

# APPLICATIONS OF “HONG KONG CHINESE MATERIA MEDICA STANDARDS”

Chinese Medicine Regulatory Office,  
Department of Health of Hong Kong

Hong Kong Chinese Materia Medica Standards  
(HKCMMS) Section

# HKCMMS

## Background:

- Launched by Department of Health in 2001, aiming at establishing reference standards for commonly used Chinese Materia Medica (CMM) in Hong Kong

## Aims:

- Promote research of Chinese medicines
- Provide reference standards for CMM trade
- Ensure the safety and quality of CMM
- Promote modernisation and internationalization of Chinese medicines industry in Hong Kong
- Facilitate trade in Chinese medicines

# Governance & Partnership

## Research Institutions (RI)

- ✓ Collect sample and develop research methods
- ✓ Collect data and draft standard



## Government Laboratory

- ✓ Verify the methods provided by RI
- ✓ Provide technical support in method development



Publication of  
HKCMMS  
Reference  
Standards  
(Monographs)

## Scientific Committee



- ✓ Evaluate the methods and draft standards provided by RI
- ✓ Resolve technical issues and monitor progress

## International Advisory Board



- ✓ Endorse standards
- ✓ Advise on the principles, methodologies, parameters and analytical methods

# Progress of HKCMMS

- 11 volumes of HKCMMS were published between 2005-2024
- Total number of CMM standards endorsed: 344



# Highlights of HKCMMS Applications

## Key contributions:

1. Provide the applicable and adoptable reference for CMM trade
2. Ensure the safety and quality of CMM in protection of public health
3. Facilitate the trade in Chinese medicines
4. Promote CM research and developments
5. Provide frameworks for references and research findings

# (1) Provide Applicable and Adoptable Reference for CMM Trade

- Identification of CMM and rectification of medicinal parts used in Hong Kong
  - For instance, the monograph of Medulla Junci specified the correct medicinal part for this CMM

## Morphology of Medulla Junci and Herba Junci



Medulla Junci (stem pith)

- Correct medicinal part as shown in HKCMMS Volume 3



Herba Junci (whole plant)

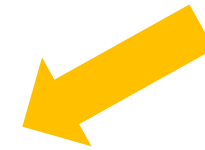
- Commonly available in market before publication of HKCMMS Volume 3
- Used medicinal part deviated from the Chinese Medicine Ordinance (Cap. 549 Laws of Hong Kong)

# (1) Provide Applicable and Adoptable Reference for CMM Trade

- To assist:

- ✓ Manufacturers of proprietary Chinese medicines (pCm)
- ✓ Holders of Certificate for Manufacturer (GMP) of pCm
- ✓ Applicants of registration of pCm

for establishing raw materials and product specifications



# (1) Provide Applicable and Adoptable Reference for CMM Trade

- A number of Hong Kong manufacturers of proprietary Chinese medicines certified with Good Manufacturing Practice (GMP) and Hospital Authority (HA) have adopted references standards of HKCMMS in the procurement of CMM and establishing quality control standards



醫院管理局  

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HOSPITAL  
AUTHORITY





## (2) Ensure CMM Safety and Quality in Protection of Public Health

- Provide information for regulatory authorities to strengthen the control:
  - For example, heavy metal content exceed limits for a CMM may warrant drug regulatory authority to conduct related risk assessments and initiate product recall
- Provide updates on the trends and concerns of contaminants in CMM:
  - Conduct regular reviews on limits and developments in order to be consistent with the requirements of various Pharmacopoeias. e.g.
    - Limit of Cadmium reviewed to harmonize with the European Pharmacopoeia
    - Determination of Sulphur Dioxide residues with limit has been included with reference to latest regulatory control in the Mainland



## (3) Facilitate the Trade in Chinese Medicines

- Serve as standards for accreditation:

- The Hong Kong Accreditation Service has already launched ISO/IEC 17025 accreditation service to laboratories performing tests according to HKCMMS
- 4 local laboratories complied with criteria of Hong Kong Laboratory Accreditation Scheme to authenticate the CMM according to the HKCMMS

HOKLAS SC-40
Issue No. 5
Issue Date: 17 May 2023
Implementation Date: 17 May 2023
Page 1 of 10

### HOKLAS Supplementary Criteria No. 40

‘Chinese Medicine’ Test Category – Identification of Chinese Materia Medica by Microscopic Examination in accordance with the Hong Kong Chinese Materia Medica (HKCMM) Standards

HOKLAS SC-44
Issue No. 5
Issue Date: 03 January 2024
Implementation Date: 03 January 2024
Page 1 of 18

### HOKLAS Supplementary Criteria No. 44

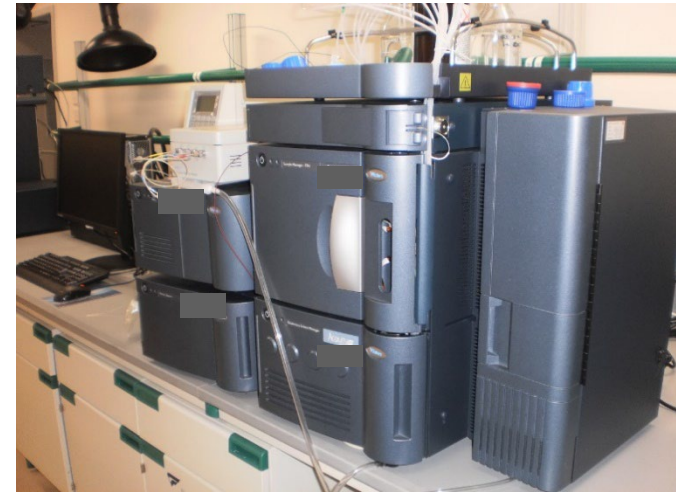
‘Chinese Medicine’ Test Category – Chemical and Physicochemical Testing to the Hong Kong Chinese Materia Medica (HKCMM) Standards

Accredited Test Items	No. of Accredited Laboratory*
Microscopic Identification	3
Chemical Analysis (including TLC, FP and AS)	2
Heavy Metals	2
Pesticide Residues	1
Aflatoxin	1
Tests (including ash, water content and extractives)	2

\*According to the information on the website of Hong Kong Accreditation Service ([https://www.itc.gov.hk/en/quality/hkas/accreditation/our\\_accreditation\\_services.html](https://www.itc.gov.hk/en/quality/hkas/accreditation/our_accreditation_services.html)) in Nov 2024


## (4) Promote CM Research & Developments

- Local universities and non-local research institutions participate in the HKCMMS Project
- Expansion of research capacity of research institutions in terms of manpower, analytical equipment and funding, etc




# (5) Provide Frameworks for References and Research Findings

- Cited by overseas reputable authorities
- Serve as reference methods in authenticating the reference herbal materials
- e.g. American Herbal Pharmacopoeia\* adopts HKCMMS to authenticate Botanical Reference Materials of Eucommiae Cortex, Isatidis Radix, Polygoni Multiflori Radix, Rehmanniae Radix

  
 AMERICAN HERBAL PHARMACOPOEIA®  
**AHP-Verified™ Botanical Reference Material**  
**Macroscopic Certificate of Authenticity**

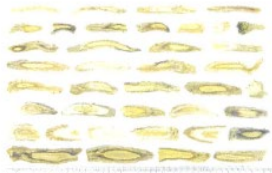


Botanical Nomenclature	<i>Isatis indigotica</i>	
Standard Common Name	Isatis (ban lan gen)	
Plant Part	Root	
Material Code	Isa.ind.ro.CHHC.01	
Lot Nr.	2761	
Quantity	5 gm	
Reference(s) Used for Comparison	HKCMMA 2007; PPRC 2000; Wagner et al. 2009; Zhao 2004	
Result	Material conforms with reference data.	
Certificate Nr.	645	Date: 01/04/2017
Provided For	TCM Healthcare, Unit 705 Sun Cheong Industrial Bldg., 1 Cheung Shun St. Kowloon, Hong Kong	





**Macroscopic Characterization**

When whole, cylindrical, slightly twisted, 10-20 cm in length, 0.5-1 cm in diameter. External surface pale grayish-yellow or pale brownish-yellow, longitudinally wrinkled, with horizontal lenticels, and rootlets or rootlet scars. Root stock bulges slightly, showing dull green or dull brown remnants of petiole bases and scars arranged in whorls, and dense verruciform (wart-like) protuberances. In transverse section, bark yellowish-white, occupying around 1/2-3/4 of radius, wood (xylem) yellow.

<b>Organoleptic Characterization</b>	
Taste	Sweetish, then bitter and astringent.
Aroma	Slight.
Texture	Compact, soft, slightly brittle.
Fracture	Fairly even.

**Figure 1** *Isatis indigotica* obliquely sliced root, sample # Isa.ind.ro.CHHC.01.  
**Figure 2** *Isatis indigotica* obliquely sliced root close-up view, sample # Isa.ind.ro.CHHC.01.  
**Figure 3** *Isatis indigotica* root fracture, sample # Isa.ind.ro.CHHC.01.

Compiled by Lynette Casper, B.S. Title: Quality Assurance Date: 01/19/17 Signature: 	Released by Roy Upton, RH Title: AHP Executive Director Date: 1/19/17 Signature: 
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Website: www.herbal-ahp.org

## (5) Provide Frameworks for References and Research Findings

- Total 24 ISO documents related to Traditional Chinese Medicine (TCM) cited HKCMMS as reference:

No.	Document Description
1	ISO 18664:2015 - Determination of Heavy Metals in Herbal Medicines used in Traditional Chinese Medicine
2	ISO 21314:2019 - Salvia miltiorrhiza Root and Rhizome
3	ISO 21316:2019 - Isatis indigotica Root
4	ISO 21317:2019 - Lonicera japonica Flower
5	ISO 21370:2019 - Dendrobium officinale Stem
6	ISO 22212:2019 - Gastrodia elata Tuber
7	ISO 22584:2019 - Angelica sinensis Root
8	ISO 22988:2019 - Astragalus mongholicus Root
9	ISO 23191:2020 - Determination of selected Aconitum Alkaloids by High-Performance Liquid Chromatography (HPLC)
10	ISO/TR 23975:2019 - Priority List of Single Herbal Medicines for Developing Standards
11	ISO 19609-1:2021 - Quality and Safety of Raw Materials and Finished Products Made with Raw Materials - Part 1: General Requirements
12	ISO 19609-1:2021 - Quality and Safety of Raw Materials and Finished Products Made with Raw Materials - Part 2 Identity Testing of Constituents of Herbal Origin

No.	Document Description
13	ISO 23959:2021 - Glehnia littoralis root
14	ISO 22585:2022 - Codonopsis pilosula root
15	ISO 22586:2022 - Paeonia lactiflora root - White peony root
16	ISO 23965:2022 - Bupleurum chinense, Bupleurum scorzonerifolium and Bupleurum falcatum root
17	ISO 4564:2023 - Scutellaria baicalensis root
18	ISO 9306:2023 Traditional Chinese medicine — Ephedra sinica, Ephedra intermedia and Ephedra equisetina herbaceous stem
19	ISO 8071:2024 Traditional Chinese medicine — Ligusticum chuanxiong rhizome
20	ISO 9109:2024 Traditional Chinese medicine — Rehmannia glutinosa root
21	ISO/TR 18986:2024 Traditional Chinese medicine — Report on the global industry and standardization development of Panax ginseng
22	ISO 8959:2024 Traditional Chinese medicine — Eucommia ulmoides stem bark
23	ISO 9299:2024 Traditional Chinese medicine — Curcuma longa rhizome
24	ISO 13615:2024 Traditional Chinese medicine — Atractylodes macrocephala rhizome

# (5) Provide Frameworks for References and Research Findings

- Maximum permitted limits of heavy metals stated in HKCMMS were cited to provide one of reference standards in TCM in BS ISO 18664:2015
- BS ISO 18664 was published in 2015 in response to the worldwide demand for:
  - ✓ Harmonization of the determination of heavy metals in herbal medicines used in TCM
  - ✓ Providing the maximum limits of heavy metals in natural materials of TCM in various references



Annex A  
(informative)

Reference of national, regional and organizational limits of heavy metals in natural TCM materials and calculated limits using Target Hazard Quotients based on USEPA and WHO

Different countries, regions and organizations give their own limits of heavy metals in natural materials of TCM. Table A.1 shows these limits in various types of herbal products. Also, some health authorities provide risk assessment methods (USEPA) and recommend heavy metals intake per week (WHO). According to these information and TCM's characteristics, the calculated limits using Target Hazard Quotients are also listed with the summarized maximum and minimum limits from previous references in Table A.1.

Table A.1 — The national, regional and organizational limits of heavy metals in natural TCM materials and calculated limits using Target Hazard Quotients based on USEPA and WHO (µg/kg)

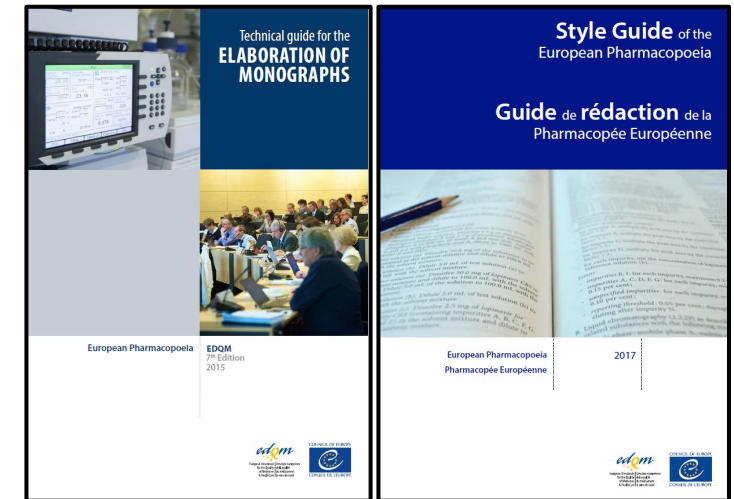
	Pb <sup>a</sup>	As <sup>a</sup>	Cd <sup>a</sup>	Hg <sup>a</sup>	Object	Analytical methods	Authority organization or regulation
Australia	5.0	—	-1	0.1	Unprocessed herbal material	AAS, ICP-AES or ICP-MS	Therapeutic Goods Administration
China	5	2	0.3	0.2	Crude herbal drugs	AAS and ICP-MS	Chinese Pharmacopoeia 2010 edition
Hong Kong	5	2	1	0.2	Chinese material medica	ICP-MS	Hong Kong Chinese Materia Medica Standards
Macao	20	5	—	0.5	Crude herbal drugs and Chinese patent medicines for external use	AAS and ICP-MS (The same as in Chinese Pharmacopoeia)	Written instructions No.10/SS/2013
Germany	5	—	0.2	0.1	Herbal medicines	—	Draft recommendation for limits of heavy metals in medicinal products of plant and animal origin 1991
India	10	3	0.3	1	Herbs	AAS	Pharmacopoeia of India
Japan	20	5	—	—	Crude herbal drugs	Colourimetric method	Japanese Pharmacopoeia 16th edition

	Pb <sup>a</sup>	As <sup>a</sup>	Cd <sup>a</sup>	Hg <sup>a</sup>	Object	Analytical methods	Authority organization or regulation
Hong Kong	5	2	1	0,2	Chinese material medica	ICP-MS	Hong Kong Chinese Materia Medica Standards



## (5) Provide Frameworks for References and Research Findings

- TCM herbal drug monographs in the European Pharmacopoeia (EP) must be prepared according to<sup>1</sup>:
  - ✓ The Style Guide of EP
  - ✓ Technical guide for elaboration of Monographs
  - ✓ Chinese Pharmacopoeia as basis
  - ✓ Take into consideration the information from WHO monographs on selected medicinal plants and HKCMMS as well



<sup>1</sup>Mei Wang and Gerhard Franz. The Role of the European Pharmacopoeia in Quality Control of Traditional Chinese Herbal Medicine in European Member States. *World Journal of Traditional Chinese Medicines* 2015 1(1):5-15

# (5) Provide Frameworks for References and Research Findings

- As references for scientific research of Chinese medicines
- Out of 344 CMM monographs published in HKCMMs, around 157 of them have been cited as references in more than 390 international journal articles



An integrated approach to reveal the chemical changes of Ligustri Lucidi Fructus during wine steaming processing

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**ABSTRACT**  
Ligustri Lucidi Fructus (LLF) is a traditional Chinese medicine to treat osteoporosis and hepatic dysfunction. Steaming is the major processing method for LLF in Chinese Pharmacopoeia, but the chemical changes involved are still unclear. In this study, a research strategy was proposed to reveal the chemical changes during wine steaming processing of LLF. Firstly, in total 104 compounds were tentatively identified using HPLC-ESI/MS. Secondly, potential chemical changes were revealed by comparing peak areas of the 104 compounds between LLF and the corresponding wine-steamed LLF (WSLLF). Finally, the chemical changes were confirmed by comparing the contents of 104 compounds between LLF and WSLLF. The contents of 45 compounds increased and 59 compounds decreased during wine steaming processing. The contents of 10 potential hydrolysis products increased from 0.75% to 0.88% after processing. Our study indicates that hydrolysis of inositol phosphonate esters such as inositol phosphonate is responsible for the chemical changes during the wine steaming of LLF. The proposed strategy could be employed to investigate the chemical changes of herbs during processing.

**1. Introduction**  
Ligustri Lucidi Fructus (LLF) known as Nvshen in China is derived from the dried ripe fruits of *Ligustrum lucidum* (Oleaceae) [1]. It has been used as a traditional Chinese medicine (TCM) for more than 2000 years [1]. LLF is widely recognized to have various effects, such as anti-osteoporosis [2, 3], hepatoprotective [4], anti-cancer [5], and anti-oxidant [6]. LLF is also widely used in TCM formulas such as *Yinchen Tang* [7], *Yinchen Tang* [8], and *Yinchen Tang* [9]. The chemical constituents of LLF include flavonoids, phenylpropanoids, and terpenoids [10]. Spectrometry is the most abundant method in LLF, and its content could reach 3.00% [11]. In the clinical practice of TCM, crude herbs are usually processed before use. The processing step is believed to modulate the therapeutic properties of TCMs, such as enhancing the efficacy, reducing the toxicity, altering the nature, flavor and chemical composition, and modifying the taste [12]. The processing of LLF is to soak with yellow rice wine as recorded in Chinese Pharmacopoeia (ChP) [13]. Chemical constituents of LLF and wine-steamed LLF (WSLLF) had been extensively studied. For example, Li et al. identified 50 compounds in WSLLF by using liquid chromatography coupled mass spectrometry (LC/MS) [13]. Yang et al. reported the chemical peak areas for *Ligustrum lucidum*, *Saposhnikovia divaricata*, *Actinidia chinensis* after processing using high performance liquid chromatography [14]. However, the chemical changes involve the wine steaming processing of LLF are still not well understood. In this work, an integrative research was performed to reveal the chemical changes of LLF during wine steaming processing. As a ultra-high performance liquid chromatography coupled with Orbitrap mass spectrometry (UHPLC/ESI/MS) can scan and identify 104 compounds in LLF. Secondly, semi-quantitative analysis was performed to reveal the potential chemical differences between LLF and WSLLF. Finally, the contents of 7 major compounds were determined in commercial LLF and WSLLF using a HPLC-UV method, and the chemical changes were confirmed.

**2. Materials and methods**  
**2.1. Chemicals and reagents**  
The reference standards, including quinic acid (QA), loganic acid (LA), hydroquinone (HQ), salutaridinol (SL), salutaridinol-7-O-glucuronide (SL7G), rutin (R), luteolin (L), gallic acid (GA), gallic acid-3-O-methyl ether (GAE), apigenin-7-O-glucuronide (AG7G), chlorogenic acid (CGA), and caffeoyl-CoA (CCoA) were purchased from National Institute for Research in Drug Control (NIDC), Beijing, China.

YAKUGAKU ZASSHI 138, 571-579 (2018)

生薬「ボウフウ」の品質評価 (野生品と栽培品の相違点)

西原正和,\* 坂井啓二, 大仁俊子, 坂川聖雄

Quality Evaluation of *Saposhnikovia Radix* (Differences between Wild-type and Cultivated Products)

Masakazu Nishihara,\* Keiji Nakai, Yuko Osumi, and Hirocuni Shiohara

Received October 5, 2017; Accepted November 28, 2017; Advance publication released online January 30, 2018

**ABSTRACT**  
*Saposhnikovia Radix* ("Boofu") is an important crude drug used in Kampo formulations. It is extracted in wild-type plants. However, recently, extraction has become difficult because of the decrease in wild-type plants. There are cultivated plants for the majority of the market, from which the crude drug is extracted. However, the cultivation techniques used are not sufficient to obtain the desirable extracts. In this study, we compared the contents of the trace and the quantitative values of characteristic constituents obtained from wild-type and cultivated plants, and a remarkable difference. Therefore, it is considered that these indicators play an important role in the evaluation of wild-type products.

**Keywords:** *Saposhnikovia Radix*; *Saposhnikovia Radix*; *Rhizoma Cimicifugae*; *pinic-6-O-galloyl caffeoyl-3-O-methyl ether*

**要約:** 漢方薬の原料植物として用いられるボウフウは、近年栽培品が増加している。栽培品の抽出技術は十分でなく、望ましい抽出物を得ることができない。本研究では、野生品と栽培品の含有成分を比較し、顕著な相違点を確認した。この結果、これらの成分は品質評価に重要な役割を果たしていると考えられる。

ボウフウは、*Saposhnikovia divaricata* SCHEUCHTZERの根が基本原料となる生薬で、発汗、解熱、鎮痛を比較し、初級細胞毒性や抗腫瘍活性に高い効果が期待されている。近年、野生品の採取が難しくなっており、栽培品の抽出技術は十分でなく、望ましい抽出物を得ることができない。本研究では、野生品と栽培品の含有成分を比較し、顕著な相違点を確認した。この結果、これらの成分は品質評価に重要な役割を果たしていると考えられる。

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전량 시간에 따른 애엽의 성분비전 비교연구

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**ABSTRACT**  
The Comparative Study on Compositional Pattern Analysis of Decoction of Extracted *Artemisia argyi* by Different Extraction Time

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**Objectives:** This study was conducted to find out the optimal extraction time for *Artemisia argyi*.  
**Methods:** The compositional pattern was compared with HPLC (High Performance Liquid Chromatography) and GC (Gas-Chromatography) by decocting *Artemisia argyi* 10, 60, 120 minutes respectively.  
**Results:** With longer extraction time, the contents of reference compounds were extracted 1.1 times more when 3.4-diacetofluquinic acid was extracted for 60 minutes than when extracted for 10 minutes in HPLC test, but the contents were reduced when extracted for 120 minutes compared to 60 minutes extraction time. 3,4-dif-O-caffeoylquinic acid, 3,5-dif-O-caffeoylquinic acid, 4,5-dif-O-caffeoylquinic acid, jaceosidin, and eupatilin showed the largest yield rate when extracted for 10 minutes, and it decreased as time passed. The contents of chlorogenic acid, 3,5-diacetofluquinic acid, 4,5-diacetofluquinic acid, jaceosidin, apocarpone, and eupatilin were detected only in 10 minutes extraction but not in 60 or 120 minutes extraction according to GC test.

**Conclusions:** The results show that extraction time could affect the physicochemical characteristics or composition of *Artemisia argyi* extracted. Thus, short extraction time could be useful for decoction of *Artemisia argyi*.  
**Key words:** *Artemisia Argyi* Extraction Time; High Performance Liquid Chromatography; Gas Chromatography

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\*252\* 中国药典标准 Drug Standards of China 2018, 19 (3)

香港中药材标准研究与历程回顾

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Received October 5, 2017; Accepted November 28, 2017; Advance publication released online January 30, 2018

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148 World Latest Medical Information (Electronic Version) 2017, Vol.17, No.79

· 经验交流 ·

“香港中药材标准”与《中华人民共和国药典》在新药筛选中的对比与前景

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2. Department of Health, the Government of the Hong Kong Special Administrative Region of the People's Republic of China

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## (5) Provide Frameworks for References and Research Findings

- As a precedent to show microscopic identification features of CMM with high resolution images
- HKCMMS is the first reference standard compendium to illustrate microscopic features of CMM with drawings and photographs
- Set an example to other pharmacopoeias / compendia

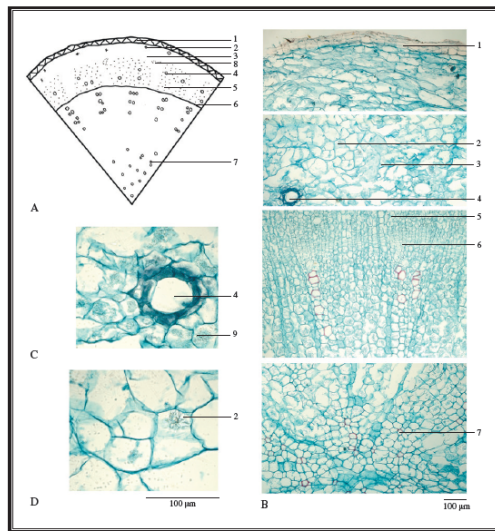


Figure 2. Microscopic features of transverse section of *Radix Panacis Quinquefolii*

A. Sketch B. Section illustration C. Resin canal D. Cluster of calcium oxalate

1. Cork 2. Cluster of calcium oxalate 3. Cortex 4. Resin canal  
5. Phloem 6. Cambium 7. Xylem 8. Cleft 9. Starch granules

*Radix Panacis Quinquefolii*  
monograph in HKCMMS Volume 3  
published in 2010

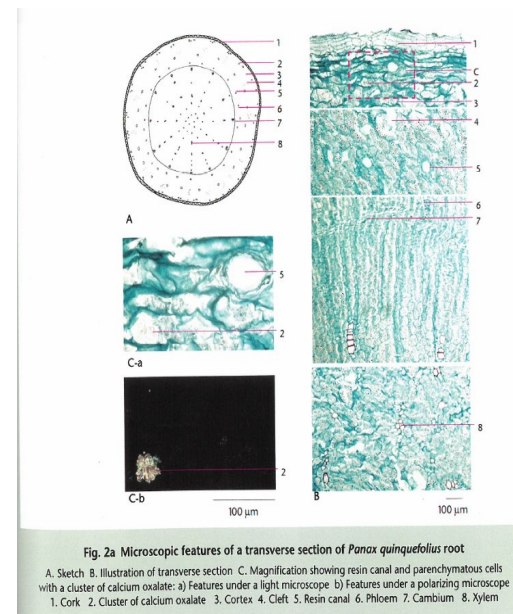


Fig. 2a. Microscopic features of a transverse section of *Panax quinquefolius* root

A. Sketch B. Illustration of transverse section C. Magnification showing resin canal and parenchymatous cells with a cluster of calcium oxalate: a) Features under a light microscope b) Features under a polarizing microscope  
1. Cork 2. Cluster of calcium oxalate 3. Cortex 4. Cleft 5. Resin canal 6. Phloem 7. Cambium 8. Xylem

*Radix Panacis Quinquefolii*  
monograph in  
USP's Dietary Supplements  
Compendium\* published in 2015

# (5) Provide Frameworks for References and Research Findings

- The Western Pacific Regional Forum for the Harmonization of Herbal Medicines (FHH) is a technical forum with aims to provide technical documents and consensus on technical issues related to the quality, safety and efficacy of herbal medicines
- HKCMMS is cited as one of the pharmacopoeial references in FHH webpage



About FHH

Bulletin Board

Meetings

Projects

Link

Purpose

Products

Terminology

Link

Pharmacopoeia is an official publication containing a list and description of medicines (including herbal medicines) and published by the authority of a government.

The pharmacopoeia widely used in the field of herbal medicines are as follows.

## Worldwide Pharmacopoeia

Pharmacopoeia	URL
Chinese Pharmacopoeia	<a href="http://wp.chp.org.cn/front/chpint/en/">http://wp.chp.org.cn/front/chpint/en/</a>
Japanese Pharmacopoeia	<a href="http://www.pmda.go.jp/english/rs-sb-std/standards-development/jp/0019.html">http://www.pmda.go.jp/english/rs-sb-std/standards-development/jp/0019.html</a>
Korean Pharmacopoeia	<a href="https://www.mfds.go.kr/eng/brd/m_18/view.do?seq=70483">- 10th Ed. (Eng) https://www.mfds.go.kr/eng/brd/m_18/view.do?seq=70483</a> <a href="https://www.mfds.go.kr/brd/m_211/view.do?seq=14317">- 11th Ed. (Kor) https://www.mfds.go.kr/brd/m_211/view.do?seq=14317</a>
Hong Kong Chinese Materia Medica Standards	<a href="http://www.cmro.gov.hk/html/eng/GCMT/hkcmms/volumes.html">http://www.cmro.gov.hk/html/eng/GCMT/hkcmms/volumes.html</a>
Vietnamese Pharmacopoeia	<a href="https://duocdienvietnam.com/">https://duocdienvietnam.com/</a>
European Pharmacopoeia	<a href="https://www.edqm.eu/en/european_pharmacopoeia_10th_edition">https://www.edqm.eu/en/european_pharmacopoeia_10th_edition</a>
British Pharmacopoeia	<a href="https://www.pharmacopoeia.com/">https://www.pharmacopoeia.com/</a>
United States Pharmacopoeia	<a href="https://www.usp.org">https://www.usp.org</a>
International Pharmacopoeia (WHO)	<a href="https://apps.who.int/phint/en/p/about/">https://apps.who.int/phint/en/p/about/</a>



\*Website of FHH: [http://www.fhh.or.kr/projects/pharma\\_link.php](http://www.fhh.or.kr/projects/pharma_link.php)

THANK YOU