
Health informatics — Conceptual data model for Chinese medicinal herbs

*Informatique de santé — Modèle de données conceptuel pour les
plantes médicinales chinoises*

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Foreword

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This document was prepared by Technical Committee ISO/TC 215, *Health informatics*, in collaboration with Technical Committee ISO/TC 249, *Traditional Chinese medicine*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Chinese medicinal herbs have been used systematically for over 4,000 years because of their efficacy and cost-effectiveness in preventing and curing illness. According to the WHO, around 21 000 plant species have the potential for being used as medicinal plants, therefore many health authorities and administrators took traditional forms of medicine more seriously and have explored the possibility of utilizing them in primary health care.

However, the species of commonly used medicinal plants are decreasing and many plants face extinction. In China, for example, liquorice stocks fell sharply by more than 40% from the 1950s to the 2010s. The main reasons include an emerging growth in demand, deforestation, environmental deterioration, ecological imbalance and lack of awareness of environmental protection.

It would be beneficial to establish unified information systems including databases. There are a range of regional and other databases on the uses of medicinal plants. The development of a common design for databases on the conservation and sustainable use of Chinese medicinal herbs should also be done at the international level. It is beneficial to exchange information both within and between countries permitting a constant process of refining and updating.

By collecting information of individual Chinese medicinal herb, such as plant attributes, growth geographic attributes, medicinal attributes and identification methods, etc., it is possible to set up centralized databases to explore further on scarce species, alternative varieties and authentic Chinese medicinal herbs. This would also facilitate artificial cultivation, sustainable development and application of Chinese herbal medicine resources.

This document aims at protecting scarce species of Chinese medicinal herbs, promoting their cultivation, seeking proper substitutes and breeding new varieties in high quality. Moreover, it can assist the standardization and information process of the general surveys on Chinese medicinal herbs.

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Health informatics — Conceptual data model for Chinese medicinal herbs

1 Scope

This document specifies a conceptual data model for Chinese medicinal herbs (CMH). The organization of the data model for each CMH consists of its medicinal attributes, plant attributes, geographic attributes and identifications.

This document is applicable to the establishment and maintenance of CMH databases.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3166-1, *Codes for the representation of names of countries and their subdivisions — Part 1: Country code*

ISO 3166-2, *Codes for the representation of names of countries and their subdivisions — Part 2: Country subdivision code*

ISO 3166-3, *Codes for the representation of names of countries and their subdivisions — Part 3: Code for formerly used names of countries*

ISO 18668-1, *Traditional Chinese medicine — Coding system for Chinese medicines — Part 1: Coding rules for Chinese medicines*

ISO 18668-3, *Traditional Chinese medicine — Coding system for Chinese medicines — Part 3: Codes for Chinese Materia Medica*

ISO 6709, *Standard representation of geographic point location by coordinates*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

conceptual data model

data model that represents an abstract view of the real world

Note 1 to entry: A conceptual model represents the human understanding of a system, which can be anywhere from a paper-based system to a complex database in an IT system.

[SOURCE: ISO/IEC 11179-1:2023, 3.2.25]

3.2 Chinese medicinal herb CMH

medicinal parts of medicinal plants after preliminary processing, which are used as raw materials in Chinese medicines

Note 1 to entry: Except for animal, mineral, and composite materials.

3.3 producing area
area where medicinal plants grow naturally or artificially

3.4 microscopic examination
examination of a test specimen by microscope with a magnification of generally × 50 to × 500, with or without etching

[SOURCE: ISO 17639:2022, 3.2]

3.5 physical and chemical identification
qualitative or quantitative analysis of the active ingredient, main ingredient or characteristic ingredient of a Chinese medicinal herb by physical or chemical means with the purpose to tell its authenticity and grading

4 Conceptual data model for CMH

4.1 Overview

The data model for each CMH shall consist of its medicinal attributes, plant attributes, geographic attributes and identifications. The conceptual data model for CMH is shown in [Figure 1](#).

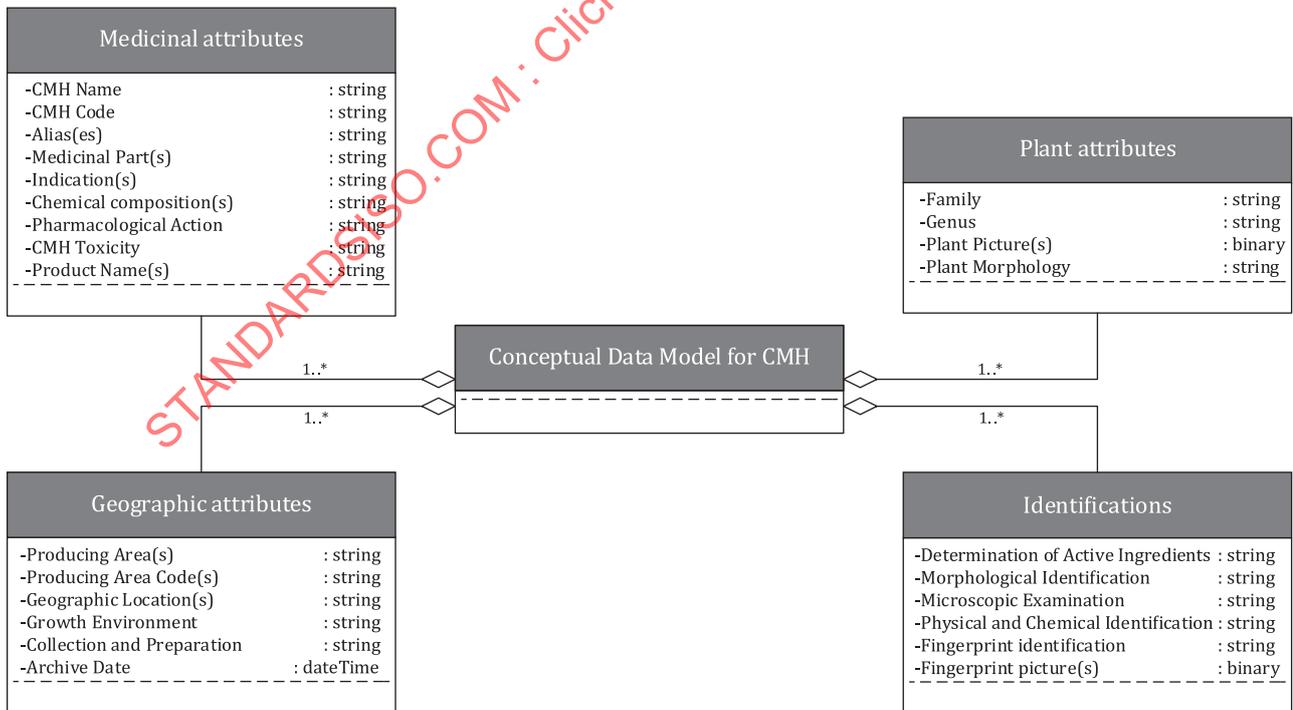


Figure 1 — Unified Modeling Language (UML) diagram of the conceptual data model for CMH

4.2 Medicinal attributes

4.2.1 Overview

The medicinal attributes shall include: CMH Name, CMH Code, Medicinal Part(s), Indication(s).

The medicinal attributes may include: Alias(es), Chemical Composition(s), Pharmacological Action, CMH Toxicity and Product Name(s).

4.2.2 CMH Name

The attribute of the CMH Name is represented by "CMHN". Its datatype is string. According to ISO 18668-3, each CMHN field must include Latin, English, Simplified Chinese characters, Traditional Chinese characters and Chinese Pinyin. If a CMH is unique to a country, the official name in the country may be added to the name.

4.2.3 CMH Code

The attribute of the CMH Code is represented by "CMHC". Its datatype is string. CMHC shall be in accordance with ISO 18668-3. If there is a CMH not included in ISO 18668-3, it shall be encoded in accordance with ISO 18668-1.

4.2.4 Alias(es)

The attribute of Alias(es) is represented by "ALI". Its datatype is string. Each ALI field may include Latin, English, Simplified Chinese characters, Traditional Chinese characters or Chinese Pinyin.

4.2.5 Medicinal Part(s)

The attribute of Medicinal Part(s) is represented by "MP". Its datatype is string. MP describes where CMH can be used as a medicinal material, such as roots, rhizomes, leaves, flowers, fruits, and seeds.

4.2.6 Indication(s)

The attribute of Indicator(s) is represented by IND. Its datatype is string. IND describe the efficacy and indications of CMH.

4.2.7 Chemical Composition(s)

The attribute of Chemical Composition(s) is represented by "CC". Its datatype is string. CC describes the known effective chemical compositions of CMH.

4.2.8 Pharmacological Action

The attribute of Pharmacological Action is represented by "PhA". Its datatype is string. PhA describes the pharmacological effects of effective chemical constituents of CMH, including processes such as absorption, decomposition, metabolism, and excretion in organisms.

4.2.9 CMH Toxicity

The attribute of CMH Toxicity is represented by "CMHT". Its datatype is string. CMHT describes the toxicity of Chinese medicinal herbs.

4.2.10 Product Name(s)

The attribute of Product Name(s) is represented by "PN". Its datatype is string. If there are finished products on the market, the PN may be included in the database with a brief description.

4.3 Plant attributes

4.3.1 Overview

The Plant attributes shall include: Family, Genus, Plant Picture(s) and Plant Morphology.

4.3.2 Family

The attribute of Family of CMH is represented by "FCMH". Its datatype is string.

4.3.3 Genus

The attribute of Genus of CMH is represented by "GCMH". Its datatype is string.

4.3.4 Plant Picture(s)

The attribute of CMH Plant Picture(s) is represented by "CMHPP". Its datatype is binary. PPCMH shall be in JPEG (JPG), PNG, BMP or GIF format, and the main features of the CMH should be legible.

4.3.5 Plant Morphology

The attribute of CMH Morphology is represented by "CMHM". Its datatype is string. The internal and external morphology and structure of the CMH shall be described in detail, including the law of variation of organ formation and development, cells, tissues, organs in different environments and during ontogeny and phylogeny.

4.4 Geographic attributes

4.4.1 Overview

The Geographic attributes shall include: Producing Area(s), Producing Area Code(s), Geographic Location(s), Growth Environment, Archive Date.

Geographic attributes may include: Collection and Preparation.

4.4.2 Producing Area(s)

The attribute of Producing Area(s) is represented by "PA". Its datatype is string. PA describes the origin of the CMH, including countries, provinces or regions. It shall be in accordance with ISO 3166-1, ISO 3166-2, and ISO 3166-3.

4.4.3 Producing Area Code(s)

The attribute of Producing Area Code(s) is represented by "PAC". Its datatype is string. The PAC shall be consistent with the codes provided in ISO 3166-1, ISO 3166-2, ISO 3166-3.

4.4.4 Geographic Location(s)

The attribute of Geographic Location(s) is represented by "GL". Its datatype is string. GL provides the corresponding latitude and longitude and average altitude, which shall be in accordance with [4.4.2](#), [4.4.3](#) and ISO 6709.

4.4.5 Growth Environment

The attribute of Growth Environment is represented by "GE". Its datatype is string. GE describes the annual average temperature, annual average humidity, and annual average sunshine time of the

original plant of the CMH. It is divided into wild environment and artificial planting environment. The cultivation methods can be provided if artificially planted.

4.4.6 Collection and Preparation

The attribute of Collection and Preparation is represented by "CP". Its datatype is string. According to the growth characteristics of CMH, its original plant should be collected, harvested, processed and dried as required.

4.4.7 Archive Date

The attribute of Archive Date is represented by "AD". Its datatype is dateTime. This attribute refers to the date and time when a certain CMH data is completed. The value of this attribute should be automatically generated and accurate to the second.

4.5 Identifications

4.5.1 Overview

Identifications attributes shall include: Determination of active ingredients, Morphological Identification, Microscopic Examination, Physical and Chemical Identification.

Identifications may include: Fingerprint Identification and Fingerprint Picture(s).

4.5.2 Determination of Active Ingredients

The attribute of Determination of Active Ingredients is represented by "DAI". Its datatype is string. DAI describes the qualitative and quantitative methods for determining the effective chemical constituents in CMH.

4.5.3 Morphological Identification

The attribute of Morphological Identification is represented by "MorI". Its datatype is string. MorI describes the morphological identification methods and conclusions of CMH.

4.5.4 Microscopic Examination

The attribute of Microscopic Examination is represented by "MicE". Its datatype is string. MicE describes the microscopic identification method and conclusion of CMH.

4.5.5 Physical and Chemical Identification

The attribute of Physical and Chemical Identification is represented by "PCI". Its datatype is string. PCI describes the physical and chemical identification methods and conclusions of CMH.

4.5.6 Fingerprint Identification

The attribute of Fingerprint Identification is represented by "FI". Its datatype is string. FI identification methods to determine the fingerprint of CMH include but are not limited to spectroscopic and chromatographic methods.

4.5.7 Fingerprint Picture(s)

The attribute of Fingerprint Picture(s) is represented by "FP". Its the datatype is binary. FP shall be in JPEG (JPG), PNG, BMP or GIF format.

5 Example

An example of the CMH model is provided in [Annex A](#).

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Annex A (informative)

Example

The medicinal attributes of liquorice are shown in [Table A.1](#).

Table A.1 — Medicinal attributes of liquorice

CMH Name	Glycyrrhizae Radix et Rhizoma; Liquorice; 甘草; Gan cao
CMH Code	06156310300299005
Alias(es)	Liquorice
Medicinal Part(s)	Root and rhizome
Indication(s)	Invigorating the spleen and replenishing qi, clearing away heat and detoxifying, relieving pain, and harmonizing the ingredients in formulas.
Chemical Composition(s)	Liquiritin, Isoliquiritin, Glycyrrhizin, Liquiritigenin, 18 β -Glycyrrhetic acid, Liquiritin apioside, Glycyrrhetic acid, Licochalcone A, Glabridin.
Pharmacological Action	N/A
CMH Toxicity	N/A
Product Name(s)	N/A

The plant attributes of liquorice are shown in [Table A.2](#).

Table A.2 — Plant attributes of liquorice

Family	Fabaceae
Genus	<i>Glycyrrhiza uralensis</i> Fisch.; <i>Glycyrrhiza inflata</i> Bat.; <i>Glycyrrhiza glabra</i> L.
Plant Picture(s)	

Table A.2 (continued)

Plant Morphology	<p>Herbs perennial, roots and rhizomes thick, 1 cm to 3 cm in diam., brown outer, pale yellow inside. Sweet.</p> <p>Stems erect, much branched, 30 cm to 120 cm tall, densely covered with scaly glands, lanceolate glands and white or brown tomentose.</p> <p>Leaves 5 cm to 20 cm, stipules triangular-lanceolate, around 5 mm, around 2 mm, pubescently pubescently pubescently pubescent; Oval, long ovate or suborbicular, 1,5 cm to 5 cm long, 0,8 cm to 3 cm wide, dark green on top, green underneath, densely covered with yellowish brown glandular pubescent and pubescent, apically apically, shortly pointed. The base is round, the edges are full or slightly wavy, and the number is reversed.</p> <p>Racemes axillary, with many flowers, sessile sessate pubescent. Point and puberulent; calyx campanulate, 7 mm to 14 mm long, densely glandularly pubescent and pubescent, base slanted and sessately sessate, around 5, around Partially connected; corolla purple.</p> <p>White or yellow, 10 mm to 24 mm long, globose-oblong, apically dimpled, base with short stalk, valvate shorter than sate, keel valvate shorter than valvate; ovate densely lanceolate. The pods are curved like a sickle or a ring, densely packed with spheres, dense knobs and bristles. Seeds 3 to 11, dark green, round or kidney-shaped, around 3 mm. Flowering from June to August, fruiting from July to October.</p> <p>Erect genus, leaves alternate, odd number of compound leaves, 7 leaflets to 17 leaflets, elliptic ovate, racemes axillary, pubescent, butterfly-shaped flowers. The oblong fruit is sometimes curved in a sickle or ring shape and densely covered with brown hairy glandular hairs. Flat round seed.</p>
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The geographic attributes of liquorice are shown in [Table A.3](#).

Table A.3 — Geographic attributes of liquorice

Producing Area(s)	It is distributed in Asia, Europe, Australia, America and other places. In China, liquorice is mainly distributed in Xinjiang, Inner Mongolia, Ningxia, Gansu and Shanxi Yinzhou, mainly in the wild. Artificially planted liquorice is mainly produced in the Hexi Corridor of Xinjiang, Inner Mongolia and Gansu, and the surrounding areas of western Yunnan and parts of Ningxia.
Producing Area Code(s)	650000000000,CHN 640000000000,CHN 620000000000,CHN 150000000000,CHN
Geographic Location(s)	Latitude: 36°-54° north latitude Altitude: 150 m to 1 400 m
Growth Environment	Dry, long hours of sunshine.
Collection and Preparation	After 2 years to 3 years of planting, the finished product can be harvested, when the stems and leaves are withered in the fall from the end of September to the beginning of October. Wash and dry.
Archive Date	2023-06-07T16:18:20

The identifications of liquorice are shown in [Table A.4](#).