
expressed by

  [NPU010574] Pt—Glucose(administered); am.s.(p.o.) = ? mmol
  [NPU010575] Pt—Glucose(administered); subst.cont.(p.o.; am.s./body mass) = ? mmol/kg
  [NPU08714] B—Glucose; subst.c.(0 min) = ? mmol/l
  [NPU08516] B—Glucose; subst.c.(15 min) = ? mmol/l
  [NPU08504] B—Glucose; subst.c.(30 min) = ? mmol/l
  [NPU08517] B—Glucose; subst.c.(45 min) = ? mmol/l
  [NPU08501] B—Glucose; subst.c.(60 min) = ? mmol/l
  [NPU08518] B—Glucose; subst.c.(75 min) = ? mmol/l
  [NPU08506] B—Glucose; subst.c.(90 min) = ? mmol/l
  [NPU08507] B—Glucose; subst.c.(120 min) = ? mmol/l
  [NPU08508] B—Glucose; subst.c.(150 min) = ? mmol/l
  [NPU08500] B—Glucose; subst.c.(180 min) = ? mmol/l
  [NPU08510] B—Glucose; subst.c.(210 min) = ? mmol/l
  [NPU08511] B—Glucose; subst.c.(240 min) = ? mmol/l
  [NPU08512] B—Glucose; subst.c.(270 min) = ? mmol/l
  [NPU08513] B—Glucose; subst.c.(300 min) = ? mmol/l
  [NPU08514] B—Glucose; subst.c.(330 min) = ? mmol/l
  [NPU08515] B—Glucose; subst.c.(360 min) = ? mmol/l
  [NPU08735] B—Glucose; subst.c.(max. c.; proc.) = ? mmol/l
  [NPU010047] B(cB)—Glucose; subst.c.(0 min) = ? mmol/l
  [NPU010059] B(cB)—Glucose; subst.c.(15 min) = ? mmol/l
  [NPU010048] B(cB)—Glucose; subst.c.(30 min) = ? mmol/l
  [NPU010060] B(cB)—Glucose; subst.c.(45 min) = ? mmol/l
  [NPU010045] B(cB)—Glucose; subst.c.(60 min) = ? mmol/l
  [NPU010061] B(cB)—Glucose; subst.c.(75 min) = ? mmol/l
  [NPU010050] B(cB)—Glucose; subst.c.(90 min) = ? mmol/l
  [NPU010051] B(cB)—Glucose; subst.c.(120 min) = ? mmol/l
  [NPU010052] B(cB)—Glucose; subst.c.(150 min) = ? mmol/l
  [NPU010044] B(cB)—Glucose; subst.c.(180 min) = ? mmol/l
  [NPU010053] B(cB)—Glucose; subst.c.(210 min) = ? mmol/l
  [NPU010054] B(cB)—Glucose; subst.c.(240 min) = ? mmol/l
  [NPU010055] B(cB)—Glucose; subst.c.(270 min) = ? mmol/l
  [NPU010056] B(cB)—Glucose; subst.c.(300 min) = ? mmol/l
  [NPU010057] B(cB)—Glucose; subst.c.(330 min) = ? mmol/l
  [NPU010058] B(cB)—Glucose; subst.c.(360 min) = ? mmol/l
  [NPU010111] B(cB)—Glucose; subst.c.(max. c.; proc.) = ? mmol/l
  [NPU08713] P—Glucose; subst.c.(0 min) = ? mmol/l
  [NPU04186] P—Glucose; subst.c.(15 min) = ? mmol/l
  [NPU04174] P—Glucose; subst.c.(30 min) = ? mmol/l
  [NPU04187] P—Glucose; subst.c.(45 min) = ? mmol/l

[NPU04175] P—Glucose; subst.c.(60 min) = ? mmol/l
[NPU04965] P—Glucose; subst.c.(75 min) = ? mmol/l
[NPU04176] P—Glucose; subst.c.(90 min) = ? mmol/l
[NPU04177] P—Glucose; subst.c.(120 min) = ? mmol/l
[NPU04178] P—Glucose; subst.c.(150 min) = ? mmol/l
[NPU04179] P—Glucose; subst.c.(180 min) = ? mmol/l
[NPU04180] P—Glucose; subst.c.(210 min) = ? mmol/l
[NPU04181] P—Glucose; subst.c.(240 min) = ? mmol/l
[NPU04182] P—Glucose; subst.c.(270 min) = ? mmol/l
[NPU04183] P—Glucose; subst.c.(300 min) = ? mmol/l
[NPU04184] P—Glucose; subst.c.(330 min) = ? mmol/l
[NPU04185] P—Glucose; subst.c.(360 min) = ? mmol/l
[NPU08734] P—Glucose; subst.c.(max. c.; proc.) = ? mmol/l
[NPU08768] U—Glucose; subst.c.(0 min) = ? mmol/l
[NPU010581] U—Glucose; subst.c.(30 min) = ? mmol/l
[NPU08769] U—Glucose; subst.c.(60 min) = ? mmol/l
[NPU010582] U—Glucose; subst.c.(90 min) = ? mmol/l
[NPU08770] U—Glucose; subst.c.(120 min) = ? mmol/l
[NPU08771] U—Glucose; subst.c.(180 min) = ? mmol/l
[NPU010583] U—Glucose; subst.c.(240 min) = ? mmol/l
[NPU010571] U—Glucose; subst.c.(300 min) = ? mmol/l
[NPU010584] U—Glucose; subst.c.(360 min) = ? mmol/l

Laboratory NN:
[NPU02196]
Pt—Glucose tolerance(glucose p.o.; list; proc.)
[NPU010574] Pt—Glucose(administered); am.s.(p.o.) = 417 mmol
[NPU08714] B—Glucose(administered); subst.c.(0 min) = ? mmol/l
[NPU08501] B—Glucose; subst.c.(60 min) = ? mmol/l
[NPU08507] B—Glucose; subst.c.(120 min) = ? mmol/l

PRACTICAL APPLICATION

Coding centre

The expression of the concepts to be used locally as elements in properties needs to be worked out for each particular cultural region by an authoritative body.

For example the expression in French to be used in France, Canada, Wallonie, Switzerland or the Côte d'Ivoire may differ according to convention.

In a given region expression of a list of potentially about 11 000 elements could take one man month work, while expression of the 2 000 elements actually needed for an initial list of properties, would require less.

Names of bacteria need no translation; but may need transcription.

Combination of elements into properties by use of the code value strings requires a few days work and some overnight computer compilations.

The outcome is prepared for dissemination by floppy disc, an Internet facility or other, and includes:
1. The coding scheme for elements in that language/cultural region
2. The coding scheme for properties in full text, including supplementary information (Notes, *M*, etc.)
3. The coding scheme for properties abbreviated for use in request and report forms

Local application

In the individual laboratory the first two of the above coding schemes are for occasional consultation, while the third is for transformation (not mapping of similar or near identical concepts) to, or replacement of, the local coding scheme.

The major issue is correct transformation, because often not all details are included in the local expressions, and much pondering may be needed. Confounding of a coagulation procedure and an immunological procedure in patients treated with anticoagulants is critical. Confounding of catalytic activity result of cholinesterase at 25 °C and at 37 °C is critical, etc. When local habit is for mass concentration (unit: mg/ml; mg %; mg/100 ml; mg/l) a factor is to be applied for changing into substance concentration before transmission.

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INDEX OF ABBREVIATIONS

ATTC	American Type Culture Collection
BP	British Pharmacopoeia
CAS	Chemical Abstract Service
C-NPU	Committee–Commission of Nomenclature, Properties and Units of the International Federation of Clinical Chemistry–International Union of Pure and Applied Chemistry
EC	Enzyme Committee of the International Union of Biochemistry and Molecular Biology
IFCC	International Federation of Clinical Chemistry
INN	International Nonproprietary Name of the World Health Organization
ISO	International Standardization Organization
IUPAC	International Union of Pure and Applied Chemistry
MSH	Medical Subject Headings, Bethesda: National Library of Medicine.
SI	International System of Units