

Properties and Units in the Clinical Laboratory Sciences

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Rationale

The availability of **electronic patient records** would greatly increase the quality of health care, reduce health care cost, and facilitate epidemiologic surveys to the benefit of patients worldwide.

In developing a generalized architectural buildup and adherent structures, there is a need for systems and schemes in each of the medical domains to support and populate the electronic patient record.

In the domain of clinical laboratory medicine, the guidelines from IUPAC on the structuring of properties, on kind-of-properties, and on units are a *sine qua non* if a coherent system with global acceptance is to be worked out.

Grounding

Two IUPAC documents form the basis for such an enterprise in clinical laboratory medicine:

- Dybkær and Jørgensen: Quantities and Units in Clinical Chemistry (1)
- Riggs et al. "Silver book" (2)

Also, several documents from the World Health Organization, from the European Standardization Committee, and from many international organizations have been adhered to in the course of the project, in particular for coding of concepts defined by these organizations, e.g., CAS, ATCC, UMLS, NCCLS, UMD, INN, ISTE, and OMIM.

Full-scale testing

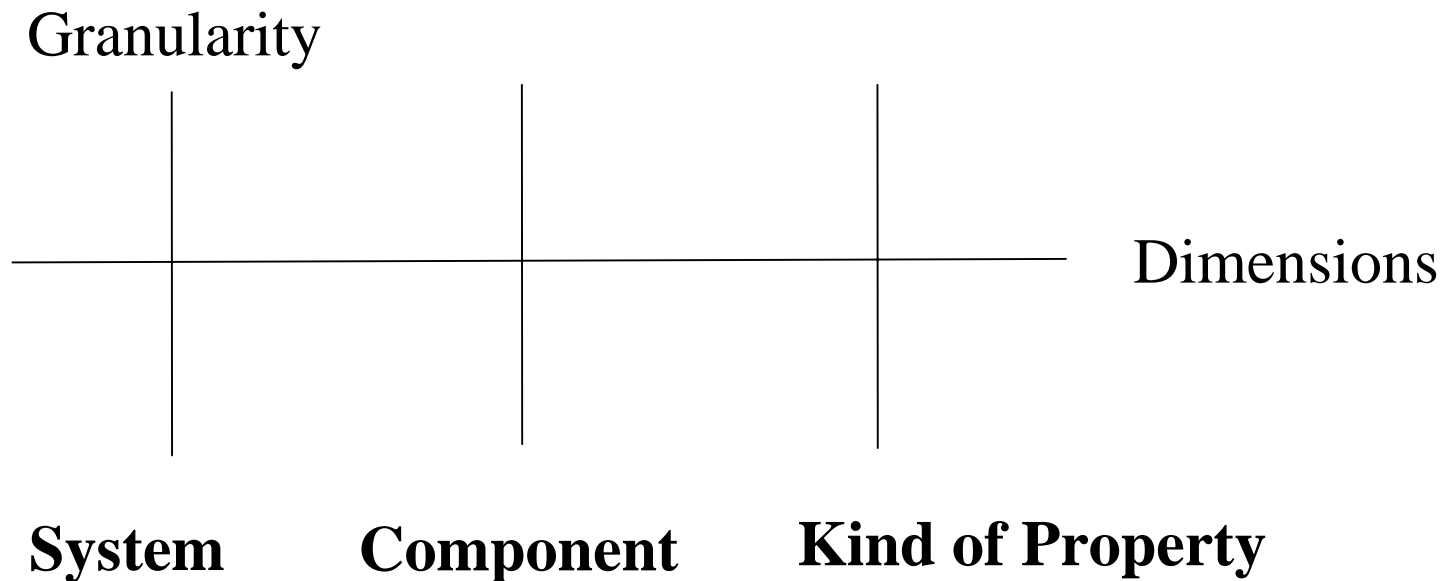
Testing of practicability and actual use of the coding scheme is currently being done in Denmark and in Sweden. This process has resulted in some modifications and, in particular, additions to the scheme, but the general structure has stood the challenge of practical application in a series of clinical laboratories.

The coding scheme has yielded a bonus in making possible the electronic transmission between laboratories and in the request and reporting to-from general practitioners, medical wards, etc.

Concept schemes that are part of an electronic medical record must be grounded in the domain of actual use. The C-NPU coding scheme forms one such building block.

C-NPU Codes

Three axes of the coding scheme



Examples

NPU01715

Plasma—Complement activity, antibody-induced; kind-of-property(erythrolysis; procedure) = ?

Endorsed by The International Complement Workshop

NPU02572

Blood—Lead; substance concentration = ? micromole/liter

Endorsed by IUPAC Commission on Toxicology

NPU03454

Semen—Spermatozoa; number of entities = ? 10^6

Endorsed by The International Society of Andrology

NPU01677

Plasma—Coagulation, ecarin-induced; time(procedure) = ? second

Endorsed by The International Society on Thrombosis and Haemostasis

NPU04764

Urine—Adrenergic beta-antagonist; taxon(IOC Screen) = ?

Endorsed by IFCC Committee on Laboratory Assessment on Drugs of Abuse

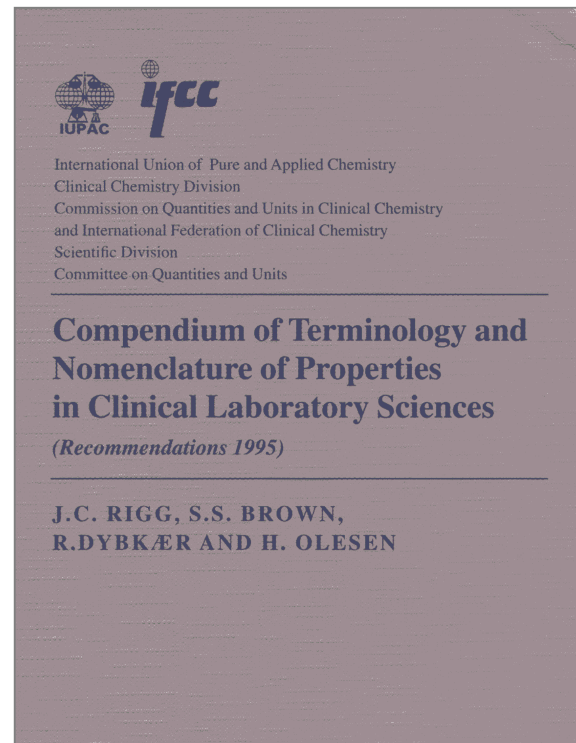
Publications

Properties and Units in the Clinical Laboratory Sciences:
(published in *Pure Appl. Chem.* between 1995-2000)

- I. Syntax and Semantic Rules
- II. Kinds-of-Property
- III. Elements (of Properties) and their Code Values
- IV. Properties and their Code Values
- V. Properties and Units in Thrombosis and Haemostasis
- VI. Properties and Units in IOC-Prohibited Drugs
- VII. Properties and Units in Inborn Errors of Metabolism, in preparation
- VIII. Properties and Units in Clinical Microbiology
- IX. Properties and Units in Trace Elements
- X. Properties and Units in General Clinical Chemistry
- XI. Coding Systems - Structure and Guidelines
- XII. Properties and Units in Clinical Pharmacology and Toxicology
- XIII. Properties and Units in Reproduction and Fertility
- XIV. Properties and Units in Tumor Markers, in preparation
- XV. www databases, in preparation
- XVI. Properties and Units in Clinical Allergology
- XVII. Properties and Units for Urinary Calculi, in preparation
- XVIII. Nomenclature, Properties, and Units in Clinical Molecular Biology, in preparation

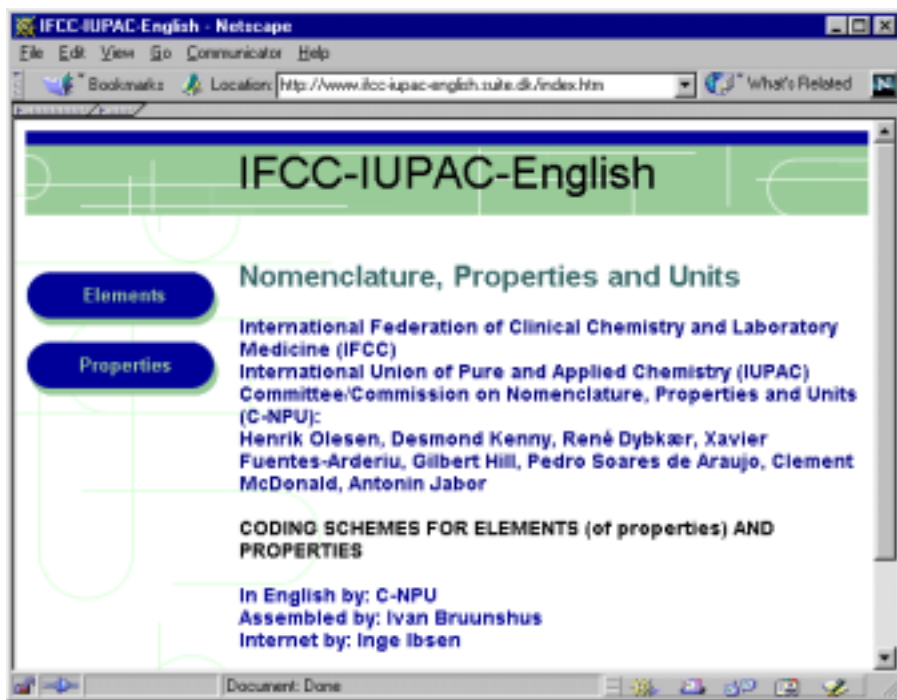
References

1. IUPAC-IFCC (International Union of Pure and Applied Chemistry & International Federation of Clinical Chemistry, Commission on Clinical Chemistry), 1967. Quantities and units in clinical chemistry. Recommendation 1966. Prepared for publication by R Dybkær and K Jørgensen. Copenhagen: Munksgaard.
2. IUPAC-IFCC, 1995. Compendium of terminology and nomenclature of properties in clinical laboratory sciences. The Silver Book. Prepared for publication by JC Rigg, SS Brown, R Dybkær, H Olesen. Oxford: Blackwell Science, 290 pp.
3. IUPAC-IFCC (International Union of Pure and Applied Chemistry - International Federation of Clinical Chemistry), Commission-Committee on Nomenclature, Properties, and Units. Properties and units in the clinical laboratory sciences. XI. Coding systems - structure and guidelines. (Technical report 1997). Prepared for publication by H Olesen, D Kenny, R Dybkær, I Ibsen, I Bruunshuus, X Fuentes-Arderiu, G Hill, P Soares de Araujo, C McDonald. Pure and Appl Chem 1997; 35: 317-44.



Dissemination of the results

Publications on the coding schemes produced have appeared in *Pure and Applied Chemistry* for the laboratory specialties of Thrombosis and Haemostasis, Clinical Chemistry, Clinical Microbiology, Reproduction and Fertility, Complement Factors, Clinical Pharmacology, Doping Control, Allergology, and Haematology. See [IUPAC web site](http://www.ifcc-iupac.suite.dk).



To facilitate access, and for updating, the 10 000 ++ coded properties are given on www.ifcc-iupac.suite.dk, as are codes for the elements used as building blocks.

In preparation are schemes on Tissue Typing, Blood Transfusion, and Molecular Biology.

IUPAC credits

The project was initiated by the Chemistry and Human Health Division, Commission on Nomenclature, Properties, and Units (C-NPU 18/87) at the IUPAC General Assenbly in Boston in 1987. It has since been supported by IUPAC in the form of encouragement and funds for meetings, but first of all by the credibility and the "good name" of the IUPAC organization *per se*.

It is of major impact in convincing governmental organizations that local (country-wise) support and implementation is worthwhile.

The Commission on Nomenclature, Properties, and Units would like to express its appreciation and gratitude to The International Union of Pure and Applied Chemistry for support over so many years.

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