Research paper

Materia medica chests: Investigating the 19th century use of botanicals by different medical professions

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Abstract

The use of herbal substances was an element of everyday medicine until the advent of synthetic medicines from the late 19th Century onwards. Medicinal chests were used as teaching and examination tools for apothecaries and pharmacists. The contents of two 19th Century *materia medica* chests that are owned by the Worshipful Society of Apothecaries in London (LSA) were analysed and compared with written texts from the time in order to understand botanical drug knowledge in 19th Century Britain. The samples in the chests and any associated information was documented and analysed.

The pharmacists' examination chest contained 84 botanical drug samples, while 94 botanical drugs could be identified in the apothecaries' chest; 45 of these were present in both chests. Minimal changes in herb use over the 19th Century and limited variation of the botanical drugs used by different medical professionals were found. There are some differences with respect to the therapeutic areas which were of importance - the pharmacists' chest contained some potent purgatives and toxic drugs, while botanical drugs unique to the apothecaries' chest were gentle digestives and tonic herbs. Comparison of the chest contents with texts from the 19th Century has indicated that no single historical source provides a complete picture of the botanical drug use at the time.

This is a pilot study highlighting the potential of such chests in research on the history of European herbal medicine, and a more systematic study including research on the botanical drugs' chemical composition and authenticity is warranted.

Keywords

Apothecaries; herbal; history; medicine chest; pharmacy, European phytotherapy

Introduction

The 19th Century saw dramatic changes in health care, including medicine and pharmacy. During the century, apothecaries, and druggists/chemists were professionalised. Physicians, surgeons and midwives also consolidated their positions in society. Knowledge of the chemical constituents of plant medicines and the use of chemically defined medicines increased as professionals sought to improve their treatment of patients, while distancing themselves from unqualified ‘quacks’. This professionalization also led to less emphasis on domestic self-care, and popular domestic health guides started to recommend that health practitioners should be involved in determining treatment (Griggs, 1997; Heinrich et al, 2018).

The popularity of domestic self-medication in the 18th Century led to the production of medicine chests to be used at home or at sea. These were usually produced and sold by chemists/druggists and apothecaries and many examples of these can be found in museums today (Crellin, 1979). Crellin has argued that these medicine chests reflect the orthodox medicine of the time, as authors of guides contained within them were often physicians. Other chests include those of physicians and academics that were compiled for educational training purposes or as a collection of curiosities, such as three *materia medica* chests found at Cambridge University (Saville Peck, 1953).

Two *materia medica* chests, which are part of an archive of artefacts, books and records at the Worshipful Society of Apothecaries London (LSA), form the basis of this study. The LSA is a livery company in the City of London founded by Royal Charter in 1617 to support and protect the rights of apothecaries (Hunting, 2004). The increased rights of apothecaries to both attend to patients and dispense medicines led to them becoming what we know as modern-day general practitioners.

Botanical drugs comprised the great majority of drugs used in 19th Century Britain. The botanical contents of these chests are therefore relevant to understanding the practice of medicine at that time. They also form a useful dataset in considering the long-term history of herbal medicines, from antiquity to the current day. The types of conditions that were known about and/or treated in the 19th Century will be reflected in the drugs available at the time and what they were used for. Despite changes during the 19th century, by its end, botanical drugs (defined as medicines produced from plants or plant parts) still comprised the vast majority of medicines.

The objective of this study is to assess whether the botanical drugs in the chests reflect medical publications at the time and whether there were differences between drugs used by different professional groups, as indicated by the contents of the chests.

Background: Historical texts and physical archives in ethnopharmacology

By the 19th Century, in addition to the official pharmacopoeias, there were many texts on *materia medica* and medicinal botany (e.g., Bell, 1815; Pereira, 1854; Flückiger, 1879). Historical texts allow the changing views and knowledge of medicinal plants to be traced through time. Additionally, the influence of those texts on medicinal plant use can be

determined, including the influence of historical plant use on contemporary plant use by comparison (Heinrich et al, 2006; Leonti, 2011).

Monitoring the mention of different plant medicines and their uses over time allows a detailed picture to be built up of changing beliefs and knowledge about them. Today we trace the history of the healthcare professions in the UK through the changes in legislation that enabled the members of different professional groups to practice. Researching the varied use of botanical medicines by these groups may enable greater insight into the practical differences between what each profession was doing on a day to day basis and what this reflects about the scientific paradigm and culture of the period.

Historical artefacts such as *materia medica* chests complement written material, as the physical presence of plant samples enables plant identity to be checked and clarifies the plant part used. Leonti et al (2010: p.382) discuss this with reference to archeobotanical findings of carbonised vegetables and fruit following the eruption of Mount Vesuvius: “findings like these impart a physical component to historical texts, providing solid evidence of the historic presence of the described species”. Brand et al (2017: p.210) agree that *materia medica* collections can “provide valuable material evidence that complements literature-based research”.

The medicine chests

The first *materia medica* chest described here was used as a training tool for the major examination required by the Pharmaceutical Society for all members who wished to practice as a pharmaceutical chemist. This examination required knowledge of the entire British pharmacopoeia, in addition to an extra list of medicinal plants (Hudson & Boylan, 2013). The major examination *materia medica* chest at the Society of Apothecaries does not represent the

full range of materials of which examinees would need knowledge. The pharmacists' chest is a small box, approximately 37.5cm x 27cm x 10cm in size. It is not known when the case was acquired by the LSA.

The medicines are neatly organised with between one and three samples in each small compartment (Figures 1-3). The botanical drugs are found as whole or cut roots, leaves, flowers, bark, seeds or lumps of resinous material, depending on the medicine. There are chemical powders and some liquid medicines stored in small stoppered tubes. For each sample, either the sample itself or the compartment is numbered and these correspond to a key printed on wooden dividers of the three trays that stack within the chest. The key is labelled with a common usage name, scientific botanical name and the country the sample was from (Figure 4).

The second chest was given to the Society in 1935 by Dr Cyril Herbert Thomas Ilot (member of the Court of Assistants), the great-great-grandson of an apothecary. The apothecaries chest is a large cabinet (152cm x 58cm x 64cm) situated on the landing at the LSA. To study the contents, drawers needed to be removed one at a time and taken to the archive room. The apothecaries' cabinet was in need of restoration and great care had to be taken when removing the drawers not to damage it further, with one of the drawers impossible to take out. There are 18 large drawers (approximately 45cm x 50cm x 5cm) each separated into 24 to 28 different compartments that contain plant material, chemical powders or other drugs. Not every compartment has a unique sample in it, with some of the drawers containing smaller material (such as seeds, leaves or flowers) having the samples mixed up and spread throughout each compartment. Each drawer has written on the edge "subscribers are particularly requested not to injure the specimens". Some drawers have index cards in the compartments listing the

materials that were or still are present (see Figure 5 for an example). There are also six notebooks (with W.C. Barnes Chemist printed on the front) listing the names, uses, and official preparations of a number of the samples (see Figure 6 for an example). The list of herbs present in this chest was compiled mainly from the index cards and notebooks. Some of the samples could be identified from their morphology, however, this name was usually confirmed by the presence of a notebook or index card entry. Each of the compartments was labelled with a number. Some of the labels stated "hall no. …" This indicates that its use was for those studying for the LSA exam, as this exam was also known as the "Hall exam" (personal correspondence with Nicholas Wood, July 2016). An advertising leaflet printed by the Hall of Apothecaries promoting "Iodex" iodine ointment for joints and "neuro-phosphates" for menopause had a handwritten note on the front claiming "from which this *materia medica* chest came – when replaced by cause often came for teaching purposes", further supporting the likely use of the chest by trainee apothecaries. There were a number of business cards for physicians found in the chest, in addition to a blank invitation from W.C. Barnes for attendance to view the specimens (Figure 7).

Due to the mixing up of samples in the apothecaries' cabinet, the one inaccessible drawer and the lack of labels for every sample, it was impossible in the time available to identify each sample positively. An estimated 25% of botanical drug samples present were not included in the analysis, producing an incomplete set of data for comparison with the pharmacists' chest.

The medicines in the apothecaries' chest consist of much larger samples than in the pharmacists' chest, as the drawers and compartments within the drawers are considerably bigger (Figures 8-10). Each drawer tends to have similar plant parts or preparations grouped

together, for example, there is one drawer that only contains sections of wood or bark. Some samples appear repeatedly in a few different compartments and even in different drawers. This may be due to material moving in transit, getting mixed up during use or having a repeated appearance due to an arranged order to the drawers that is not currently apparent. The notebooks and index cards that were found in some of the drawers correspond to some but not all the samples, and not all notebook entries could be matched up to samples.

In the context of this project, botanical drug is defined as the sample provided in the chest in whatever form it is found. In the most part this is raw, dried plant material, however, there were some dried extractions present in the chests in stoppered tubes or wrapped in paper.

Dating of the chests

The apothecaries' chest was likely to be in use between 1815, when the LSA exam was started and at least 1891, as there is a sample wrapped in a letter from the Royal Microscopical Society from 1891. The hall exams stopped being held in 1858 when the GMC took over responsibility for examining the medical professions, however, the chest appears to still have been in use after that point. The chest contains a business card for a G.F. Collier, MD (Figure 11) of the Royal College of Physicians. The Society of Apothecaries members' records show that he passed his LSA exam in 1819 and became a member of the Royal College of Physicians in 1831, so the card was placed in the chest after 1831, further evidence of active use of the chest. The pharmacists' chest was likely to be in use between 1852, when the major examination became compulsory to become a Pharmaceutical Chemist, and sometime from 1908 to 1911, when the Pharmacy Act, followed by the National Insurance Act, required the development of a compulsory syllabus for pharmacist training and a new examination (Earles, 2005). The Pharmaceutical Journal published examples of exam papers from 1898 onwards, and in 1899

an article spelled out that applicants should be able to recognise specimens and describe where they were from, how they were used, collected and prepared for market. They also needed to know the chief constituents of the plants and understand qualitative tests (Hudson & Boylan, 2013).

Methods

Lists of the specimens present in each chest were compiled using the labels on the keys for each compartment in the pharmacists' chest and a combination of visual identification where obvious, the index cards and notebook entries in the apothecaries' chest. When there were two separate botanical drug samples present from the same plant, i.e. a root and a resin, or seeds and bark, these were listed as one entry but both forms were included. Any non-plant derived samples, such as animal parts, insects and chemical powders were not considered in this analysis.

These lists of specimens were compared with each other to establish which samples were present in both chests and which were only contained in the apothecaries' chest. They were then compared with the drugs listed in the English translation of the London Pharmacopoeia from 1817 and the British Pharmacopoeia from 1898; two accepted sources for lists of drugs in use at the time of publication.

For each sample, the Latin binomial name provided in the key of the pharmacists' chest or the entry on the index card or notebook entry in the apothecaries' chest was taken as the most accurate description for the plant of origin. This was used to establish appropriate modern scientific taxonomic names for each sample. The Kew Gardens Medicinal Plant Names Service (MPNS) database was searched for the Latin binomial botanical names listed for each plant

(apart from some cases in the apothecaries' chest, when there was only a common name provided) and the most likely one or two suggestions chosen. In the event that there was no clear choice, but one of the suggested plant names was listed as a medicinal species and others were not, the medicinal one was chosen. The scientific name suggested by the MPNS was also cross referenced with The Plant List (www.theplantlist.org) in cases where further information was required. Where there was only a common name provided in the chest, this was used to search the MPNS, or cross referenced with Grieve (1978) or Flückiger (1879). Some examples of this process are described below.

For example, the word anchusa was written on paper wrapped round a sample of purple roots in the apothecaries' chest; this could be tentatively identified as either alkanet (*Alkanna tinctoria* (L.) Tausch., which is listed by Gray as having the scientific name *Anchusa tinctoria* and was also known by the common name "diers bugloss" (Woodville, 1810) or as garden bugloss (*Anchusa officinalis* L.) from the common name. *Alkanna tinctoria* (L.) Tausch. is the most likely option due to the roots of alkanet being purple (Woodville, 1810).

Aloe socotrina, as labelled in the pharmacists' chest was not listed in either the MPNS or TPL, however, socotrine aloe was listed as a common name for *Aloe perryi* Baker, which is an aloe species used in Yemeni traditional medicine (Ali et al, 2001); this sample is listed as being from Socotra, which is today officially part of Yemen.

Catechu nigrum was listed without a scientific name, however, Flückiger suggests that either *Acacia catechu* Willd. or *Acacia suma* Kurz can be used to manufacture catechu nigrum. Searching for black catechu or either of the names suggested by Flückiger gives the modern scientific names *Senegalia catechu* (L.f.) P.J.H. Hurter & Mabb. or *Senegalia polyacantha*

(Willd.) Seigler & Ebinger; however, *Senegalia polyacantha* (Willd.) Seigler & Ebinger is not linked to black catechu as a common name in MPNS and is listed as an unresolved name in TPL, making *Senegalia catechu* (L.f.) P.J.H. Hurter & Mabb. the more likely choice.

Alexandria senna and Tinnevelly senna are found in the pharmacists' chest with the scientific names of *Cassia lanceolata* and *Cassia elongata*, respectively. One of the notebooks in the apothecaries' chest lists East Indian senna leaves and Alexandrian senna; no scientific name is given for the East Indian senna listing, but the Alexandrian senna is listed with the scientific name *Cassia senna*. Flückiger lists Tinnevelley senna and East Indian senna as coming from *Cassia augustifolia* but Alexandrian senna as coming from *Cassia acutifolia*. The MPNS associates all the above species names with the species *Senna alexandrina* Mill., which is confirmed by a recent paper confirming that the same species produces East Indian and Alexandrian senna; however, the authors state that even when the same species is used, variations in geographical source can affect the chemical composition of the senna (Farag et al, 2015).

Bdellium appears in MPNS as the genus of a synonym for a species with the modern Latin binomial *Commiphora africana* (A.Rich.) Engl. Searching for bdellium as a common name in MPNS resulted in the suggestions, *Commiphora wightii* (Arn.) Bhandari, *Commiphora africana* (A.Rich.) Engl. and *Commiphora mukul* (Hook. ex stocks) Engl. The last option was the only one that had common name listings of both bdellium and false myrrh and is a species used in modern day Ayurvedic traditional medicine. Gray (1824, p.185) lists bdellium or "myrrha imperfecta" as "exudes from a nondescript amyris, called by Adanson". Grieve (1978) discusses bdellium as an inferior myrrh that is a mixture of resins from several African *Commiphora* species including a perfumed bdellium also called habaghadi, which is mentioned

by Flückiger (1879) as a variety of true myrrh. This indicates a complex picture and some disagreement from different sources, showing that definite assignment to a single species is not always possible

The botanical drugs present in the pharmacists' chest, but not found among those identified in the apothecaries' chest or either of the pharmacopoeias were also searched for in Steggall (1844), a guide to preparation for the Pharmaceutical Society exams.

RESULTS & DISCUSSION

The samples found in the pharmacists' chest have been preserved relatively well, as they are tightly packed in, without much movement possible. However, the leaves were often crumbling, with features such as ribs being hard to identify. This means that identification solely by morphological characteristics would be impossible in some cases. In the apothecaries' chest, large sections of wood, bark and roots were well preserved, as were many of the seeds with tough outer casings, however, as with the pharmacists' chest, many of the samples of leaves and flowers were disintegrating and difficult to identify. The written information in the apothecaries' chest was all handwritten and could sometimes be difficult to decipher.

Overall, there were 84 botanical drug samples in the pharmacists' chest (Table 1). There were 16 samples of botanical drug in the pharmacists' chest that were not found in those identified from the apothecaries' chest or either pharmacopoeia, and an additional 24 that were in the pharmacists' chest and one or both of the pharmacopoeias, but not in the apothecaries' chest. Overall, there were 94 botanical drugs that could be identified in the apothecaries' chest (Table 2), with some additional chemically derived, mineral- or animal-origin drugs that were not analysed. There were 19 botanical drugs listed or present in the apothecaries' chest that were

not found in the pharmacists' chest or either pharmacopoeia; and an additional 30 that were in the apothecaries' chest and one or both of the pharmacopoeias, but not the pharmacists' chest. There were 45 botanical drug samples that were found in both chests, although these were not always present in both pharmacopoeias.

Botanical drugs found in the chests

Table 1: Botanical drugs found in the major examination *materia medica* chest

Botanical drug name as listed on key	**Plant scientific name as listed on key**	**Country of origin of sample as listed on key**	**Scientific (tentative) name according to modern nomenclature**	**Use**
Aconite root *†	*Aconitum napellus*	Europe	*Aconitum napellus* L.	Used as an anodyne liniment and occasionally given internally for rheumatism (Flückiger)
Alexandrian senna leaf	*Cassia lanceolata*	Alexandria	*Senna alexandrina* Mill.	Used as a laxative
Aloe barbadensis dried leaf juice *†	*Aloe vulgaris*	Barbados	*Aloe vera* (L.) Burm.f.	Purgative
Aloe capensis dried leaf juice	*Aloe lucida*	Cape of Good Hope	*Aloe ferox* Mill.	Cape aloes (Aloe ferox L.) are listed by Flückiger as having "brilliant conchoidal fracture and peculiar odour". He states that all the aloes are used as purgatives
Aloe socotrina dried leaf juice *†	*Aloe (undetermined)*	Socotra via Bombay	*Aloe perryi* Baker	Flückiger states that all the aloes have similar uses
Ammoniacum gum-resin *	*Dorema ammoniacum*	Persia and Punjab	*Dorema ammoniacum* D.Don	Expectorant and used in certain plasters (Flückiger)
Areca nut	*Areca catechu*	South Asia	*Areca catechu* L.	According to Flückiger, a dose of 4-6 drachms can be used to expel tapeworm
Arnica root †	*Arnica montana*	Europe	*Arnica montana* L.	Used externally on bruises and chilblains. Internally used as a stimulant and diaphoretic (Flückiger)
Ash bark *†	*Fraxinus ornus*	Southern Europe	*Fraxinus ornus* L.	Gentle laxative (Flückiger)
Bael fruit	*Aegle marmelos*	Malabar	*Aegle marmelos* (L.) Corrêa	Flückiger describes bael as an Indian remedy for dysentery and diarrhoea that also helps in

				constipation
Balsam of Peru resin *	*Myroxylon pareirae*	Central America	*Myroxylon balsamum* (L.) Harms or *Myroxylon balsamum* var. *pereirae* (Royle) Harms	Flückiger states that it is occasionally prescribed in the form of ointment as a stimulating application to old sores. Sometimes internally for asthma and chronic cough
Balsam of Tolu resin *†	*Myroxylon toluifera*	New Granada	*Myroxylon balsamum* (L.) Harms (this is the same as the Balsam of Peru)	Used as an ingredient to make syrups pleasant tasting (Flückiger)
Bearberry leaves	*Arctostaphylos uva-ursi*	Indigenous	*Arctostaphylos uva-ursi* (L.) Spreng.	Astringent tonic used in afflictions of the bladder (Flückiger)
Belladonnae root *†	*Atropa belladonna*	Britain or Germany	*Atropa belladonna* L.	Used for the preparation of atropine that can be used to dilate the pupil of the eye. It can be used externally in a liniment for neuralgia (Flückiger)
Benzoin resin	*Styrax benzoin*	Siam/Sumatra	*Styrax benzoin* Dryand.	Mainly used in incense (Flückiger)
Birthwort root	*Aristolochia longa*	South Europe	*Aristolochia fontanesii* Boiss. & Reut.	Grieve states that it is used as an aromatic stimulant in rheumatism and gout and for removing obstructions after childbirth
Bitter orange peel *†	*Citrus bigaradia*	South Europe	*Citrus* × *aurantium* L.	Aromatic tonic (Flückiger)
Black hellebore root	*Helleborus niger*	Not listed	*Helleborus niger* L.	Flückiger considers black hellebore to be a drastic purgative
Black pepper fruit *†	*Piper nigrum*	East Indies	*Piper nigrum* L.	Mainly only used as an ingredient in other preparations (Flückiger)
Buchu leaves †	*Barosma betulina*	Cape of Good Hope	*Agathosma betulina* (P.J.Bergius) Pillans	Disorders of the urino-genical organs. Thought to be a diuretic and diaphoretic (Flückiger)
Gum olibanum	*Boswellia thurifera*	Arabia	*Boswellia serrata* Roxb.	Flückiger states that olibanum can be obtained from the stem of several different *Boswellia* species and that its main use is in incense
Calumbae root *†	*Jateorrhiza columba*	Eastern Africa	*Jateorhiza palmata* (Lam.) Miers	Used as a mild tonic. Contains berberine (Flückiger, 1879)
Canella bark *	*Canelia alba*	West Indies	*Canella winterana* (L.) Gaertn.	Aromatic stimulant (Flückiger)

Chilli peppers *†	*Capsicum fastigiatum*	Zanzibar	*Capsicum frutescens* L.	Used as a local stimulant or internally to promote digestion (Flückiger)
Carraway fruit	*Carum carvi*	England and Germany	*Carum carvi* L.	Aromatic stimulant or as a flavouring ingredient (Flückiger)
Cardamon fruit *†	*Elettaria cardamomum*	Malabar	*Elettaria cardamomum* (L.) Maton	Aromatic often administered with other medicines (Flückiger)
Carrageen plant (chondrus crispus)	*Lichen hibernicus*	Irish Coast	Most likely *Chondrus crispus* Stackh., commonly used under its name carrageen	Grieve lists *Chondrus crispus* as the botanical name for Irish moss with the synonym carrageen with uses as a pulmonary demulcent. Flückiger lists a synonym as *Fucus crispus* L. and states that it was introduced to the medical profession in England in 1831. He advises that it produces a mucilaginous decoction that can be used in pulmonary complaints, but it is mainly used for industrial methods such as thickening colours in printing or for fining beer
Carthagena bark	Not given	Not listed	*Carapichea ipecacuanha* (Brot.) L.Andersson or *Cinchona lancifolia* Mutis	According to Flückiger, this may be a variety of ipecacuanha or a cinchona bark not used in pharmacy
Cascarilla bark *†	*Croton eluteria*	Bahama islands	*Croton eluteria* (L.) W.Wright	Used as a tonic (Flückiger)
Cassia pod *	*Cassia fistula*	East or West Indies	*Cassia fistula* L.	The pulp separated from the woody part of the pods is a mild laxative. It is also an ingredient in confection sennae (Flückiger)
Catechu nigrum wood *	Not given	Not given, although it appears in the pharmacopoeias of China and India (MPNS)	*Senegalia catechu* (L.f.) P.J.H.Hurter & Mabb.	Catechu (or cutch) is used as an astringent and can be manufactured from *Acacia catechu* Willd. Or *Acacia suma* Kurz (Flückiger)
Catechu pallidum extract	*Uncaria gambir*	Singapore	*Uncaria gambir* (W.Hunter) Roxb.	This is described as gambier by Flückiger. He states that it is used medicinally for its astringent properties, but is mainly used for tanning and dyeing. In

				1852, catechu was used for its astringent properties in diarrhoea and haemorrhage (Steggall).
Chamomile flowers *	*Anthemis nobilis*	Europe	*Chamaemelum nobile* (L.) All.	The infusion is used as a bitter stomachic and tonic (Flückiger)
Chirata twigs	*Ophelia chirata*	Northern India	*Swertia chirayita* (Roxb.) H.Karst.	Flückiger spells this chiretta and describes it as a pure bitter tonic that is mostly used in India
Cinnamon bark *†	*Cinnamomum zeylanicum*	Ceylon	*Cinnamomum verum* J.Presl	Used as a cordial and stimulant in medicine, but more commonly used as a spice (Flückiger)
Cocoa butter	*Theobroma cacao*	Not listed	*Theobroma cacao* L.	Used in pharmacy as a base for suppositories or pessaries (Flückiger)
Colchicum corn *†	*Colchicum autumnale*	Indigenous	*Colchicum autumnale* L.	Used in gout, rheumatism, dropsy and cutaneous maladies (Flückiger)
Colocynth pulp *†	*Citrullus colocynothis*	Countries bordering on the Mediterranean	*Citrullus colocynthis* (L.) Schrad.	Used as a purgative alongside aloes and scammony (Flückiger)
Copaiba resin *	*Copaifera multijuga*	Brazil	*Copaifera multijuga* Hayne	Flückiger states that it is a stimulant to mucous membranes, particularly those of urino-genical organs
Coriander fruit	*Coriandrum sativum*	Cultivated in Britain	*Coriandrum sativum* L.	They have stimulant and carminative effects, yet Flückiger states that they are mainly used in cookery and by distillers of gin
Cortex cassia *	This has 'substituted for cinnamon' written on the key	East or West Indies	*Cinnamomum cassia* (L.) J.Presl. is most likely (although according to Flückiger there are multiple *Cinnamomum* species that are used to substitute *Cinnamomum zeylanicum*)	The pulp separated from the woody part of the pods is a mild laxative. It is also an ingredient in confection sennae (Flückiger)
Cubebs fruit †	*Cubeba officinalis*	Java	*Piper cubeba* L.f.	Used in the treatment of gonorrhoea (Flückiger)
Cusparia bark *†	*Galipea cusparia*	South America	*Angostura trifoliata* (Willd.) T.S.Elias	Tonic in dyspepsia, dysentery and chronic diarrhoea (Flückiger)
Cusso leaves and flowers	*Brayera anthelmintica*	Abyssinia	*Hagenia abyssinica* (Bruce ex Steud.) J.F.Gmel. (*Brayera anthelmintica* Kunth ex A.Rich is listed as a synonym).	Flückiger states that this is used solely as a vermifuge with "alarming and even fatal results"
Digitalis leaf *†	*Digitalis*	Europe	*Digitalis purpurea* L.	It reduces the frequency and force of the heart's action, so acts as a sedative. But

				is also used as a diuretic (Flückiger)
Dill fruit *†	*Anethum graveolens*	Europe	*Anethum graveolens* L.	The distilled water is stomachic and carminative (Flückiger)
Dragon's blood resin	*Calabus draco*	India	*Daemonorops draco* (Willd.) Blume (syn.: *Calamus draco* Willd. - or one of the many other taxa commonly labelled as dragon's blood)	Listed as an astringent for diarrhoea by Grieve. According to Flückiger, it is used only as a colouring agent
Ergot †	*Claviceps purpurea*	England and the continent	*Claviceps purpurea* (Fr.) Tul.	Used due to its effect on the uterus in parturition (Flückiger)
False myrrh resin	*Bdellium*	Unknown	The originating species for this resin is unclear from comparing textbooks and the MPNS	This is mentioned briefly by Flückiger as a commodity brought to Barygaza.
Fennel fruit *†	*Foeniculum dulce*	Malta etc.	*Foeniculum vulgare* Mill.	By 1879, Flückiger states that fennel was not used to any considerable extent. The main consumption was in cattle medicines
Galls *†	Excrescences on *Quercus infectoria*	Not listed	*Quercus infectoria* G.Olivier	Used to extract tannic and gallic acid (Flückiger)
Gamboge/Cambogia gum-resin †	*Garcinia morella*	Siam	*Garcinia morella* (Gaertn.) Desr.	This is a drastic purgative (Flückiger)
Gentianae root *†	*Gentiana lutea*	Central Europe	*Gentiana lutea* L.	Bitter tonic (Flückiger)
Grains of paradise seeds	*Amonium melegueta*	Western coast of Africa	*Aframomum melegueta* K.Schum.	Flückiger describes these as Grana paradise and states that they are used occasionally as a condiment and "to give a fiery pungency to cordials"
Green Hellebore root	*Veratrum viride*	North America	*Veratrum viride* Aiton	Flückiger lists *Veratrum viride* Aiton as American white hellebore, but states that it is almost impossible to tell apart from *Veratrum lobelianum* Bernh., which is a green coloured variety found in the Alps
Guaiacum resin *†	*Guaiacum officinale*	West Indies	*Guaiacum officinale* L.	Diaphoretic and alterative. Prescribed in cases of gout and rheumatism(Flückiger)
Gum juniper (sandrach) *†	*Gummi juniperi*	Mogadore (Morocco)	*Juniperus oxycedrus* L., *Juniperus communis* L. or *Juniperus sabina* L.	Used in skin complaints (Flückiger)
Hemidesmus root *†	*Hemidesmus indicus*	India	*Hemidesmus indicus* (L.) R.Br	Reported to be alterative, tonic, diuretic and diaphoretic (Flückiger)

Hemlock fruit *†	*Conium maculatum*	Indigenous	*Conium maculatum* L.	The root is the source of the alkaloid conine, while the leaves are sedative to motor nerves (Flückiger)
Iceland moss *	*Cetraria islandica*	North Europe	*Cetraria islandica* (L.) Ach.	Used in decoction as a mild tonic (Flückiger). The 1817 pharmacopoeia lists it as a pectoral and emollient
Ipecacuanha root *†	*Cephaelis ipecacuanha*	Brazil	*Carapichea ipecacuanha* (Brot.) L.Andersson	Emetic, but as an expectorant and diaphoretic in small doses. In India it was used for dysentery (Flückiger)
Jalap root *†	*Exogomium purga*	Mexico via Vera Cruz/ Tampico	*Ipomoea purga* (Wender.) Hayne or *Ipomoea dumosa* (Benth.) L.O.Williams	Flückiger states that it is used as "a brisk cathartic"
Lobelia leaves and twigs †	*Lobelia inflata*	North America	*Lobelia inflata* L.	Nauseating emetic that is also prescribed in spasmodic asthma (Flückiger)
Long pepper fruit *	*Piper longum*	India	*Piper longum* L.	Flückiger states that long pepper is only used as a spice, but that its roots are used by Hindus, Persians and Arabs
Male fern rhizome *†	*Aspidium filix-mas*	Indigenous	*Dryopteris filix-mas* (L.) Schott	For use in intestinal worms, particularly tapeworm (Flückiger)
Marshmallow root *	*Althaea officinalis*	Indigenous	*Althaea officinalis* L.	Used as a demulcent and also sometimes applied as an emollient poultice (Flückiger)
Mastiche resin *	*Pistacia lentisars*	Island of Scio	*Pistacia lentiscus* L.	"Not now regarded as possessing any important therapeutic virtues, and as a medicine is becoming obsolete" (Flückiger)
Matico leaves	*Artanthe elongata*	Peru	*Piper aduncum* L.	Listed by Grieve as a styptic for preventing haemorrhage and treating ulcers, diarrhoea and dysentery
Mezereon bark *†	*Daphne mezereum*	Not listed	*Daphne mezereum* L.	Alterative and sudorific when taken internally. Used in venereal, rheumatic and scrofulous complaints. But in 1879, it was only used in the compund decoction of sarsaparilla (Flückiger)

Myrrh resin *†	*Balsamodendron myrrha*	Arabia felix/Alyssiania (Yemen)	*Commiphora myrrha* (Nees) Engl.	"Myrrh, though much used, does not appear to possess any very important medicinal powers, and is chiefly employed on account of its bitter, aromatic properties" (Flückiger)
Nutmeg	*Myristica officinalis*	East Indian archipelago	*Myristica fragrans* Houtt.	Stimulant (Ure, 1813)
Nux vomica seeds *†	*Strychnos nux vomica*	East Indies	*Strychnos nux-vomica* L.	Reduces excitability of nerves, yet heightens sensations of touch, vision and hearing (Pereira, 1854)
Opium *†	*Papaver somniferum*	Asia minor	*Papaver somniferum* L.	Sedation (Flückiger)
Pale cinchona bark *	*Cinchona condminea*	Ecuador	*Cinchona officinalis* L.	Most valuable remedy in fevers. Uncertainty of its composition and inconvenient bulk make it less eligible form of medicine than the alkaloids isolated (Flückiger)
Pareirae root	*Cissampelos pareira*	Brazil	*Cissampelos pareira* L. MPNS lists *Cissampelos pareira* as false pareira root, while pareira root is classed as *Chondrodendron tomentosum* Ruiz & Pav.	Listed by Grieve as a tonic, diuretic and aperient, and as an antiseptic to the bladder, while in Brazil it has a history of use for snake bites
Podophyllum root and resin †	*Podophyllum peltatum*	North America	*Podophyllum peltatum* L.	Anthelminthic and emetic (introduced into British Pharmacopoeia in 1864; Flückiger, 1879)
Pomegranate root bark *†	*Punica granatum*	South of Europe	*Punica granatum* L.	For the expulsion of tape worms (Flückiger)
Red cinchona bark *†	*Cinchona succirubra*	Western slopes of Chimborazo (Ecuador)	*Cinchona pubescens* Vahl	The cinchona barks were used interchangeably.
Rhatany root †	*Krameria triandra*	Peru	*Krameria lappacea* (Dombey) Burdet & B.B.Simpson	Used as an astringent (Flückiger)
Rhubarb root	*Rheum (rhaponticum ?)***	China/Europe/UK	*Rheum rhaponticum* L. and R. spp. (including hybrids)	Rhubarb is used as a purgative, stomachic and tonic. *Rheum rhaponticum* or Banbury rhubarb is cultivated from seeds from Southern Siberia and produces rhubarb which is less bitter, more mucilaginous and astringent (Flückiger)
Sarsaparilla root *†	*Smilax officinalis*	Central America	*Smilax officinalis* Kunth.	Used in syphilitic disorders alongside mercury, or for "rheumatic affections, scrophula and

				cutaneous complaints" (Woodville, 1832)
Scammony resin and root *†	*Convolvulus scammonia*	Asia minor	*Convolvulus scammonia* L.	Cathartic (Ure, 1813)
Senega root *†	*Polygala senega*	North America	*Polygala senega* L.	Stimulating expectorant and diuretic, useful in pneumonia, asthma and rheumatism (Flückiger)
Simaruba bark *	*Simaruba amara*	Guiana	*Simarouba amara* Aubl.	Tonic (Ure, 1813)
Squil (sliced bulb)	*Urginea scilla*	Mediterranean coasts	*Drimia maritima* (L.) Stearn	Grieve lists this as a stimulating expectorant and it is used in modern day for this action
Tinnevelly senna leaves *†	*Cassia elongata*	Southern India	*Senna alexandrina* Mill.	As a laxative and purgative (Flückiger)
Tragacantha gum *†	*Astragalus verus*	Asia minor	*Astragalus verus* Oliver.	Acts as a demulcent in water and provides firmness to lozenges and pills (Flückiger)
Turmeric rhizome †	*Curcuma longa*	India	*Curcuma longa* L.	Used as a condiment and in dyeing (Flückiger)
White hellebore rhizome	*Veratrum album*	Europe	*Veratrum album* L.	As with other hellebores, Flückiger describes this as a drastic purgative that is rarely used internally
Yellow cinchona bark *	*Cinchona calisaya*	Bolivia/Southern Peru	*Cinchona calisaya* Wedd.	The cinchona barks are all used interchangeably

All identifications are tentative and require further and more detailed work
Those botanical drugs in **bold** are also present in the apothecaries' chest.
* - Indicates a botanical sample that was also present in the 1819 London Pharmacopoeia
† - Indicates a botanical sample that was also present in the 1898 British Pharmacopoeia
** - As written in the pharmacists' chest key, including the question mark. This is listed as false rhubarb in the MPNS.

The presence in the pharmacists' chest and the simultaneous absence of bdellium, bael fruit, birthwort, catechu pallidum, chirata, carrageen, cusso, dragon's blood, grains of paradise, gum olibanum, matico leaves, nux areca, pareirae root, rheum and green hellebore from the pharmacopoeias indicates that these were of specific interest to pharmacists; either chemically or due to unique properties other than as medicines. *Chrondus crispus*, dragon's blood, grains of paradise and gum olibanum may have been used as flavourings and to improve formulations of compound mixtures. The presence of plant samples in the *materia medica* chests does not necessarily indicate that they were used as botanical drugs by pharmaceutical chemists or apothecaries. It is possible that some samples were there to ensure that exam candidates were

able to identify easily confused species. The role of the pharmaceutical chemist was to sell drugs to the public and to dispense for physicians. As the key link between supplier and consumer, it was essential that they could identify correct species and high-quality medicines. For example, bdellium (false myrrh) may have been present to ensure its differentiation from true myrrh; *Chondrus crispus* may have been present as a comparison with other Lichen species such as *Lichen islandicus*; *Rheum rhaponticum* may have been present to compare with other rhubarb species and *Veratrum viridis* may have been present due to potential confusions with *Veratrum lobelianum* or 'hellebore' roots used at the time. Hence, the presence of these samples in the pharmacists' chest but not the pharmacopoeias used generally by all medical professionals possibly indicates a greater focus on knowledge of potential adulterations in raw botanical drugs for pharmaceutical chemists than apothecaries and physicians.

Cusso, nux areca, pareirae root, rheum and veratri viridis root are all strong purgatives, while birthwort and other *Aristolochia* species are now known to cause renal toxicity. *Aristolochia serpentaria* has been described as a diaphoretic and diuretic stimulating tonic that caused nausea and vomiting if taken in excess and was of use in typhus and intermittent fevers (Steggall, 1852). Pareirae root was said to be tonic, aperient and diuretic and given in calculous diseases, ulceration of the kidneys and bladder, leucorrhoea, dropsy, rheumatism and jaundice (Steggall, 1852). Rheum rhaponticum and other rhubarbs are tonic, stomachic and astringent in small doses, but purgative in larger ones (Steggall, 1852).

The majority of these remedies in the pharmacists' chest but not the pharmacopoeias were used for digestive complaints or as purgatives (three remedies were listed as purgative, one as a violent vermifuge, one for tapeworm and three for dysentery or diarrhoea). In addition to providing information about the types of problems that people sought assistance for, this can provide some insight into the types of medicines being provided by pharmacists specifically.

Table 2: Botanical drugs present in the apothecaries' chest

Botanical drug name as listed or through comparison with pharmacists' chest	Scientific name as listed in notebook or index card (if provided)	Scientific name according to modern nomenclature	Use
Acacia gum *†	*Acacia vera*	*Vachellia nilotica* (L.) P.J.H.Hurter & Mabb. (syn.: *Acacia arabica* var. *nilotica* (L.) Benth.)	Flückiger lists Acacia gum as another name for gum Arabic, which is used as an adjuvant in medicine
Aloe resin *†	Not specified	*Aloe vera* (L.) Burm.f.	Purgative
Aloes from Cape of Good Hope	*Aloe lucida*	*Aloe ferox* Mill.	Cape aloes (Aloe ferox L.) are listed by Flückiger as having "brilliant conchoidal fracture and peculiar odour". He states that all the aloes are used as purgatives
Anchusa root	None given. Anchusa was handwritten on paper wrapped round the sample	*Alkanna tinctoria* (L.) Tausch. or *Anchusa officinalis* L.	Alkanet root is used as a dye. *Anchusa officinalis* L. (bugloss) turns green with acids. Culpepper recommended external application of alkanet root for ulcers and inflammation (Grieve) and Woodville states that it was used as an astringent
Aniseed *†	*Pimpinella anisi*	*Pimpinella anisum* L.	Aromatic stimulant and carminative (Flückiger)
Arnica root †	*Arnica montana*	*Arnica montana* L.	Used externally on bruises and chilblains. Internally used as a stimulant and diaphoretic (Flückiger)
Asafoetida resin *†	*Ferula asafoetida*	*Narthex asafoetida Falc. Ex Lindl* or *Ferula narthex* Boiss.	Stimulant and antispasmodic (Flückiger)
Atropa root †	*Atropa belladonna*	*Atropa belladonna* L.	Used for the preparation of atropine that can be used to dilate the pupil of the eye. It can be used externally in a liniment for neuralgia (Flückiger)
Barley *	*Hordeum diotichos*	*Hordeum vulgare* L.	Sometimes used as a demulcent, otherwise unimportant in medicine (Flückiger)
Bastard dittany root	*Dictamnus albus* written in notebook	*Dictamnus albus* L.	Grieve lists it as a stomachic and cordial of use in nervous complaints and intermittent fevers. As well as an ingredient of various compositions
Benzoin *†	*Styrax benzoin*	*Styrax benzoin* Dryand.	Mainly used in incense (Flückiger)
Black pepper *†	*Piper nigrum*	*Piper nigrum* L.	Mainly only used as an ingredient in other preparations (Flückiger)
Brasil wood	None given in the notebook listing	*Caesalpinia echinata* Lam.†	According to Flückiger, several species of Caesalpinia are imported under the name of

			Brazil wood and are used for red dye
Buchu leaves †	*Identified by sight*	*Agathosma betulina* (P.J.Bergius) Pillans	Disorders of the urino-genical organs. Thought to be a diuretic and diaphoretic (Flückiger)
Cabbage bark	The notebook just lists *Brassica* as a name	*Andira inermis* (W.Wright) DC.	Grieve lists it as a narcotic and vermifuge that is also an emetic
Cambogia †	*Stalagmitis cambogoides*	*Garcinia morella* (Gaertn.) Desr.	This is a drastic purgative (Flückiger)
Camphor wood	Not given	*Cinnamomum camphora* (L.) J.Presl	Stimulant properties used internally and externally (Flückiger)
Canellae cortex *	Identified by sight	*Canella winterana* (L.) Gaertn.	Aromatic stimulant (Flückiger)
Capsicum berries *†	*Capsicum annuum*	*Capsicum annuum* L.	Used as a local stimulant or internally to promote digestion (Flückiger)
Cardamon fruit *†	*Elettaria cardamomum*	*Elettaria cardamomum* (L.) Maton	Aromatic often administered with other medicines (Flückiger)
Carraway fruit *†	*Carum carvi*	*Carum carvi* L.	Aromatic stimulant or as a flavouring ingredient (Flückiger)
Cascarillae cortex *†	*Croton cascarilla*	*Croton eluteria* (L.) W.Wright	Used as a tonic (Flückiger)
Cassia cortex	*Cinnamomum cortex*	*Cinnamomum cassia* L. J.Presl	Used as a cordial and stimulant or for a food spice (Flückiger)
Cassia seeds	Identified by sight	*Cassia fistula* L.	The pulp separated from the woody part of the pods is a mild laxative. It is also an ingredient in confection sennae (Flückiger)
Castor bean *†	*Ricinus communis*	*Ricinus communis* L.	Flückiger describes castor oil as a mild and safe purgative
Chamomile flowers *	*Anthemis nobilis*	*Chamaemelum nobile* (L.) All.	The infusion is used as a bitter stomachic and tonic (Flückiger)
Cinchona bark *†	Identified by sight, but the specific species was unknown.		Most valuable remedy in fevers. Uncertainty of its composition and inconvenient bulk make it less eligible form of medicine than the alkaloids isolated (Flückiger)
Cinnamon cortex *†	Scientific name not provided in the notebook	*Cinnamomum verum* J.Presl	Used as a cordial and stimulant in medicine, but more commonly used as a spice (Flückiger)
Clove bark and buds*†	*Eugenia caryophyllata*	*Syzygium aromaticum* (L.) Merr. & L.M.Perry	Only used with other medicines. Chief consumption as a culinary spice Essential oil sometimes relieves toothache (Flückiger) – which is a common home remedy used today
Colchicum	*Colchicum autumnale*	*Colchicum autumnale* L.	Used in gout, rheumatism, dropsy and cutaneous maladies (Flückiger)
Colocynth pulp *†	Identified by sight	*Citrullus colocynthis* (L.) Schrad.	Used as a purgative alongside aloes and scammony (Flückiger)
Cuspariae cortex *†	*Cusparia febrifuga*	*Angostura trifoliata* (Willd.) T.S.Elias	Tonic in dyspepsia, dysentery and chronic diarrhoea (Flückiger)
Dill fruit *†	*Peucedamum graveolens*	*Anethum graveolens* L	The distilled water is stomachic and carminative (Flückiger)

Elderflowers †	*Sambucus nigra*	*Sambucus nigra* L.	Used in British medicine to make an aromatic distilled water or for flavouring (Flückiger)
Elm bark	*Ulmus campestris* (as listed in the notebook entry)	*Ulmus glabra* Huds.	Grieve lists it as a tonic, demulcent, astringent and diuretic. It appeared in the 1864 and 1867 pharmacopoeias. Flückiger describes elm bark as a weak mucilaginous astringent that is not commonly used
Euphorbium resin *	*Euphorbia officinarum*	*Euphorbia officinarum* L.	Flückiger lists euphorbium resin as previously having been used as an emetic that is now obsolete
Fennel seeds *†	*Foeniculum capillaeum*	*Foeniculum vulgare* Mill.	By 1879, Flückiger states that fennel was not used to any considerable extent. The main consumption was in cattle medicines
Galbanum resin *†	*Bulon galbanum*	*Ferula gummosa* Boiss. Or *Notobubon galbanum* (L.) Magee	Stimulating expectorant internally, or applied as a plaster on indolent swellings (Flückiger)
Galls *†	Identified by sight	*Inflorescences on Quercus infectoria* G.Olivier	Used to extract tannic and gallic acid (Flückiger)
Garlic *	*Allium sativum*	*Allium sativum* L.	Grieve lists some of the properties as antiseptic, diaphoretic, diuretic and expectorant
Gentianae radix *†	Identified by sight	*Gentiana lutea* L.	Bitter tonic (Flückiger)
Guaiacum resin and wood *†	*Guaiacum officinale*	*Guaiacum officinale* L.	Diaphoretic and alterative. Prescribed in cases of gout and rheumatism (Flückiger)
Gum copal	None given in notebook listing	*Rhus copallinum* L., or *Vateria copallifera* (Retz.) Alston	Used as a pigment binder in varnishes (Gray, 1824)
Hops *†	*Humulus lupulus*	*Humulus lupulus* L.	Used as a tonic and sedative (Flückiger)
Iceland moss *	*Lichen islandicus*	*Cetraria islandica* (L.) Ach.	Used in decoction as a mild tonic (Flückiger). The 1817 pharmacopoeia lists it as a pectoral and emollient
Ipecacuahna *†	Identified by sight	*Carapichea ipecacuanha* (Brot.) L.Andersson	Emetic, but as an expectorant and diaphoretic in small doses. In India it was used for dysentery (Flückiger)
Juniper resin *†	Not provided	*Juniperus oxycedrus* L., *Juniperus communis* L. or *Juniperus sabina* L.	Used in skin complaints (Flückiger)
Kino wood *†	*Pterocarpus erinacea*	*Pterocarpus erinaceus* Poir.	Used as an astringent. Thought to be used in the manufacture of wines (Flückiger)
Ladanum (identified as *Cistus creticus* L. by Gray, 1824)	None given in notebook listing	*Cistus creticus* L. (syn: *Cistus* × *incanus* subsp. *creticus* (L.) Heywood	*Used in perfumery*
Lavender flowers *†	*Lavandula spica*	*Lavandula angustifolia* Mill.	The volatile oil is stated by Flückiger to have stimulant properties, but not to be used in medicine
Lemon peel *†	*Citrus medica*	*Citrus medica* L.	Used as a flavouring (Flückiger)

Lichen, liver wort *	*Lichen islandicus*	*Cetraria islandica* (L.) Ach.	Used in decoction as a mild tonic (Flückiger). The 1817 pharmacopoeia lists it as a pectoral and emollient
Linseed *†	*Linum uritatrinum*	*Linum usitatissimum* L.	Either used as a demulcent, or applied as an emollient poultice (Flückiger)
Log wood	*Flamatoxylon campechianum* written in the notebook	*Haematoxylum campechianum* L.	Grieve describes it as a mild astringent useful in weakness of bowels. It is also used in dyeing (Flückiger)
Macis (involucrum of nutmeg) *†	*Myristica fragrans*	*Myristica fragrans* Houtt.	Stimulant (Ure, 1813)
Mahogany	None given in the notebook listing	Various different species possible	African mahogany is used in traditional medicine (MPNS). Jamaica kino is an extract from mahogany used as a substitute for kino (Gray, 1824)
Manna (ash bark) *†	*Fraxinus ornus*	*Fraxinus ornus* L.	Gentle laxative (Flückiger)
Mastiche *	*Pistacia lentiscus*	*Pistacia lentiscus* L.	"Not now regarded as possessing any important therapeutic virtues, and as a medicine is becoming obsolete" (Flückiger)
Mezoreon cortex *†	*Daphne mezoreum*	*Daphne mezereum* L.	Alterative and sudorific when taken internally. Used in venereal, rheumatic and scrofulous complaints. But in 1879, it was only used in the compund decoction of sarsaparilla (Flückiger)
Mustard seeds †	*Brassica allia/migra*	*Sinapis alba* L. or *Brassica nigra* (L.) W.D.J.Koch	Only *Brassica nigra* Koch is listed in Flückiger, with an external use in poultices or liniments
Myrrh resin *†	*Not given*	*Commiphora myrrha* (Nees) Engl.	"Myrrh, though much used, does not appear to possess any very important medicinal powers, and is chiefly employed on account of its bitter, aromatic properties" (Flückiger)
Nux vomica *†	*Strychnos nux vomica*	*Strychnos nux-vomica* L.	Reduces excitability of nerves, yet heightens sensations of touch, vision and hearing (Pereira, 1854)
Opium *†	*Papaver somniferum*	*Papaver somniferum* L.	Sedation (Flückiger)
Orange peel *†	*Citrus aurantia*	*Citrus* × *aurantium* L.	Aromatic tonic (Flückiger)
Oris root	None given. Orris root was written on paper wrapped round the sample	*Iris* × *germanica* L. or *I. pallida* Lam.	Grieve states that the root has diuretic, emetic and cathartic properties and was used in bronchitis, diarrhoea and dropsy, but that the principle use was in perfumery
Podophyllum root †	Identified by sight	*Podophyllum peltatum* L.	Anthelminthic and emetic (introduced into British Pharmacopoeia in 1864; Flückiger, 1879)

Poppy flowers *†	*Papaver rhaes*	*Papaver rhoeas* L.	Used in pharmacy for their colour (Flückiger)
Qeuacum lignum	None given in the notebook listing	Unknown	Unknown
Quassia wood	*Quassia excelsa*	*Picrasma excelsa (Sw.) Planch.*	A stomachic and tonic that is toxic to flies (Flückiger)
Red Saunder's wood	*Pterocarpus santalinus*	*Pterocarpus santalinus* L.f.	Used to colour the compound tincture of lavender. Used in art (Flückiger)
Rhodium wood	None given in the notebook listing	*Genista canariensis* L., *Amyris balsamifera* L., *Cordia gerascanthus* L., or *Convolvulus scoparius* L.f.	Hill (1751) describes it as a cordial and an astringent, while Gray describes it as cordial and cephalic
Rose petals	*Rosa gallica*	*Rosa gallica* L.	Rose infusion is used as a vehicle for other medicines (Flückiger)
Rosemary leaves	Identified by sight	*Salvia rosmarinus* Spenn. as the accepted name for *Rosmarinus officinalis* L. (MPNS)	Flückiger states that the leaves are only used by herbalists, but that they are popularly thought to stimulate hair growth
Sacraium lactus	Not given	Unknown	Unknown
Saffron	*Crocus sativus*	*Crocus sativus* L.	Solely used as a colouring agent (Flückiger)
Sarsaparilla radix *†	Identified by sight	*Smilax officinalis* Kunth.	Used in syphilitic disorders alongside mercury, or for "rheumatic affections, scrophula and cutaneous complaints" (Woodville, 1832)
Sarsoe extraction	None given. Sarsoe was handwritten on paper wrapped round the sample	Possibly Sarasoe (*Brassica rapa* L.) or sarso, which is Hindi for mustard oil (*Brassica juncea* (L.) Czern., Consp.)*	Rapeseed and mustard oil are used in many traditional medicine systems (MPNS)
Sassafras cortex and root *†	*Laurus sassafras*	*Sassafras albidum* (Nutt.) Nees	Flückiger reports that it is sudorific and stimulant, but that it is only given in combination with sarsaparilla and guaiacum
Scammony resin *†	*Convolvulus scammoneae*	*Convolvulus scammonia* L.	Cathartic (Ure, 1813)
Sea ilrack (likely wrack) *	*Fucus vesiculosus*	*Fucus vesiculosus* L.	This is listed in the 1983 British Herbal Pharmacopoeia as anti-hypothyroid, anti-obesec and anti-rheumatic
Seed lao stick	None given in notebook listing	Unknown – possibly actually lac stick	Lac stick is used to produce a dye similar to cochineal
Senega root *†	Identified by writing on wrapping	*Polygala senega* L.	Stimulating expectorant and diuretic, useful in pneumonia, asthma and rheumatism (Flückiger)
Senna Alexandrina leaves *†	*Cassia senna*	*Senna alexandrina* Mill.	As a laxative and purgative (Flückiger)
Senna, east Indian *†	*Not given*	*Senna alexandrina* Mill.	As a laxative and purgative (Flückiger)
Simarouba bark *	*Quassia simarouba*	*Simarouba amara* Aubl.	Tonic (Ure, 1813)
St John's Bean/karob	None given in the notebook listing	*Ceratonia siliqua* L.	Grieve states that the seeds were once thought to clear the throat of

			singers. The fruit have similar constituents to cassia pods
Staphisagria †	*Delphinium staphisagriae*	*Delphinium staphisagria* L.	Used as a powder for the destruction of pediculi. Delphinine (one of the alkaloids found in it) has been used externally for neuralgia (Flückiger)
Star anise	None given on the handwritten card present in the drawer	*Illicium verum* Hook. F. Although, before 1888 this and the toxic *Illicium anisatum* L. were considered the same species (Felter & Lloyd, 1898).	Grieve describes it as a carminative, stimulant and diuretic. Gray describes it as a stomachic that can be burnt as incense. By 1879, Flückiger states that only the essential oil is used medicinally
Stramonium †	*Datura stramonium*	*Datura stramonium* L.	Smoked like tobacco for the relief of asthma (Flückiger)
Succinum, amber	Identified by sight	Amber is a fossil substance originating from a range of species (mostly Pinaceae) and the species is not identified	Unknown - Powdered amber appears in multiple compound recipes by Culpepper (1816)
Sugar cane *†	*Saccharum officinale*	*Saccharum officinarum* L.	Used for making syups and lozenges due to its taste and ability to preserve (Flückiger)
Tamarind *†	*Tamarindus indica*	*Tamarindus indica* L.	This was used to make confection of senna in the 1817 pharmacopoeia. Flückiger considers it a mild laxative
Tolu balsam *†	*Tolufera balsamum*	*Myroxylon balsamum* (L.) Harms (this is the same as the Balsam of Peru)	Used as an ingredient to make syrups pleasant tasting (Flückiger)
Tragacantha *†	*Astragalus verus*	*Astragalus verus* Oliver.	Acts as a demulcent in water and provides firmness to lozenges and pills (Flückiger)
Uva ursi leaves (bearberry) *†	*Arbutus uva-ursi*	*Arctostaphylos uva-ursi* (L.) Spreng.	Astringent tonic used in afflictions of the bladder (Flückiger)
Violet flowers	None given in the notebook listing	There are a number of possible Viola species	Grieve states that they are a slight laxative
Warder's bryout (Also listed in notebook as Magellan cortex)	None given in the notebook listing	unknown	Winter's bark (Drimys winteri Forster) was discovered in the Straits of Magellan, indicating a potential connection with Magellan cortex and Winter's bark
Winter's bark	None given in notebook listing	*Drimys winteri* J.R. Forst. & G. Forst.	Grieve describes it as a stimulant, aromatic tonic, antiscorbutic that may be substituted for canella and cinnamon
Yellow gum	*Acaroides gummi*	Unkown	Unknown

Botanical drugs in bold also appear in the pharmacists' chest.
* Indicates that the sample appears in the 1817 London Pharmacopoeia.
† Indicates that the sample appears in the 1898 British Pharmacopoiea.

There are 19 plant samples in the apothecaries' chest that are not found in the pharmacists' chest or either of the pharmacopoeias (1817 and 1898). Of these 19, five were used as dyes or pigments: anchusa, brasilwood, gum copal, logwood and lac stick (although lac stick is not a confirmed sample). This may be due to the likely owner of the chest, W.C. Barnes, who was a chemist and the owner of Phoenix Works Dye Company in Hackney Wick in London (Russell, 2000).

The presence of ladanum and orris root in the apothecaries' chest, but not either pharmacopoeia can be explained by their use in perfumery rather than medicine. Apothecaries may also have sold some non-medicinal items, such as the dyes listed above. Syrup of violets was used to distinguish between acids and alkalis (Raine, 1967), indicating a potential non-medical use for violet flowers.

Excluding the samples that are primarily used for dyes or perfumery, all the botanical drugs exclusively found in the apothecaries' chest were used for their effects on digestion (whether for general digestive effects, diarrhoea, parasite infection or constipation) or for gentle tonic effects. In contrast to the drugs apparently exclusively present in the pharmacists' chest, only one of the above botanical drugs (cabbage bark) was used as an emetic or purgative (excluding orris root, which has a primary use in perfumery).

Additionally, 50% of the botanical drug samples in the apothecaries' chest were from plants commonly grown within or native to Europe, while only 33% of those in the pharmacists' chest were from Europe. This is not a completely accurate comparison, as we do not know where half of the samples in the apothecaries' chest were from due to incomplete data, but it does hint at more experimental drug use by pharmacists than apothecaries, reflecting the move by apothecaries from drug manufacturers to general practitioners by the latter half of the 19th Century.

Botanical drugs that change in usage over the course of the 19th Century

Only five botanical drugs appear to lose popularity during the course of the 19th Century, as they are present in the apothecaries' chest and the 1817 pharmacopoeia, but not the pharmacists' chest and the 1898 pharmacopoeia (Table 3). On the other hand, there are seven drugs not in use at the beginning of the century that gain in popularity by the latter part of the century; as shown by their absence or presence in the *materia medica* collections and pharmacopoeias. Overall, this indicates a stability of the botanical drugs used during the 19th century.

There were a number of botanical drugs that were found in the apothecaries' chest and the 1898 pharmacopoeia, but not the pharmacists' chest. The absence of a drug that appears to have been in use at the time the chests were in use (due to its presence in pharmacopoeias or other written archives) indicates that either the chests are not a complete record of all botanical drugs in use at the time or (in the case of the apothecaries' chest) that not all of the botanical drugs present have been identified and further research is required to confirm the complete collection.

Conclusions

The close correspondence in the contents of the two *materia medica* chests and two 19th Century pharmacopoeias suggests similar drug use across a variety of health professionals and over the course of the century. Some of the samples in the pharmacists' chest may have been present to enable students to learn to differentiate between drugs and their common adulterants, such as myrrh and bdellium (false myrrh). All samples identified here have been of importance in the relevant textbooks at some point of the 19th Century. However, no single book contained the full list of medicines, including the pharmacopoeias. No single resource from the time

paints a full picture of the medicine of the day and none can be taken as a standalone representation of medical knowledge in the 19th Century.

Samples present only in the examination or apothecaries' chests and no other sources indicate botanical drugs or products specifically of use for the pharmacists or apothecaries and give some indication of specialism or a way of differentiating their practice from other medical groups, but may also reflect the specific interests of the people who compiled or owned the chest – the likely owner of the apothecaries' chest spent much of his professional life working in the chemical dye industry. This would differ from the generic domestic medicine chests that would be sold to the public by apothecaries, and druggists and chemists. The use of the examination and apothecaries' chests discussed in this study also differs from other medicine chests that have been analysed, such as a travelling medicine chest that belonged to physician Sir Stuart Threipland (Worling, 2013), as the ones analysed here were used for educational purposes rather than medical ones. Domestic and travelling medicine chests were more likely to contain a range of preparations and tinctures, rather than crude botanical drugs (Worling, 2013; Crellin, 1979).

It was difficult to accurately identify all of the botanical drug samples present in the chests. A large proportion of the botanical drugs were imported from various parts of the world. This is likely to lead to high levels of misidentification and adulteration of botanical drugs coming from abroad; a problem which persists today (Bilia, 2014; Booker and Heinrich, 2016). The accurate identification and proof of provenance of the plant material being imported would be dependent on those who were importing the material. Therefore, it would be of interest to confirm the species present using firstly classical pharmacognostical techniques combined with phytochemical methods and then DNA fingerprinting comparisons with authenticated samples.

This will enable a more accurate analysis of the drugs used and the provenance of the plants that they were obtained from.

Over the course of the 19th Century botanical drugs were discovered and introduced to the British pharmacopoieas. This can be demonstrated by the presence of ergot, cubeba, rhatany root, lobelia, hemidesmus and turmeric in the pharmacists' chest and the 1898 pharmacopoiea, but not the apothecaries' chest or the 1817 pharmacopoiea. A large number of botanical drugs, which are important in today's phytotherapy are of course absent since they had not yet been introduced into practice, including many of the very widely used 'modern' phytomedicines'. Some botanical drugs would have been used by experienced women, healers and laypeople as local medicines, but not taken up by medical professionals.

The roles played by different professionals in society may have affected the botanical drugs with which they were familiar. Apothecaries gradually reduced manufacture of drugs over the 19th Century (they stopped quinine production at the Society of Apothecaries in 1834) and started to focus solely on the role of general practitioner. With the Pharmacy Acts of 1852 and 1868, pharmaceutical chemist became a more defined profession that involved research and manufacturing of medicines, as well as their dispensing.

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Appendix 1

Figure citations

Figure 1: The pharmacist's *materia medica* chest.

A range of bark, leaves, resins, twigs and seed pods arranged neatly in numbered compartments.

Figure 2: Individual samples or compartments in the pharmacist's *materia medica* chest numbered to correspond with the key.

Figure 3: Close up of the pharmacist's *materia medica* chest.

Some samples were enclosed in stoppered tubes.

Figure 4: One of the keys in the pharmacist's *materia medica* chest.

The numbered key corresponds to the botanical drug samples in one of the trays of the chest.

Figure 5: The index card for cardamom in the apothecaries *materia medica* chest.

A typical index card from the apothecaries chest. The plant family, Latin binomial, recipes for common preparations and known constituents are listed.

Figure 6: A page from one of the notebooks found in the apothecaries *materia medica* chest.

This page is for opium, which was the most comprehensive entry. Included were common preparations, historical knowledge of the botanical drug, origins of the sample, known constituents and studies that had been carried out into effects.

Figure 7: Invitation card.

A card found in the apothecaries chest to be used to invite the holder to view specimens.

Figure 8: One drawer of the apothecaries' *materia medica* chest.

Showing a collection of botanical samples, including peppercorns and galls. Some of the samples have been mixed and migrated to different compartments.

Figure 9: Seed drawer in the apothecaries' *materia medica* chest.

The majority of the botanical drug samples in this drawer were seeds. Some of the index cards can be seen, as well as samples that have been stored wrapped in paper.

Figure 10: A drawer in the apothecaries' *materia medica* chest.

This drawer contains mainly bark, with galls, seed pods and resin.

Figure 11: A business card.

This card was found in one of the drawers of the apothecaries materia medica chest, indicating either a viewer or contributor to the chest.