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European Materia Medica in Historical Texts: Longevity of a Tradition and Implications for Future Use

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Abstract

Recent research in the area of new drug discovery has shown the continued promise of looking to natural products for bioactive compounds. Researchers have thus turned to traditional medicine, which is still used widely throughout the world and increasingly in industrialized countries as well, to provide clues as to which products to investigate. The oral traditions on which much of this medical knowledge rests, however, are unstable, prompting researchers to turn to textual sources for potential drugs. This study uses Mediterranean/European medical texts from the 5th century BC to the 19th century A.D. to compile a list of the most commonly used "simples" – or single action drug substances – used in therapeutics in traditional European medicine. It finds that traditional European materia medica was based on a Dioscordean tradition that lasted through the 19th century with remarkably little variation, but is significantly different from the present-day herbal pharmacopoeia as represented by the National Institutes of Health. The most prominent simples of that tradition can thus provide clues to further bioactive compounds that have not as of yet been fully exploited for their potential, but were clearly of great use in the past.

Keywords

materia medica; new drug discovery; Dioscorides; history; traditional medicine; bioprospecting

I. Introduction

I.1. Aim of the Study

This study of ancient, medieval, and early modern pharmacopoeias argues that the materia medica of the ancient Mediterreanean world had remarkable longevity in the European medical tradition, solidly in evidence well into the 19th century. Although historians are well aware of the prevalence of Galenic humoral theory in European medicine throughout this time, continuity of materia medica has yet to be fully verified. This study aims to document and prove that continuity by examining 12 medical texts that treat the subject of medicinal "simples", or herbal, animal, or mineral substances thought to have inherent healing properties. These texts span more than two millennia, from the 5th century B.C. to the 19th century A.D. This study first identifies these texts, then presents a compiled list of the top 439 simples, or those named in at least 4 of the 12 texts. Analysis of this list reveals remarkable consistency between later pharmacopoeias and Dioscorides's *De materia medica*

of the 1st century A.D, thus demonstrating that this work, rather than the Hippocratic Corpus of the 5th century B.C., provided the basis for western materia medica through the medieval and early modern periods. Finally, this study compares the most common medicines and their uses throughout these periods with contemporary herbal medicine and finds a significant disconnect between the two. In this way, it seeks to point pharmacologists toward a study of traditional substances and their potential for providing clues to bioactive compounds.

I.2. Background/Context: Traditional Medicine

Traditional medicine, including Chinese medicine, Indian ayurveda, Arabic unani medicine, and various forms of indigenous medicine, often employs medication therapies involving the use of herbs, animal parts, and inorganic materials that have been in place for millennia and developed from empirical practices over time rather than the application of theoretical principles. Prior to the 20th century, European medicine constituted one form of indigenous medicine whose formidable arsenal of drugs derived from natural products – mainly plants and plant parts from the Mediterranean region but with significant additions from the Middle East, Asia, and the Americas in the medieval and early modern periods.

Despite the longevity of this tradition, which dates back to the fifth century B.C., scholars have often been quick to dismiss its effectiveness (see discussion in Riddle, 1985, xx–xxii). Those who wish to present a picture of the triumphal march of western medicine in the modern era portray traditional healing and herbal medicine as profoundly irrational and un-scientific, the stuff of witch-doctors and shamans who did more harm than good. Any possible benefit that patients may have derived from traditional drugs, it has been argued, was the result of a psychological “placebo effect” (Shapiro, 1959). According to this narrative, prior to the modern age these “useless and often dangerous medications” were almost wholly ineffective, and drugs that had beneficial action were “the exception rather than the rule” (Shapiro 1959; Dowling, 1973; Sneader, 2005, 2). One author has gone so far as to say that “claims made for traditional remedies in the past have no validity” (Sneader, 2005, 3).

Traditional medicine, however, and medication therapy that derives largely from herbal medicine constitute a highly significant component of modern medical care for most of the world’s population today. In 2005, the World Health Organization outlined its significance in terms of expenditure and use in both developing and developed countries, finding that in Africa as much as 80% of the population turned to local indigenous methods of healing, while 42% of those surveyed in the U.S. had sought out alternative or traditional forms of health care at least once (WHO, 2005; see also Eisenberg et al., 1998). The importance of traditional medicine in the developing world and its growing popularity in industrialized countries has come to the attention of the pharmaceutical industry and the medical research community, both of which have sought to capitalize on the knowledge contained therein.

In conjunction with the growing appreciation for traditional medicine, there is concurrently a renewed recognition of the potential of natural products for new drug discovery. In contrast to a recent claim that “remarkably few [plants and minerals] possess the ability to relieve disease when rigorously evaluated by the criteria of modern, evidence-based medicine,” (Sneader, 2005, 3) recent research in fact shows evidence of the promise of natural products for providing prototypes for new drugs. Indeed, Newman and Cragg’s in-depth survey of the sources of new drug discovery over the past 25 years indicates that the vast majority of new drugs have resulted from the isolation and imitation of bioactive molecules of natural products. In fact, only one new drug, the antitumor compound sorfenib, has resulted from chemical synthesis through the method of combinatorial chemistry and high-throughput screening (Newman and Cragg, 2007). The lack of expected results from this method has

prompted researchers in the field to call for the further investigation and imitation of the products of “Mother Nature” both for single and synergistic effects, and for the use of new technologies for screening these products (Fabricant and Farnsworth, 2001; Chin, 2006; Newman and Cragg, 2007; Lam 2007; Butler and Newman, 2008; Ji et al. 2009; Li and Vederas, 2009).

The recognition of the benefits of phytotherapy in particular has led to increasing research into plant products in order to isolate bioactive compounds. At least 25% (and probably more) of present-day medicines derive from plants, and recently, plant-based medicinals have been found to be effective in the treatment of cancer, HIV, and malaria, so much so that some pharmaceutical companies have directed research in this area (Fabricant and Farnsworth, 2001; Buenz et al, 2004; Buenz et al., 2006; Gertsch, 2009). An obvious and rich source for information about these products lies in the medication therapies of traditional medicine (Fabricant and Farnsworth, 2001). There are more than 20,000 species of plant used in traditional medicines globally that can be “reservoirs of potential new drugs”. (Gupta, et al., 2008). These factors have combined to lead to “bioprospecting”, the idea that new drugs can be found by studying herbal medicine and phytotherapy in contemporary and historic societies (Gertsch, 2009). Although bioprospecting is certainly not a new idea or practice (see Schiebinger, 2004; De Vos, 2007), it has gained renewed popularity over the past two decades among academic and industrial researchers.

Both of these trends – the increasing recognition of the value of traditional medicine and the recent rise in bioprospecting – converge in the field of ethnopharmacology, whose position as an interface between the social and natural sciences makes it a particularly important focus for new research into drug discovery (see Gertsch, 2009 on the rise in the impact factor for the *Journal of Ethnopharmacology*; Heinrich and Gibbons, 2001; Heinrich et al., 2006). Thus far, much of the emphasis in the social science aspect of ethnopharmacology has been on the use of paleoecological, archaeological, and especially anthropological methods to obtain medicinal knowledge from traditional societies – i.e., the analysis of the physical remains of ancient societies, the study of folk traditions, and the documentation of indigenous medical knowledge and local medical traditions through the study of contemporary societies (Gertsch, 2009). The articles in the *Journal of Ethnopharmacology*, for example, are largely devoted to the gathering of indigenous knowledge about local plants throughout the globe, testing them for bioactivity, and isolating bioactive compounds.

I.3. Historical Texts of Traditional Medicine

All of these efforts have contributed to an ever more complete picture of the efficacy and wisdom of traditional medicine from virtually every corner of the globe. Nevertheless, there is a sense of urgency among researchers to record this information, largely because there is substantial evidence that these knowledge traditions, which are usually communicated orally, are quickly eroding. Oral traditions run the risk of being lost due to the disinterest and absence from traditional village life of younger generations under the influence of modern education systems and the pressures of industrialization, urbanization and the inculcation of western values (Cox, 2000; Srithi, et al., 2009). In addition to the erosion of traditional knowledge, there is evidence that environmental degradation, deforestation, and invasion of non-indigenous plant species are depleting and threatening the sustainability of traditional species of medicinal plants (Buenz et al., 2004; Brandao et al., 2008).

Thus, a variety of recent publications have urged the use of textual traditions in Indian, Chinese, and European medicine to look for possible new examples for drug discovery – as Ji et al., state, “we have a rich historical record from ancient physicians about how to use natural medicines alone and in combination, which might provide important clues for developing new drugs”. (Ji et al. 2009, 198). In the Mediterranean, there a rich and

continuous tradition of pharmaceutical writings of ancient Greek, Roman, Byzantine, Arabian, and medieval European physicians and compilers that dates back to the 5th century BC. Investigation into these sources requires the expertise of historians and classicists, thus prompting the expansion of interdisciplinary collaboration in the field of enthopharmacology. The use of published textual sources in addition helps to overcome the risks and ethical controversies associated with bioprospecting (Buenz, et al., 2004). Indeed, scholars argue that with the loss of traditional knowledge in modern-day society, the written historical record becomes increasingly important, not only for information about potential medicines but to address issues of ownership and intellectual property rights for traditional medical knowledge (Riddle, 1992; Holland, 1994; Buenz et al., 2004; Fiore et al., 2005; López-Munoz et al., 2006; Scott and Hewett, 2008; Lev and Amar, 2008).

Historical texts have been put to use in the field of ethnopharmacology in two main ways. The first type of study involves regional surveys of local materia medica that show correspondence between textual and present-day folk traditions. Several scholars have done research into ancient, medieval, and early modern European herbals and recipe books and compared them with the materia medica used in present-day indigenous medical traditions around the Mediterranean (Lev, 2002; Lev and Amar, 2006; Lev and Amar, 2007; Lardos, 2006; Pollio et al., 2008; Leonti, et al. 2009). Their findings indicate that contemporary knowledge of folk medicine and use of local herbs for medicinal purposes is often based upon, and evolved in conjunction with, the written pharmacopoeia of ancient Greece, Rome, and Arabia, thus demonstrating the value of textual sources for providing evidence of the use of traditional material medica and clues as to their value. A second type of study uses these sources to guide them to new potential medicines through the study of their historic use (Fiore et al., 2005; Cox, 1998; Lardos, 2006; Buenz et al., 2006; Brandao, 2008; Adams et al., 2009). These studies look to ancient, medieval, and early modern texts in order to seek out traditional materia medica, arguing that these texts are indeed extremely valuable and as yet relatively untapped resources for further research. For example, Adams et al. (2009) argue that historical texts should be explored in a systematic manner and "could be a promising source of knowledge for the rediscovery of useful remedies and the development of modern phytotherapeutics for the 21st century" (Adams et al., 2009, 356).

Work has begun in this area, but there is still much to be done, hindered by a number of challenges pointed to by various authors (see Riddle, 1985, xxiii-xxv; Buenz et al., 2004; Lardos, 2006; Lev and Amar, 2006; Pollio et al., 2008; Scott and Hewett 2008 for discussion of various challenges). First, the inaccessibility of many of these texts, preserved in libraries, archives, and monasteries with limited and sometimes no access to the public, presents a significant barrier to their study. Early manuscripts and printed works alike also often suffer from problems of legibility due to water or other damage and quality of print or handwriting. There are also problems with language and terminology. Rarely are these texts written in the vernacular, and even upon translation, much of the terminology is foreign to modern-day researchers. Perhaps most daunting is the obstacle presented by the lack of certainty about which plants are which (See Pollio et al., 2008 for the case of identifying rue).

These difficulties are certainly appreciable and are not easily overcome. However, a number of measures are currently underway to address them: digitalization of early sources has made a surprisingly large number of obscure early pharmacy texts available for download; the GALEN project has sought to make a database for the labeling of disease over time (Rogers et al., 2001); and new technologies that allow for automated extraction of data from digitalized texts (see Buenz, 2004; Buenz et al., 2006) enhance the feasibility of historical texts to aid the search for new drugs.

This article seeks to build upon these steps to overcome the difficulties involved. It also points to directions for future research and collaboration in order to more fully exploit the pharmacological richness of early textual traditions in the history of medicine and pharmacy. In the first place, this article calls for the continued expansion of interdisciplinary communication and collaboration among members of the scholarly community, and the use of multiple methodologies of the social and natural sciences in constructing a historical record of early materia medica and active principles (Chavez and Reinhard 2003, 208; Buenz 2004; Heinrich et al., 2006). In particular, it encourages the heightened involvement of historians in the process, who now have unprecedented access to early medical texts through digitalization. Historians, classicists, and Arabists can also aid with the identification of plant species due to increased availability of digitalized medieval *sinonimas*, or dictionaries of synonyms that record plant names in Arabic, Greek, and Latin (see also Levey 1971).

It should be acknowledged, however, that this study is only a first step in a much larger project. It is the first study to present a comprehensive compilation of materia medica from the most important medical works of the Mediterranean and Europe over the *longue durée* of several centuries covering several major watershed events. Such a study allows researchers for the first time to be able to see fully the consistency and continuity of this tradition, and provides clues as to which natural products ought to be tested for bioactivity. This study thus attempts to bring together existing research into traditional materia medica with calls for more information on natural products used in medicine, and in this way allows previously isolated studies to be brought into a larger, more comprehensive framework of knowledge of traditional western medicine.

II. Materials and Methods

II.1. Determining the Textual Tradition

This study uses books of medicine and pharmacy produced in the ancient, medieval, early modern Mediterranean region in order to identify traditional material medica and trace its development in the western world from approximately 500 BC to the 19th century A.D. It is part of a larger study currently underway on the history of pharmacy in colonial Mexico (see De Vos, 2001). In order to identify a textual tradition for the history of European pharmacy, a list of books was compiled from those named in the inventories of nine different pharmacies in eighteenth-century Mexico. These inventories came from various sections of the *Archivo General de la Nación* in Mexico City and the *Archivo General de Indias* in Seville, Spain (see De Vos, 2001 and 2007). This list enabled the identification of 17 key pharmacy texts of the Spanish empire published between late 15th and 18th centuries, 15 of which made regular references to earlier authors as sources of information, for a total of 77 authors who were referred to at least once. A tally was kept of the number of books that referred to each author, for a total of 415 references, in order to identify the most influential texts (i.e., those most commonly referred to among the 15 texts examined) leading up to and following the invention of print. This information enabled the identification of a series of different periods in which pharmacy writing flourished as well as the identification of the most important works within these periods (see Table 1).

II.2. Determining the Western Pharmacopoeia

Once the textual tradition and major periods of pharmacological and pharmaceutical development were determined, these key texts were located and most downloaded as PDF files from Google books. Those unavailable for download were located as digitalized works from the online catalogue of the Faculty of Pharmacy Library of the Compultense University of Madrid. After consultation of these works, it was determined which books dealt mainly

with “simples”, or materia medica that consisted of one substance, as opposed to “compounds” which involve the mixing of two or more different substances. Books of simples (or books with sections dealing specifically with simples) largely correlate with what are today referred to as pharmacopoeia or in the early modern period as “herbals” even though they included material from animal and mineral sources as well. From these books, lists of simples were compiled, with care taken to eliminate overlap by seeking out Latin, Spanish, and English translations for each substance named. In cases where several different varieties of a plant were named (such as long, round, and thin birthwort) the identifications were collapsed into one parent category (pepper).

In total, twelve different sources containing unambiguous lists of simples (i.e., simples listed in separate tables of contents or in indexes) were consulted, beginning with the Hippocratic Corpus of the 5th century BC and ending with the *Farmacopea Española* of 1865 (see Table 2). The list of combined simples totaled 985, with 439 of those occurring in at least 4 of the 12 sources (see Table 3), which were then identified through various mechanisms (i.e., consulting translations and identifications in academic articles and books and using the Internet, encyclopedias, etc.). The Latin binomial nomenclature of most of the plants was located in Beck’s recent translation of Dioscorides, in Riddle’s work on the simples listed in the Hippocratic Corpus, in Lardos’s identification of medicines in the *Iatrosophikon* of Cyrpus, and, failing that, in the International Plant Names Index (Riddle, 1987;Beck, 2005;Lardos, 2006; www.ipni.org). All names were cross-checked with the USDA’s Germplasm Resources Information Network (GRIN) online database (http://www.ars-grin.gov/cgi-bin/npgs/html/tax_search.pl). However, 15 of the 439 identifications were inconclusive with regard to scientific name, and a number of the simples could only be identified by genus, as the specific species was not indicated in the plant name (see Holmes, 1888 on the difficulties and errors involved in identifying species of asafoetida plants). Even those identified may be erroneous, as modern identifications of plants from classical works often accepted as definitive may in fact be unreliable (Raven, 2000, pp. 5–6, 23). Further research in this area will undoubtedly reveal inconsistencies in the translations given, and will hopefully lead to further clarification as to species and variety of plants indicated.

II.3. Interpreting the Western Pharmacopoeia: Degree of Consistency

All but 5 simples were identified and categorized as plant, animal, or mineral. The individual lists of simples from each author were then compared with the materia medica of the two earliest works, the Hippocratic Corpus (ca. 500 BC) and Dioscorides’s *De materia medica* (ca. 60–78 AD) by determining the percentage of simples they shared in common, labeled their “degree of consistency”. The individual authors and their materia medica were then arranged by time period in order to see if there were any periods of major change, i.e., if the materia medica changed significantly with regard to with major historical events and the potential political, social, or cultural upheaval that would follow, such as the fall of the Roman Empire around 500 AD; the rise of the Arabian empires ca. 600–700 AD; the rise of medieval universities ca. 1200; the European discovery of America, the establishment of print, and the Renaissance of the 15th and 16th centuries; and the European Enlightenment and Industrial Revolution in the 18th and 19th centuries.

II.4. Interpreting the Western Pharmacopoeia: Consistency of Therapeutic Use

In order to determine consistency of designated therapeutic qualities and use – the “virtue” in contemporary parlance – of individual simples over time, the 14 most common simples were identified, e.g., those that were cited in all of the 12 sources consulted. For each of those 14, at least one ancient and one medieval source were consulted and its “virtue” recorded and compared. Early modern and modern sources were also consulted, but it was

found that these sources only listed simples without identifying their virtue. No attempt was made to evaluate the efficacy or validity of these virtues, however, and no claim is made here to that effect. The purpose here is only to present the pharmacopoeia of western medicine and evaluate its consistency over the centuries.

Finally, an attempt was made corroborate the 14 most common simples with materia medica from present-day herbal and alternative medicine in the U.S., using lists from the National Institutes of Health's Medline Plus – Herbal Medicine website and from its National Center for Complementary and Alternative medicine. These lists were compared with the list of compiled simples, looking to see how many of the present-day herbal medicines were included first in the full list of 985 simples, then with the top 439 most common (those that occurred in at least 4 of the 12 sources consulted), then the top 267 (those that occurred in at least 6 of the 12 sources consulted), then the top 159 (those that occurred in at least 8 of the 12 sources consulted), then the top 26 (those that occurred in at least 11 of the 12 sources consulted) and the top 14 (those that occurred in all of the 12 sources consulted). Finally, the virtues/uses of 4 of the historically most common simples were compared with those that were also listed on the modern website.

III. Results

III.1. Western Pharmacopoeia

Out of 439 simples, the majority were from plant sources. Plants made up 341, or 78% of the total, while there were 45, or approximately 10% from animals and 49, or 11% from minerals (see Table 4). Many of these simples served a variety of purposes in addition to medicine: they were also used to make artisanal/industrial products such as cosmetics, perfumes, pigments, varnishes, candy, beverages, jewelry, shoe polish, embalming fluid, amulets, and sealers.

III.2. Degree of Consistency among Authors

Analysis of the correspondence between different traditions, authors, and time periods revealed a significantly higher correspondence between each work and that of Dioscorides than with Hippocrates or among time periods. The number of simples in common between Hippocrates and later works was remarkably consistent, with an average of 43.5% in common (see Table 5). Only Celsus from the 1st century AD veers from this, with a 54% correspondence, and there is no consistent trend showing a gradual veering away from a Hippocratic base. This is not as true, however, for Dioscorides (see Table 6). Here there is a higher degree of correspondence: on average, comparisons of Dioscorides and other works revealed a 72% correspondence, meaning that on average they contained 72% of the same simples. There is also some indication of a pattern of a lessening of correspondence over time, though it must be pointed out that these numbers still show remarkable consistency, and this downward trend was not entirely uniform. Whereas ancient works had approximately 75–85% of their simples in common with Dioscorides, that figure was somewhat lower for the later periods, all of which fell within the range of 65–69%, with the 65–68% range for medieval works slightly higher than the 65% and 67% respectively for the 18th–19th century works. A slight anomaly in this downward trend lies in the fact that the two Renaissance works had a correlation of 68% and 69% respectively, which may be explained by the Renaissance emphasis on the recovery of ancient texts and direct translations, bypassing Arabian translations and commentaries. This anomaly, however, does not alter the overall picture of a high degree of consistency with the materia medica of Dioscorides.

This trend toward lessening of correspondence over time is even more apparent when comparisons are made based upon total simples rather than the top 439 (see Table 7). In that case, the consistency with Dioscorides – with an average of 57% correspondence - is highest for earlier periods and tapers off over time more dramatically (though again it is not a uniform decline). While ancient authors' degree of correspondence with Dioscorides was between 62 and 82% (with the significant exception of Hippocrates, whose work came several centuries earlier, and Galen, whose work contained an unusually high number of over 800 simples, thus skewing the results when considered in total), medieval correspondence dropped to 62–64%, with early modern levels slightly lower at 61% and 60%. The 18th–19th-century works, with a correspondence of 40 and 57% respectively, were lower still, though it is a testament to the longevity of the Dioscordean tradition that the 19th-century *Farmacopea Española* still had almost three-fifths of its simples in common with the 1st century *De Materia Medica.*

III.3. Degree of Consistency among time periods

Furthermore, analysis of the consistency of simples within different time periods does not reveal a strong correlation, though it does show increasing levels of correspondence over time (See Table 8). There is an average degree of only 34% consistency among ancient authors (Hippocrates, Dioscorides, Galen, and Paul of Aegina), 56% among medieval authors, and 57% among 15th–16th-century works. The two works from the 18th and 19th centuries, Palacios's *Palestra Farmacútica* and the *Farmacopea Española*, did exhibit a higher degree of consistency, averaging 76%, but this can be attributed to the fact that later Spanish pharmacopoeias were largely new editions of Palacios's work (see Lanning, 1985 and De Vos, 2007) and perhaps a general trend of increasing standardization over time. Overall, these results indicate that there is greater consistency and correlation between Dioscorides and all later works than there is among time periods, and that increasing standardization would have been centered on Diocorides' work. The overall picture, thus, is one in which Dioscorides remains the consistent basis for herbal medicine, even through major watershed events in history (see section II.3).

III.4. Comparison of Therapeutic Use over time

Finally, a survey of the ancient and medieval "virtues" – the therapeutic qualities and uses – attributed to each of the top 14 most prominent simples (those that appeared in all of the 12 sources consulted) demonstrates significant consistency over time as well, with a strong reliance on the descriptions of both Dioscorides and Galen (see Table 9). Beginning with Saladino's work in 1488, however, the virtues for simples are no longer given. Among those surveyed here, there was not one single work written after 1488 that included descriptions of virtues for each simple. Instead, they either discussed botanical properties of herbal medicine (Saladino) or possible drug substitutions (Fragoso) or the part of the plant or animal used (Palacios, *Farmacopea Española*), going into detailed discussion of therapeutic uses for compound medicines only.

The therapeutic qualities and uses attributed to these medicines appear to be remarkably consistent over approximately 1400 years. Many of the same qualities and uses are noted for medicines described by Dioscorides, Paul of Aegina, and medieval authors Serapion and Silvatico. Not only was there consistency across time, but there was consistency among the medicines as well. Fully 13 of the 14 simples (93%) were classified as hot and dry, or calefactive and dessicative in the Galenic system, with properties of being diuretic and expectorant, able to remove obstructions. These medicines were employed largely to expel thick humors, as an expectorant of thick mucus from the chest and to aid afflictions of the lungs in general, especially asthma. Eight of the 15 (53%) were used particularly in women's health (among other uses) as emmenagogues and to "expel the fetus" – though

whether as an abortifacient or to stimulate labor and delivery is not specified. (see Riddle, 1997 for more information on drugs for women's health)

Consistency in the use of materia medica in the Mediterranean/European tradition is thus clear through the ancient, medieval, and early modern period to 1865. One does see a major shift, however, between the 19th and the 21st centuries. A comparison between traditional materia medica and NIH/Medline's current list of 60 herbs and supplements (see Table 10) revealed the opposite trend to what has been discussed thus far: of the 60 herbs listed, only a little more than half (33) were found within the traditional pharmacopoeia (see Table 11). These 33, furthermore, do not match up with the ones that were the most important up to 1865 (see Table 12). Only 1 (.1% of total 985 simples) of these herbs, pennyroyal, was found in all sources; only 3 (.3% of total) of these herbs – pennyroyal, almond, and horehound - were found in the top 26 simples for the earlier period. Seventeen (1.7%) of them were to be found within the top 150 simples, 21 (2.1%) in the top 267, and 25 (2.5%) within the top 439. Thus unlike the two millennia prior, there is very little consistency between 1865 and 2010. Furthermore, a comparison of the therapeutic quality and uses of pennyroyal, almond, and horehound with their attributed historic virtues (see Table 13) reveals mixed results: two, horehound and pennyroyal, demonstrate obvious similarities with the 2010 description, while almond is less clear. Horehound, an expectorant, is still used in European cough drops today, and pennyroyal is recognized as a powerful emmenagogue and aboritfacient, similar to earlier descriptions of it. Almond, however, is given a use that would have been impossible in ancient or medieval medical thought: sweet almond is thought to have "a beneficial effect on blood lipids" in lowering cholesterol levels, while earlier works describe is as laxative, diuretic, expelling of thick humors including menstrual blood and mucus in the chest. While this attribution could arguably produce consistent results (i.e., a thinning effect), it is not conclusive.

IV. Discussion and Conclusion

The findings here concur with recent studies that have shown continuity of use of materia medica in the Mediterranean (Fiore, et al., 2005; Pollio et al., 2008; Leonti, et al., 2009), but it also attempts to outline the parameters of the entire chronology of the Mediterranean/ European pharmacopoeia over two millennia. One of the most outstanding characteristics of this pharmacopoeia is its remarkable continuity. Although there was a relatively low correspondence (averaging 43.5%) between Hippocratic simples and those of later works, that figure remains remarkably stable for works from the 6th century to the 19th. In fact, the degree of consistency between the Hippocratic Corpus and the simples listed in the *Farmacopea Española* of 1865 (45%) is higher than all medieval and early modern works. These figures serve to demonstrate the constancy of a significant portion of simples throughout 25 centuries of Mediterranean history, and through the early years of the Industrial Revolution. It is most probably explained as the result of a historical trend in which Hippocratic simples provided an early basis of compiled knowledge of simples which was then built upon significantly by Dioscorides. Thus, while Hippocratic medicine may have provided an early basis for knowledge and use of materia medica, it was definitively superseded by the work of Dioscorides in the first century A.D. The figures indicate that from that point on, the importance of Dioscorides *De materia medica* was unparalleled in providing the basis for the Mediterranean/European pharmacopoeia. It is also clear that this influence continued through several major watershed periods: as late as 1865, his materia medica remained the core of the western pharmacopoeia. This influence thus transcended historical context, including changes in medical practices and theories.

Nevertheless, there was an apparent decrease, however gradual and at times inconsistent, in the degree of correspondence between Dioscorides and later works. This may be explained

by, first, the addition of a number of simples of Asian origin by Arabian medical authors in the medieval period, and second, by the addition of materia medica from the Americas after 1492 (see Hamarneh, 1962; 1969; 1980 see Hamarneh, 1982; Riddle, 1964; and Touwaide, 2003). This trend is especially clear when total simples (985) were taken into account. However, these changes do not alter the place of Dioscorides's work as the basis for western materia medica. The importance of his work is also supported by the fact that pharmacopoeias published after 1500 did not include descriptions of therapeutic uses for simples. The lack of information about "virtues" implies that earlier works had provided sufficient description and that the therapeutic usage was accepted as fact and not in need of revision. To determine therapeutic use/virtue, early modern professionals would have consulted the latest translation of Dioscorides or another medieval herbal. Instead, pharmaceutical publications written after 1500 tend to emphasize compound medicines, their uses and how to prepare them, or are pedagogical works for apothecaries in training; thus, this is an important period for the proliferation of different genres of pharmaceutical works, a topic that needs further elaboration but is beyond the scope of this article.

Nevertheless, the basic consistency in materia medica elucidated here supports John Riddle's argument that the timelessness of Dioscorides' work resulted from an empirical tradition based on trial and error; that it worked for generation after generation despite social and cultural changes and changes in medical theory. According to Riddle,

> Dioscorides deliberately stayed away from medical theory and the swirling controversies of his day. This characteristic of his work prevented it from having a debilitating linkage with the transitory theories that succeeded on another down to the modern era. The empirical quality gave his work a timeless position in medical history. (Riddle, 1985, xix)

If a medicine proved effective time and time again, it mattered little what cause was given – as Riddle says, "If one knew the causes, the ailments could be prevented, but once one has the affliction, the cure is paramount". (Riddle, 1985, xix) The fact that these medicines were thought to have provided effective cures time after time may serve to explain the longevity of Mediterranean materia medica, particularly once it was recorded in written texts. Indeed, it has been argued that knowledge of materia medica dates back to the first human hunter-gatherer societies and even today "is rarely embedded in complete and systematic theories of medicine". (Christian, 2000; Miranda Chaves and Reinhard, 2003; Srithi, 2009)

The empirical basis for materia medica is evident in the therapeutic uses attributed to pennyroyal and horehound. According to Galenic medicine, these substances were effective due to their hot, dry qualities. Although modern medicine no longer classifies drug actions in this way, the present-day use and effects attributed to these medicines are almost identical to their earlier ones. Thus it is the actions of the simples that counts - or in other words, the theory or the "how and why" a medicine works may not be as important in these cases as the simple fact that these medicines were effective.

Despite the demonstrated longevity and probable effectiveness of traditional western materia medica, however, it is clear that that tradition was largely undermined sometime between 1865 and the present day. Only a handful of simples from the traditional pharmacopea are today recognized among the institutional medical world of the west, represented here by the U.S. National Institutes of Health and its listing of herbal remedies. This dramatic change can be attributed to a number of contributing causes in the history of pharmacy and medical chemistry: the development of organic and analytical chemistry, the rise of germ theory, the development of synthetic drugs, and the effect of the Industrial Revolution and the rise of pharmaceutical companies. All of these factors would have contributed to the diminishing use of traditional medicine, due to scientific, political, and economic motives. Yet these

medicines, used for thousands of years, may very well provide important new avenues for pharmaceutical research. This study therefore seeks to urge researchers to collaborate across disciplines in order to better understand and exploit the historical record of traditional medicines in the west, and to conduct research into the bioactive compounds of the most prominent herbal, animal, and mineral substances of the western pharmacopoeia. This work has begun, but there is still much to be done, though it is imperative that research be pursued with regard to potential for healing rather than profit.

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Table 1

Most Important Periods of Pharmaceutical Development/Pharmaceutical Manuscripts and Publications Produced

Place	Time Period	Number of Authors	% of Total Authors (n=77)	Number of References in Early Modern Works	% of Total References (n=415)
Greece	400s–300s BC	4	5.2	25	6.02
Rome	00s–100s AD	6	7.8	47	11.3
Byzantium	300s–1200s AD	5	6.5	30	7.2
Arabia	800s–1100s AD	8	10.4	47	11.3
Western Europe – Late Medieval	1100s–1300s AD	15	19.5	73	17.6
Western Europe – Renaissance	1400s–1500s AD	39	50.6	193	46.5
Total		77	100	415	100

J Ethnopharmacol. Author manuscript; available in PMC 2011 October 28.

Table 2

Books containing unambiguous lists of Simples

Author	Title	Place Produced or Published	Date Produced or Published	Text Used	Total Simples in Work
Hippocrates, *ca*. 460 BC – *ca.* 370 BC	*Hippocratic Corpus*, Various Works	Greece - Cos	5th–4th- Century BC	John Riddle, "Folk Tradition and Folk Medicine: Recognition of Drugs in Classical Antiquity" in *Folklore and Folk Medicines*, John Scarborough, ed. Wisconsin: American Institute of the History of Pharmacy, 1987, pp. 47–61.	257
Dioscorides, Pedanius, ca. 49–90 AD	*De Materia Medica*	Roman Empire – Asia Minor	60–78 AD	Andres de Laguna, *Pedacio Dioscórides Anazarbeo* [1555]. Madrid: Instituto de España, 1968–9.	592
Celsus, Aulus Cornelius, ca 25 BC – ca 50 AD	*De Medicina*, Book 5	Roman Empire	1st Century AD	*A Translation of the Eight Books of Aul. Corn. Celsus on Medicine, 2nd. Ed*. George Frederick Collier trans. Simpkin and Marshal, 1831.	99
Galen, ca. 130- 200 AD	*De Simplicium Medicamentorum Facultatibus*	Roman Empire	2nd Century AD	Claudii Galeni de simplicium medicamentorum facultatibus libri XI. Apud Gulielmum Rouillium, 1561	808
Paul of Aegina (ca. 625–690 AD)	*De Re Medica Libri Septem*, Book 7	Egypt - Alexandria	600s	*The Seven Books of Paulus, Vol. 3*. Francis Adams, trans. London: Syndenham Society of London, 1844.	398
Serapion Junior, c. 12th century	*Liber de Simplici medicina*	Arabia	1100s	*Serapionis medici arabis celeberrimi practica, studiosis medicinae utilissima.* Andreas Alpagus Bellunensis, trans. Venice: Apud Iuntas, 1550.	261
Platerius, Mattheus 1120–1161	*Circa Instans, Book of Simple Medicines*	Italy - Salerno	1100s	*Practica Io. Serapionis dicta breuiarium. Liber Serapionis de simplici medicina. Liber de simplici medicina, dictus circa instants. Practica platearii*. Venetijs: Andree Toresani de Ansula per Bernadinum Vercellensem, 1503.	207
Sylvaticus, Mattheus (1285–1342)	*Liber pandectarum medicinae*	Italy - Salerno	1300s	*Pandectae medicinae.*. Lyon: Apud Theobaldum Paganum, 1541.	278
Saladino	*Compendium aromatariorum*	Italy – Bologne	1488	*Compendio de los boticarios.* Alonso Rodríguez de Tudela, trans.. Valladolid, 1515.	199
Fragoso	*De succedaneis medicamentis*	Spain - Madrid	1575	*De succedaneis medicamentis liber denuo auctus: eiusdem animaduersiones in quamplurima medicamenta composita.* Madrid: Petrus Cosin, 1575.	340

Author	Title	Place Produced or Published	Date Produced or Published	Text Used	Total Simples in Work
Palacios, Félix	*Palestra Pharmaceutica Chymico-Galenica*	Spain – Madrid	1706	*Palestra pharmaceutica chymico-galenica: en la qual se trata de la eleccion de los simples, sus preparaciones chymicas y galenicas y de las mas selectas composiciones antiguas y modernas.* Madrid: Juan Garcia Insancon, 1706.	488
	Farmacopea Espanola	Spain – Madrid	1865	*Farmacopea Española 5th ed.* Madrid: Imprenta Nacional, 1865.	312

Table 3

Compiled list of Top 439 simples

Materia Medica – Name in Texts	Scientific Name	Source of Scientific Name[1]	English Translation	Number of Works Listed in (n=12)
Abrotano	*Artemisia abrotanum*	Beck	Southernwood	12
Acacia	*Acacia*	Beck	Acacia	12
Alumbre, alumen	Mineral/Inorganic		Alum	12
Asphaltum, betun, bitumen judaico	Mineral/Inorganic		Asphalt	12
Balsamo	*Commiphora opobalsamum, Commiphora gileadensis*	Beck, GRIN	Mecca Balsam	12
Cardamomo	*Elettaria cardamomum,*	Beck	Cardamom	12
Cassia	***Cinnamomum cassia, Cinnamomum aromaticum***	Beck, GRIN	Cassia	12
Euphorbium, euforbio	***Euphorbia patyphyllos, Euphorbia***	Beck, GRIN	Bastard spurge, spurge, broad- leaved spurge	12
Myrra	*Commiphora myrrha*	Beck	Myrrh	12
Piper, pimienta	*Piper nigrum, Piper officinarum, Piper album*	Beck	Pepper- black, long, white	12
Pulegium	*Mentha pulegium*	Beck	Pennyroyal	12
Ruta, ruda, rhu	*Ruta graveolens*	Beck	Rue	12
Styrax, storax, estoraque, liquidambar	*Styrax officinalis*	Beck	Sweetgum, Storax	12
Terebinthina, trementina	*Pistacia terebinthus*	Beck	Turpentine, terebinth	12
Absinthij, artemisa, ajenjo	*Artemisia absinthium, Artemisia campestris, Artemisia abrotonon*	Beck	Wormwood, Absinthe	11
Agni casti, agno casto	*Vitex Agnus-castus*	Beck	Chaste tree, Chaste berry, Monk's pepper	11
Amomo, amomum, grana de paradyso	*Amomum subulatum*	Beck, Riddle, GRIN	Amomum, Grains of paradise, False cardamom, Nepal cardamom, Indian cardamom	11
Amygdale, almendra	*Prunus amygdalus, Amygdalus communis, Prunus dulcis*	Beck, Riddle, GRIN	Almond - bitter and sweet	11
Centaurea	*Centaurium erythraea*	Beck, Lardos	Common Centaury	11
Cinnamomum, canela	*Cinnamomum verum*	Beck, GRIN	Cinnamon	11
Helleborus, eleboro	*Helleborus cyclophyllus, Helleborus niger*	Beck, GRIN	Helleborus, Black hellebore	11
Lactuca, lechugas	*Lactuca, Lactuca graeca, Lactuca sativa*	Beck	Lettuce, Iceburg lettuce	11
Marrubium album	*Marrubium vulgare, Marrubium creticum*	Beck	Horehound	11
Peonia, glyciside	*Paeonia mascula*	Beck, GRIN	Peony	11
Rosa	*Rosa*	Beck	Rose	11
Sulphur, azufre	Mineral/Inorganic		Sulphur	11
Agarico	*Polyporus*	Beck	Mushroom, Agaric	10

Materia Medica – Name in Texts	Scientific Name	Source of Scientific Name[1]	English Translation	Number of Works Listed in (n=12)
Allium, ajo	*Allium cepa, Allium sativum, Allium nigrum*	Beck, Lardos	Garlic, Onion	10
Aloe, azibar, acibar, acibar socotrina	*Aloe vera*	Beck	Aloe	10
Anagallis	*Anagallis phoenicea, Anagallis arvensis*	Beck, GRIN	Scarlet Pimpernel, Red chickweed	10
Anisum, anis	*Pimpinella anisum*	Beck	Anis, Anise	10
Apij, apio, apium	*Apium graveolens, Petroselinum crispum*	Beck, GRIN	Parsley, Celery	10
Aristolochia	*Aristolochia sempervivens, Aristolochia clematitis, Aristolochia longa, Aristolochia rotunda*	Lardos, Beck	Birthwort	10
Asparagi, aspergula, sparagus	*Asparagus acutifolius, Asparagus stipularis, Asparagus officinalis, Asparagus aspartilis*	Beck, Lardos	Asparagus, Wild Asparagus	10
Bdellium, bedellio	*Commiphora wightii*	Beck, GRIN	Bdellium	10
Betonica	*Stachys officinalis*	Beck	Bettany, Betony	10
Calamos aromaticus, calamo aromatico, indicus	*Acorus calamus*	Beck	Calamos, Sweet flag	10
Castoreo	Animal product		Castor	10
Colocynthidis	*Citrullus colocynthis*	Beck	Bitter gourd, Colocynth	10
Crocus, azafran	*Crocus sativus*	Beck	Saffron	10
Cupressus, cipres	*Cupressus sempervirens*	Lardos	Cypress	10
Dictamni	*Origanum dictamnus, Dictamnus albus*	Beck, GRIN	Dittany	10
Foeniculum, feniculus, feniculo, hinojo	*Foeniculum vulgare*	Beck	Fennel	10
Hyocyami, hyocyamus, iusquiamus, insquiamos	*Hyoscyamus muticus, Hycoscyamus niger*	Beck, GRIN	Henbane	10
Hyssopum, hyssopus	*Satureia graeca, Hyssopus officinalis*	Beck, GRIN	Hyssop	10
Iuniperi, enebro	*Juniperus communis*	Beck, GRIN	Juniper	10
Lapathum, lapathi, acetosa, buglossa, alkanna, acederas	*Rumex, Rumex aquaticus, Rumex acetosa*	Beck	Dock, Water dock, Sorrel, Cow's tongue	10
Lilium, lirio	*Lilium candidum*	Beck	Lily	10
Lini, lino, linum, linaza	*Linum usitatissimum*	Beck	Linseed, flax	10
Maiorana	*Origanum majorana, Origanum viride*	Beck, GRIN	Marjoram	10
Mandragora	*Mandragora officinarum*	Beck, GRIN	Mandrake	10
Mastiches, almaciga	*Pistacia lentiscus*	Beck	Mastic, Lentisk	10
Meliloti, melilotum	*Melilotus*	Beck	Mellilot, Sweet clover	10
Menthe	*Mentha*	Beck	Mint	10
Nitre salpetra, salitre, nitro, nitri, nitrum, sal nitro	Mineral/Inorganic		Nitre or soda	10

Materia Medica – Name in Texts	Scientific Name	Source of Scientific Name[1]	English Translation	Number of Works Listed in (n=12)
Ocimo, ocimum, ocimon, basilicum, albaca	*Ocimum basilicum*	Beck	Basil	10
Olibanum, thus	*Boswellia sacra*	Beck, GRIN	Frankincense, Olibanum tree	10
Papaveris, amapolas, adormidera	*Papaver somniferum*	Beck	Poppy	10
Plumbum, plomo	Mineral/Inorganic		Lead	10
Psylio, psyllium	*Plantago arenaria, Plantago afra*	Beck, GRIN	Fleawort, Psyllium	10
Sinapi, sinopo, sinapida, mostaza	*Sinapis alba*	Beck	Mustard	10
Squilla, scilla	*Drimia maritima*	Beck, GRIN	Scilla	10
Viola	*Viola odorata, Viola sororia, Viola wiedemannii*	Beck, GRIN	Violet	10
Zingiber, zinziber, gengibre	*Zingiber officinale*	Beck	Ginger	10
Acoro, acorum	*Ruscus aculeatus*	Beck	Butcher's broom	9
Aes, cobre	Mineral/Inorganic		Copper	9
Ammoniaco, ammoniacum	*Ferula marmarica, Dorema ammoniacum*	Beck, GRIN	Ammoniacum, Gum ammoniac	9
Anethum, eneldo	*Anethum graveolens*	Beck	Dill	9
Antimonium, antimonio	Mineral/Inorganic		Antimony	9
Camomela, manzanilla	*Anthemis rosea, Chamaemelum nobile, Matricaria chamomilla*	Beck, GRIN	Chamomile	9
Capillus veneris, adianto, culantrillo	*Adiantum capillus- veneris*	Beck	Maidenhair	9
Cappares, alcaparras	*Capparis spinosa*	Beck	Capers	9
Cerusa, albayalde	Mineral/Inorganic		White lead	9
Chamaepitys, camepitys	*Ajuga chamaepytis*	Beck	Ground-pine	9
Cicuta	*Conium maculatum*	Beck	Hemlock	9
Cucumeris	*Cucumis sativus, Cucumis melo*	Beck, Riddle, GRIN	Cucumber, Canteloupe, Melon	9
Enula, inula, helenio	*Inula helenium*	Beck	Helenium, Elecampane	9
Epithymum, epitimo	*Cuscuta epithymum*	Beck, GRIN	Dodder, Dodder of thyme, Clove dodder	9
Eupatorium, eupatior	*Eupatorium cannabinum*	GRIN	Hemp-agrimony	9
Ferrum, hierro	Mineral/Inorganic		Iron	9
Ficus, higos	*Ficus carica*	Beck	Figs	9
Foenum graecum, fenugrecum, alolbas	*Trigonella foenum graecum*	Beck	Fenugreek	9
Gallia, galla cummunes, agallas, gallis muscata	Animal		Gall, Bile	9
Goma arabiga	*Acacia Senegal*	Lardos	Gum-arabic	9
Hedera arborea, hiedra arborea	*Hedera helix*	Beck	Ivy	9
Helxine, parietaria, hederecea	*Parietaria officinalis, Helxine soleirolii, Soleirolia soleirolii*	Riddle, GRIN	Helxine, Babytears, Pellitory-of-the-wall	9
Lignum aloes, agallocum	*Aquilaria agallocha, Aquilaria crassna, Aquilaria malaccensis*	Beck, GRIN	Aloewood, Lignum aquila, Eagle-wood or Agilawood	9

Materia Medica – Name in Texts	Scientific Name	Source of Scientific Name[1]	English Translation	Number of Works Listed in (n=12)
Liquidritae, Glycyrrhiza, orozuz, liquiricia	*Glycyrrhiza glabra, Glycyrrhiza echinata*	Beck, GRIN	Licorice	9
Lithargyrio	Mineral/Inorganic		Litharge, Lead monoxide	9
Malvas	*Malva sylvestris*	Beck	Mallow	9
Mel, miel	Animal product		Honey	9
Meu, meum	*Meum athamanticum*	Beck	Spignel, Bauldmony	9
Mora, morus	*Morus nigra*	Beck	Blueberry, Mulberry	9
Nasturtium, mastuerso, mastuerco	*Nasturtium officinale*	Beck	Water cress	9
Nymphae, nenufar	*Nelumbo nucifera, Nymphaea alba, Nuphar luteum*	Beck	Water lily	9
Pertroselini, peregil	*Petroselinum hortense, Petroselinum crispum*	Beck	Parsley	9
Pino, pinus	*Pinus*	Beck	Pine	9
Plantago, plantaginis, platago – llanten	*Plantago, Plantago major*	Beck	Plantain	9
Polipodium quercini, polypodium	*Polypodium vulgare*	Beck	Polypody	9
Resina communis, resina pini seu communis	*Pinus*	Beck	Resin, Common resin, Pine resin	9
Sabina, savina	*Juniperus sabina*	Beck	Savin	9
Sal comun	Mineral/Inorganic		Common salt	9
Salvia	*Salvia officinalis*	Beck, GRIN	Sage	9
Scammonium, escamonea	*Convulvus scammonia*	Beck	Scammony	9
Sempervivum	*Sempervivum arboretum, Sempervivum tectorum*	Beck, GRIN	Houseleek, Live- forever	9
Tamarisci, tamarix, taray	*Tamarix, Tamarix tetrandra*	Beck, GRIN	Tamarisk, Salt cedar	9
Aeris flos, aerugo, verdigris, cardenillo raydo	Mineral/Inorganic		Verdigrease	8
Ammeos, ameos, ammi	*Ammi*	IPNI	Ammi fruit	8
Calaminta	*Calamintha incana, Clinopodium nepeta, Clinopodium menthifolium*	Lardos, GRIN	Calamint	8
Calx	Mineral/Inorganic		Lime	8
Camedrys, camedreos	*Teucrium micropodioides*	Lardos	Germander	8
Cantharides	*Meloe*	Riddle	Spanish fly, Blister beetle	8
Carthami, cartamus, cnicus	*Cartharmus tinctorius*	Beck	Safflower	8
Caryophilli, caryophyllata, gariofilus, clavo	*Syzygium aromaticum*	Lardos	Clove	8
Chelidonium, celidonia	*Chelidonium majus, Aquilegia vularis*	Beck, GRIN	Columbine, Celandine	8
Cicera, garvanco	*Cicer arietinum, Astragalus cicer*	Beck, GRIN	Garbanzo, Vetch, Chick pea	8
Ciminum, cymini, siseris, cominos	*Cuminum cyminum*	Beck	Cumin	8
Cinnabaris	Mineral/Inorganic		Cinnabar	8

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Corallium, coralia	Mineral/Animal		Coral	8
Costus arabicu, costum, costos	*Saussurea lappa*	Beck	Costus root	8
Cucurbite	*Cucurbita maxima*	Riddle	Gourd, Squash	8
Daucus, dauci, dauco, staphylinus	*Daucus carota*	Beck	Carrot	8
Fabarum, habas	*Vicia faba, Phaseolus vulgaris*	Riddle	Bean	8
Galbanum, galvano	*Ferula galbaniflua, Ferula gummosa*	Beck, GRIN	Galbanum gum	8
Granata, granatum, granada, malum granatum	*Punica granatum*	Beck	Pomegranate	8
Hyperici, ipericon, hipericon	*Hypericum perforatum, Hypericum vulgare*	Beck, GRIN	St. John's wort	8
Hypocistide, ipoquistido	*Cytinus hypocistis*	Beck	Hypocracy tree, Hypocist	8
Lapis lazuli, ceruleo, azul, cyano	Mineral/Inorganic		Lapis lazuli	8
Macer, macias	*Holarrhena antidysenterica, Myristica fragrans*	Beck, GRIN	Mace	8
Myrti, myrtus-arrayan	*Myrtus communis, Cyrilla racemiflora*	Beck, GRIN	Myrtle	8
Nux unguentaria, Nues Moscada, Nux Moschata, Moschocaryon, Musicste, Myristica or Aromatica	*Myristica fragrans*	Lardos	Nutmeg	8
Origanum, oregano, origanis	*Origanum heracleoticum, Origanum vulgare*	Beck, GRIN	Oregano	8
Pix graeca, pez griega, see apochyma, zopissa	Mineral/Inorganic		Pitch	8
Populus arbor	*Populus nigra, Populus alba*	Beck	Poplar – black, white	8
Rapae, rapum, nabos	*Brassica rapa*	Beck	Turnip	8
Rosmarinus, romero	*Rosmarinus officinalis*	Beck	Rosemary	8
Rubi, rubus, rubum, frutos de zarca	*Rubus idaeus*	Beck	Bramble, Raspberry	8
Rubia, rubea, rubeus	Mineral/Inorganic		Ruby	8
Salix, salicis, sauce	*Salix*	Beck	Willow	8
Sambuci, sambucus, sauco, sauz	*Sambucus ebulus, Sambucus nigra*	Beck, GRIN	Elder, Dwarf elder	8
Sangue, sangre, various	Animal		Blood	8
Sarcocola	*Astragalus fasciculifolius*	Beck	Sarcocola	8
Saxifraga	Inconclusive		Saxifrage	8
Scordium, scordeon, escordio	*Teucrium scordium*	IPNI, GRIN	Water germander	8
Serpillum, serpylum	Inconclusive		Wild thyme	8
Solanum, yerva mora	*Solanum*	IPNI	Nightshades, Horsenettles	8
Spica, spica nardi	*Nardostachys jatamansi, Nardostachys grandiflora*	Beck, GRIN	Spikenard	8
Sumach, rhus, zumaque	*Rhus coriaria*	Beck	Sumach	8

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Symphytum, colsolida major	*Symphytum bulbosum, Symphytum officinale*	Beck, GRIN	Comfrey	8
Tragacanthum, alquitira, gum	*Astragalus gummifer, Astragalus microcephalus*	Beck	Tragacanth	8
Acetum, vinagre	Mineral/Inorganic		Vinegar	7
Achilea, aquilegia, millefolium	*Achillea millefolium, Achillea tomentosa*	Beck	Yarrow, Milfoil, Achilles' woundwort	7
Aranea, arana tela	Animal		Spider web	7
Argentums viuum, sublimado	Mineral/Inorganic		Silver	7
Arum, aro	*Colocasia antiquorum, Colocasia esculenta, Arum maculatum*	Beck, GRIN	Cuckooo-pint, Indian turnip, Sakerobin	7
Asafetida, ferula	*Ferula marmarica, Ferula communis*	Beck	Giant fennel	7
Asarum	*Asarum*	IPNI	European snake root, Wild ginger unguent	7
Atriplex, atripicis, armuelles	*Atriplex hortensis*	Beck	Saltbush, Orach	7
Auropigmenta	Mineral/Inorganic		Orpiment, Arsenic sulfide	7
Avena vires	*Avena sativa*	Beck	Oats	7
Balaustria, balaustis	Inconclusive		Flower of pomegranate	7
Bryonia, brionia	*Bryonia dioica*	Beck	Bryony	7
Cardo, cardus benedictus	*Carduus benedictus, Centaurea benedicta*	IPNI, GRIN	Blessed thistle	7
Cataputia	*Euphorbia*	Beck	Spurge	7
Cera	Mineral/Inorganic		Wax	7
Cerasa, cerata, guindas	*Prunus avium*	Beck	Cherry	7
Coriandrum, coriandri	*Coriandrum sativum*	Beck	Coriander	7
Cubeba	*Piper cubeba*	Lardos	Cubeb, Tailed pepper, Java pepper	7
Dactili	*Phoenix dactylifera*	Beck	Date, Date palm	7
Ebano, ebenus	*Diospyros melanoxylon, Diospyros ebenum*	Beck	Ebeny, Ebony plant	7
Eruca	*Eruca sativa, Eruca vesicaria*	Beck, GRIN	Arugula, Rocket	7
Fraxinus, fraxini, fresno	*Fraxinus excelsior*	IPNI, GRIN	Ash tree	7
Gentiana	*Gentiana lutea, Gentiana purpurea*	Beck	Gentian	7
Grama, gramen, graminis, gramina	*Arundo donax*	Lardos	Graminis, Giant Reed	7
Lac, leche	Animal		Milk (various sources)	7
Lapis haematites, hematite, amatitis	Mineral/Inorganic		Haematite, Bloodstone	7
Lentisco	*Pistacia lentiscus*	Lardos	Lentisk	7
Lentium, lente, lenteja	*Ervum lens, Lens culinaris*	Beck, GRIN	Lentil	7

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Levistici, levisticum, linguisticum, lingustico, lybysticum	*Levisticum officinale*	Beck	Lovage root	7
Lupinus, altramuzes	*Lupinus*	Beck	Lupine	7
Malabathrum, folium indum	*Cinnamomum tamala,, Cinnamomum iners, Cinnamomum zeylanicum, Pogostemon patchouli*	Beck	Malabar leaf	7
Manna	*Fraxinus ornus, Astragalus brachycalyx*	Beck, GRIN	Manna	7
Melissa, torongil, toronjil	*Melissa officinalis*		Balm, Lemon balm	7
Mercurialium, mercuriales, mercurius	*Mercurialis annua, Chenopodium bonus- henricus*	Beck, GRIN	Mercury	7
Mumia, pissasphalto	Mineral/Inorganic		Mummy, or embalming fluid for Egyptian mummies	7
Nardo gallico o celtico	*Valeriana celtica*	Beck	Celtic nard	7
Nigela, nigella	*Nigella hispanica, Nigella sativa*	IPNI, GRIN	Gith, Fennel flower	7
Oleum olivarum	*Olea europaea*	Beck	Olive oil, Olive tree	7
Opoponaco, opoponax	*Opopanax hispidus*	Beck	Opopanax, Sweet myrrh	7
Pastinaca	*Pastinaca sativa*	Beck	Parsnip	7
Portulaca, verdolacas	*Portulaca oleracea*	Beck	Common purslane	7
Pruna damascena	*Prunus domestica*	Beck	Plum	7
Pulmones	Animal		Lung, various sources	7
Quinquefolio, pentaphyllum	*Potentilla reptans, Potentilla erecta*	Beck, GRIN	Cinquefoil	7
Rhaphanus, raphani, ravanos	*Raphanus sativus*	Beck	Radish	7
Sacchar, saccharinum, zuccara, zucharum	*Saccharum officinarum*	Lardos	Sugar cane	7
Sal ammoniacum	Mineral/Inorganic		Sal ammoniac	7
Spongia marina	Animal		Sponge	7
Testiculi, testiculos, various	Animal		Testicles, various sources	7
Thymum, tomillo	*Thymus sibthorpii, Thymus vulgaris*	Beck, GRIN	Thyme	7
Tithymalli, titymalos	*Euphorbia*	Beck, Riddle	Spurge	7
Tribolus, tribulo	*Tribulus terrestris*	Beck	Caltrops, Tribulus	7
Tussilaginis, tusilago	*Tussilago farfara*	Beck	Coltsfoot	7
Vinum, vino	See grape		Wine	7
Althaea, malvaviscos	*Althaea officinalis, Hibiscus moscheutos*	Beck, GRIN	Marshmallow	6
Anacardia, maranon	*Anacardium occidentale*	GRIN	Cashew	6
Arsenico, arcinico	Mineral/Inorganic		Arsenic	6
Avellana, nux avellana	*Corylus avellana*	Beck	Hazelnut, Filbert	6

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Bolus armena, bolo armenico Oriental	Mineral/Inorganic		Armenian bol	6
Borraginis	*Ornithogalum umbellatum, Borago officinalis*	Beck, IPNI	Borage, Starflower	6
Canchr, cancer, cancri	Animal		Crab	6
Cedro	*Juniperus*	Beck	Cedar	6
Cerebrum	Animal		Brain, various sources	6
Cyclaminis	*Cyclamen hederifolium*	Beck	Sow-bread	6
Dorcynium, dorycnium, doronici	*Convulvus oleaefolius, Ptelea trifoliata*	Beck, GRIN	Shrub trefoil, Dorycnion	6
Ebuli	*Sambucus ebulus*	GRIN	Dwarf elder	6
Endiveia, seris	*Cichorium endivia*	Beck	Endive	6
Eryngio, eryngium, erugij	*Eryngium campestre, Eryngium martinum, Acanthus mollis*	Beck, GRIN	Eryngo, Sea holly	6
Esula, leche de esula	*Euphorbia esula*	GRIN	Leafy spurge	6
Filicis, filix	*Polystichum filix*	Beck	Fern	6
Galanga mayor y minor	*Alpinia officinarum*	GRIN	Galangal, Thai ginger	6
Grana kermes, grana tinctorium, chermes granorum	Animal product		Kermes, Vermillion, Scarlet grain	6
Hemionitis, scolopedium, lengua de ciervo, hemionite	*Scolopendrium hemionitis*	Beck	Moon fern, Mule fern	6
Hermodactiyli	*Colchicum autumnale*	GRIN	Hermodactyl, Autumn-crocus, Colchicum, Meadow-Saffron	6
Hordeum, hordei electi, cebada	*Hordeum vulgare*	Beck, GRIN	Barley	6
Hyacinthus, jacinto	*Scilla bifolia, Hyacinthus orientalis*	Beck, GRIN	Hyacinth	6
Junco coloroso, juncus quadratus	*Juncus* (Rush)	Beck	Rush	6
Ladanum, labdanum, ladano, cistus, cisto	*Cistus, Cistus creticus, Cistus ladanifer*	Beck, GRIN	Labdanum, Rock rose, Gum labdanum	6
Lapis magnetes, magnes, piedra iman	Mineral/Inorganic		Magnet	6
Lepidio, lepidium	*Lepidium, Lepidium sativum, Lepidium latifolium, Lepidium ruderale*	Beck, Riddle, GRIN	Pepper grass, Pepperweed, Garden cress	6
Limones	*Citrus limon*	GRIN	Lime, Lemon, Citron	6
Lotus, loti, lotos	*Nelumbu nucifera*	Beck	Lotus	6
Mala, poma, manzana	*Pyrus malus, Malus domestica, Malus pumila*	Beck, GRIN	Apple	6
Margarita, perlas	Mineral/Inorganic		Pearl	6
Misy	Mineral/Inorganic		Copiapite, Yellow copperas	6
Myrobalani	*Myrobalanus bellirica, Myrobalanus citrina, Terminalia bellirica*	IPNI, GRIN	Myrobalan	6
Narcisso, narcissus	*Narcissus poeticus, Narcissus pseudonarcissus, Narcissus tazetta*	Beck, GRIN	Daffodil	6

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Opio	*Papaver somniferum*	Beck	Poppy	6
Ova, ovum, huevos	Animal		Egg (includes white, yolk, and shell)	6
Palma	*Palma*	IPNI	Palm tree	6
Panace asclepio, panax asclepq.	*Ferula nodosa, Echinophora tenuifolia*	Beck	All-heal, Aesculpaius' allheal	6
Passula, passas grandes – passum	See grape.		Raisin	6
Persisci, persicaria, melocoton	*Prunus persica*	Beck	Peach	6
Peucedanum, peucedani	*Peucedanum officinale*	Riddle	Hog's fennel	6
Quercus, encina	*Quercus*	Beck	Oak	6
Rana	Animal		Frog	6
Rhabarbari	*Rheum ribes, Rheum officinale, Rheum rhabarbarum, Rheum rhaponticum*	Beck, GRIN	Rhubarb	6
Rhaponitici, reuponticum	*Rhaponticum*	IPNI	Rhaponticum	6
Rubia tinctorum, rubea tinctor	*Rubia tinctorum*	Beck	Madder	6
Sagapenum, sagapeno	*Ferula persica*	Beck	Sagapen, Sagapenon	6
Sandaraca	Mineral/Inorganic		Sandarach, Red arsenic	6
Santalum album, rubrum, cintrimun, sandalo	*Santalum*	IPNI	Sandalwood	6
Sapo	Animal		Toad	6
Satureia, saturegia, satureja, algedrea	*Satureia thymbra, Satureja hortensis, Satureja montana*	Beck, GRIN	Savory	6
Satyrion, satyrium	*Unident-Orchidaceae, Orchis papilionacea, Orchis morio*	Beck, GRIN	Orchid	6
Sebesten	Inconclusive		Sebesten	6
Senna folia	*Cassia acutifolia, Senna alexandrina*	Lardos, GRIN	Senna, Alexandrian senna	6
Seseli	*Tordylium officinale, Tordylium maximum, Bupleurum fruticosum, Seseli tortuosum*	Beck, GRIN	Hartwort	6
Sorbus, sorba, servas secas	*Sorbus domestica, Sorbus aria*	Beck, GRIN	Serviceberry, Sorb apple	6
Stercus, estiercol	Animal product		Dung	6
Terra sigillata	Mineral/Inorganic		Stamped earth	6
Trifolium	*Psoralea bituminosa, Bituminaria bituminosa*	Beck, GRIN	Clover	6
Uva	*Vitis vinifera, Vitis sylvestris*	Beck	Grape	6
Valeriana	*Valeriana officinalis*	GRIN	Valerian	6
Verbascum, gordolobo, gnaphalium	*Verbascum*	Beck	Petty mullein, Cudweed, Candlewick	6
Verbena	*Lycopus europaeus, Verbena officinalis*	Beck, GRIN	Vervain	6
Vitriolum	Mineral/Inorganic		Vitriol	6
Acanthus	*Acanthus*	IPNI	Acanthus, Bear's breeches	5

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Adeps, adipes, pinguedo	Animal product		Lard, fat, suet	5
Agrimonia	*Agrimonia eupatoria*	Beck	Agrimony	5
Alsine	*Stellaria media*	GRIN	Chick-weed	5
Aurum	Mineral/Inorganic		Gold	5
Ben, behen, ben grana	*Moringa Arabica*	Beck	Ben, Behen	5
Berberis	*Berberis vulgaris*	GRIN	Barberries	5
Bledos, bleta, amaranthus blitum	*Amaranthus blitum*	Beck	Amaranth, Blite	5
Bretannica, britanica	*Rumex aquaticus, Rumex hydrolapathum*	Beck, GRIN	Water dock	5
Bulbo, bulbus, bulbonae, bolbos	Inconclusive		Corm (of root)	5
Bunium, bunio, bunias	*Bunius orientalis*	GRIN	Warty cabbage, Turkish rocket, Corn rocket	5
Buprestes	*Meloe variegatus*	Riddle	Blister beetle	5
Bursa pastoria	*Capsella bursa pastoris*	Beck	Shepherd's purse	5
Cadmia	Mineral/Inorganic		Calamine, Zinc oxide	5
Cameleonta al., ni., chamaileon melas	*Cardopatium corymbosum*	Beck	Cameleon, Chameleon thistle	5
Canfora, camphor	*Cinnamonum camphora*	Lardos	Camphor	5
Caracoles, cochlearia	Animal/Mineral		Snail	5
Caucalide, caucalis	*Daucus carota sylvestris, Caucalis grandiflora*	Beck	Wild carrot, Caucalis	5
Cepea	*Allium cepa*	GRIN	Shallots	5
Ceterach, doradilla	*Asplenium ceterach*	GRIN	Rustyback fern	5
Chrysocolla	Mineral/Inorganic		Metal	5
Cichorium	*Cichorium intybus*	Beck	Chicory, Succory	5
Coagulum	Animal		Rennet	5
Conyza	*Inula graveolens, Inula viscose*	Beck	Fleabane, Horseweed, Butterweed	5
Corno, cornu capri, cervi	*Plantago coronopus, Astrophytum capricorne*	Beck, GRIN	Goatshorn, Hartshorn	5
Cuscuta	*Orobanche crenata, Cuscuta*	Beck, GRIN	Dodder	5
Dragon marino, draconculus, dracontium	*Arum dracunculus, Dracunculus vulgaris*	Beck, GRIN	Dragon herb, Dragon arrowroot, Dragon arum	5
Elaterio, elacterium	*Ecballium elaterium*	Beck	Juice of wild/squirting cucumber, Elaterion	5
Filipendula, saxifraga rubra	*Spiraea filipendula, Filipendula vulgaris, Filipendula ulmaria*	Beck, GRIN	Meadowsweet, Dropwort	5
Fumariae	*Fumaria officinalis, Corydalis claviculata*	Beck	Fumitory	5
Fungus, hongos	*Fungi*	Beck	Mushroom	5
Hirudines, hirudinaria, sanguijuela	Animal		Leeches	5

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Iris	*Iris, Iris Florentina, Iris foetidissima*	Beck, GRIN	Fleur-de-lys, Iris, Gladwyn	5
Iujubae, jujuba, azufayfas	*Ziziphus zizyphus, Ziziphus jujube*	IPNI	Jujube or Chinese or Red Date	5
Lacca	Mineral/Inorganic		Shellac, Lake, Laquer	5
Lanas	Animal		Wool	5
Lapis armenia, armenus	Mineral/Inorganic		Armenian stone	5
Lapis iudaisucs, iudaica, judaica	Mineral/Inorganic		Jews' stone	5
Laserpitium, laserpitio, silphium	*Ferula tingitana, Ferula asa foetida*	Beck	Laserwort	5
Laurel	*Laurus nobilis*	Riddle	Bay tree	5
Lichen	Animal/Plant		Lichen	5
Lycio, licyum, licium, lycion	*Rhamnus petiolaris, Rhamnus lycoides, Rhamnus punctata, Lycium barbarum, Lyciuim chinense*	Beck, GRIN	Wolfberry, Buckthorn, Lycion	5
Matricaria	*Matricaria chamomilla*	Beck	German chamomile, Wild chamomile, Dyer's chamomile	5
Melonum, melones	*Cucumis melo*	GRIJN	Melon	5
Minium	Mineral/Inorganic		Red lead, Lead oxide	5
Musco, muscus	Animal		Musk	5
Nepeta, nepitha	*Nepeta cataria*	GRIN	Catnip, Catmint	5
Nux indica	*Cocos nucifera*	GRIN	Coconut	5
Nux juglans, juglandis, nux gallica, inglandis, nuezes o nogal	*Juglans regia*	Beck	Walnut	5
Ochre, ocra	Mineral/Inorganic		Ochre	5
Ossa, huesos	Animal		Bones, various sources	5
Pistacia, pistacium, alfonfigos	*Pistacia vera*	Beck	Pistachio tree	5
Purpurae, purpura	Inconclusive		Purple spots?	5
Pyrethra, pelitre, pyrethron	*Parietaria officinalis, Anacyclus officinarum*	Beck, GRIN	Pellitory	5
Ricino, ricinus	*Ricinus communis*	Lardos	Palma christi, Castor oil tree	5
Sanguis draconis, sangre de drago	*Dracaena*	Riddle	Dragon's blood	5
Serapinum	Inconclusive		Serapinum	5
Smilace aspera, smilax	*Calystegia sepium, Convulvus arvensis, Smilax aspera*	Lardos, Beck	Bindweed, Yew, Rough Bindweed	5
Spina, spina alba, Arabica	*Crataegus monogyna*	GRIN	Hawthorn	5
Spodio, spodium, cinis, cenizes	Mineral/Inorganic		Ashes, various substances	5
Spuma matis, salis, artgenti	Mineral/Inorganic		Litharge	5
Squinantiam, schoenanthi, esquinanto	*Cymbopogon schoenanthus*	Beck	Type of aromatic rush, Camel Hay, Camel Grass	5
Staphidis agria, staphysagria	*Delphinium staphisagria*	Beck	Delphinium, Stavesacre, Larkspur	5

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Stoecados, sticados, cantuesso	*Lavendula stoechas, Lavendula dentata*	Beck, GRIN	French lavender, Spike	5
Succinum, electrum	Mineral/Inorganic		Amber	5
Tamarindi	*Tamarindus indica*	Lardos	Tamarind	5
Thapsi, thapsia	*Thapsia garganica*	Beck	Deadly carrot	5
Thiaspi, thlapi, thlaspi	*Thlapsi*	IPNI	Thlapsi	5
Tormentilla	*Potentilla erecta*	GRIN	Tormentil	5
Turpeti, turbith	*Operculina turpethum*	GRIN	Turpeth	5
Unas	Animal		Hoof, claws, various sources	5
Urtica	*Urtica dioica*	Beck, GRIN	Nettle	5
Vipera sicca	Animal		Viper	5
Virga pastoris	*Dipsacus fullonum, Dipsacus sylvestris*	Beck	Teasel	5
Vitis folia	*Vitis*	IPNI	Vine	5
Zedoaria	*Curcuma zedoaria*	GRIN	Zedoary Root, White Turmeric	5
Aconito, aconitum	*Aconitum napellus, Aconitum lycoctonum*	Beck	Wolfsbane	4
Adarce, adarces, adarcion	Mineral/Inorganic		Dried sea salt, Carbonate of lime	4
Agerato, ageratum, ageratum	*Ageratum*	IPNI	Sweet milfoil, Maudin	4
Alcarabea, carus	*Carum carvi*	Beck	Caraway	4
Alkekengi, alquequenjos	*Physalis alkekengi*	GRI N	Bladder Cherry, Chinese Lantern	4
Alysso, alysson	*Asperugo procumbens, Biscutella*	Beck	Madwort	4
Ambra, ambra grisca	Animal product		Ambergris	4
Amidum, amylum	Plant product		Starch	4
Anemone	*Anemone coronaria*	Beck	Poppy anemone	4
Antirrinon, antirrino	*Antirrhinum orontium, Antirrhinum majus*	Beck, GRIN	Snapdragon	4
Artamita, cyclamen, arthamita	*Cyclamen graecum, Lonicera periclymenum*	Beck	Cyclamen	4
Aster attico, aster atticus	*Aster atticus*	IPNI	Starwort	4
Auricular muris	*Gnaphalium uliginosum, Hieracium*	GRIN	Mouse-ear, Hawkweed	4
Ballote, balot, ballota	*Ballota acetabulosa, Balota nigra*	Beck	Black horehound, false dittany	4
Bistorta	*Bistorta officinalis*	GRIN	Bistort, Dracunculus, Guinea Worm	4
Borax	Mineral/Inorganic		Borax, Sodium borate	4
Botrytis, botry, botris, botrys	*Botrys*	IPNI	Goosefoot, Feathered geranium	4
Bupthalmum, buphtalmo	*Chysanthemum coronarium*	Beck	Oxeye	4
Cacalia	*Senecio thapsoides, Mercurialis tomentosa*	Beck	Caccalia	4
Calciteide, chalcitis	Mineral/Inorganic		Chalcitis	4

Materia Medica – Name in Texts	Scientific Name	Source of Scientific Name[1]	English Translation	Number of Works Listed in (n=12)
Cannabis, canamon	*Cannabis sativa*	Beck	Hemp	4
Caries ligni corrosa	Inconclusive		Carious wood	4
Castanas	*Castanea vulgaris, Castanea sativa*	Beck, GRIN	Chestnut	4
Chondrile, condrila	*Chondrilla juncea*	GRIN	Gum succory	4
Chondrus, condro	Animal/Plant		Irish moss, algae	4
Cicada, cigarras	Animal		Cicada	4
Colofonia	Inconclusive		Colophony	4
Diphryge	Inconclusive		Husk of brass	4
Dragontea, dragantum	*Artemisia dracunculus*	GRIN	Common dragon	4
Elatine	*Elatine, Linaria vulgaris*	IPNI, GRIN	Toadflax	4
Ephemeron, ephemero	*Polygonatum multiflorum, Polygonatum verticillatum, Dietes grandiflora*	Beck, GRIN	Wild iris, Ephemeron	4
Epimedium, epimedio	*Epimedium alpinum, Epimedium grandiflorum*	GRIN	Barren wort, Epimedion	4
Gallos y gallinas	Animal		Roosters and hens	4
Garum, garo	Mineral/Inorganic		Brine of pickled fish	4
Genista	*Genista, Cytisus scoparius*	IPNI, GRIN	Broom	4
Geranium	*Geranium*	IPNI	Geranium	4
Gladiolo, xiphio	*Gladiolus*	IPNI	Gladiola	4
Heapr, higados, various	Animal		Liver, various sources	4
Hepatica, various	Inconclusive		Liverwort	4
Hiel, various	Animal		Fat, grease, various sources	4
Isopyrum, isopyro	*Isopyrum, Menyanthes trifoliate*	IPNI, GRIN	Faseolus, bog bean	4
Lapis alabastrite, alabastrum	Mineral/Inorganic		Alabaster	4
Lapis specularis	Mineral/Inorganic		Translucent gypsum	4
Laureola	*Daphne laureola*	Beck	Laurel daphne	4
Ligustrum, ligustri	*Ligustrum vulgare*	GRIN	Privet	4
Lingua (avis)	Animal		Tongue - bird	4
Lithospermum, lithospermo, linospermon	*Lithospermum officinale*	Beck	Gromwel, Groomwell	4
Lombrici, vermes terreni, gusano	Animal		Earthworm	4
Lonchitis, lonchite	*Serapias lingua, Lonchitis tenuifolia, Hypolepis tenuifolia*	Beck, GRIN	Rough spleenwort, Lonchitis	4
Lysimachium	*Lysimachia vulgaris*	Beck	Loosestrife, Looseleaf strife	4
Manteca, various	Animal		Fat, grease	4
Mesereum	*Daphne cnidium, Thymelaea passerina*	Beck	Spurge flax, Mezereum	4
Mespila, mespilum siccata, nisperos secos	*Mespilus germanica*	GRIN	Medlar	4

Materia Medica – Name in Texts	Scientific Name	Source of Scientific Name[1]	English Translation	Number of Works Listed in (n=12)
Milla pedae sicca	Animal		Slaters	4
Millij, milium, mijo	*Panicum miliaceume*	GRIN	Panic millet, Broom millet	4
Omphacium, omphacio	See grape		Juice of unripe grape	4
Ononidis, anonis, seu anonidis, unas gatas	*Onosma echinoides*	Beck	Stone bugloss	4
Oriza, arroz, oryza	*Oryza sativa*	Beck	Rice	4
Oxyacanta, oxyacanthos	Inconclusive		Evergreen thorn	4
Peplus, peplo, peplos	*Euphorbia peplus*, *Euphorbia peplis*	Riddle	Petty spurge, Peplus spurge, Peplis spurge	4
Petasite, petasitidis	*Petasites officinalis*, *Petasites hybridus*	Beck, GRIN	Butter-burr	4
Petroleo, petroleum	Mineral/Inorganic		Petroleum	4
Picea	*Picea*	IPNI	Pitch tree	4
Pityusa, esula minor	*Esula*	IPNI	Pine spurge	4
Polygonnum, sanguinaria	*Polygonum aviculare*	Beck	Bloodroot, knotgrass	4
Pompholyge, pompholyx	Inconclusive		Type of eczema?	4
Porrum, porri, puerros	*Allium porrum*	Beck	Leeks	4
Potamogiton, potamogeton	*Ottelia alismoides*	Beck	Pondweed	4
Ramno, rhamnus catharticus	*Rhamnus cathartica*	IPNI	Buckthorn	4
Sal gemma	Mineral/Inorganic		Halite	4
Salamandra	Animal		Salamander	4
Scabiosa	*Scabiosa columbaria*	IPNI	Scabious	4
Scandice, scandix	*Scandix pecten-veneris*, *Anthriscus sylvestris*	Beck	Shepherd’s needle, Wild chervil	4
Scinci, scincus	Animal		Skink	4
Scolopendra	Animal		Centipede	4
Scordoprason, scorodopraso	*Allium descendens*, *Allium sphaerocephalon*	Beck, GRIN	Garlic-leek	4
Scorpio	Animal		Scorpion	4
Scorpionides, scorpioide, scorpiodes	*Coronilla scorpioides*	Beck	Scorpionwort	4
Serpentaria	Inconclusive		Snakeroot	
Smaragdus, smeraldus – Esmeralda	Mineral/Inorganic		Emerald	4
Sonco, sonchus	*Emilia sonchifolia*, *Sonchus oleraceus*	Beck, GRIN	Sow-thistle, Sonchos	4
Sory, soricis	Mineral/Inorganic		Green vitriol	4
Sparaganium, sparganio, sparagna	*Sparganium ramosum*, *Sparganium eurycarpum*	Beck, GRIN	Bur-reed	4
Spelta	*Triticum aestivum*	Beck, GRIN	Far, Spelt	4
Stachy, stachys	*Stachys*	Beck	Base horehound	4

Materia Medica – Name in Texts	Scientific Name	Source of Scientific Name[1]	English Translation	Number of Works Listed in (n=12)
Stannum, estano	Mineral/Inorganic		Tin	4
Tanaceti, tenceto - tanacetum	*Tanacetum vulgare*	GRIN	Tansy	4
Telephium, telephio	*Andrachna telephioides, Sedum telephium, Hylotelephium telephium*	Beck, Riddle, GRIN	Telephonion, Orpine, Sedamine	4
Teucrio, teucrium	*Teucrium flavum, Teucrium fruticans*	Beck, GRIN	Tree germander	4
Thymbra	*Satureia thymbra, Satureja hortensis, Satureja montana*	Beck, GRIN	Savory	4
Thymelea	*Daphne gnidium*	Riddle	Thymelea	4
Torpedo	Animal		Cramp-fish	4
Urina, orina	Animal		Urine, various sources	4
Viscum corylinum	Inconclusive (various sources)		Birdlime	4
Xanthium, xanthio	*Xanthium strumarium*	Beck	Clutburr, Burweed, Broad-leaved burweed	4

[1] Sources include: 1)International Plant Names Index (IPNI), URL: www.ipni.org; 2) USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network (GRIN) Online Database. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/cgi-bin/npgs/html/tax_search.pl; 3) Lily Y. Beck trans. 2005. Pedanius Dioscorides of Anazarbus: De Materia Medica. Hildesheim, Zurich, New York: Olms-Weidmann, 406–489; 4) Andreas Lardos. 2006. The botanical *materia medica* of the *Iastrosophikon* – A collection of prescriptions from a monastery in Cyprus. Journal of Ethnopharmacology 104(2006), 392–404; and 5) John M. Riddle. 1987. Folk Tradition and Folk Medicine: Recognition of Drugs in Classical Antiquity. Folklore and Folk Medicines, ed. John Scarborough. Madison, WI: American Institute of the History of Pharmacy, 47–61. Identifications were made by first checking Beck's "Index of Plants and Plant Products" which included scientific names for the majority of botanical simples listed here. For those plants not listed in Beck, Riddle and Lardos were consulted. For those plants not listed in any of these three publications, the name(s) given for the simple in traditional texts (i.e., not the common/translated name) were input into the "genus" category in the IPNI. All scientific names were cross-checked in the USDA/GRIN database by inputting the common English names for plants and/or the scientific name in order to insure that modern standardized spelling and nomenclature were used. GRIN is indicated in the "source" category if any changes were made. Scientific names with only one-word designations indicate the name of the genus; the specific species and/or varieties in these cases are unknown.

Table 4

Top 439 Simples by Plant, Animal, Mineral, Unkown (n=439)

Source	Number	Percentage of Total (439)
Plant	341	77.68
Animal	45	10.25
Mineral	49	11.16
Unknown	4	.91
Total	439	100

Table 5

Correlation between Hippocrates and later works (n=439)

Hippocratic Tradition – Degree of Consistency between Hippocrates and…	Number of Simples in Top 439	Simples in Common with Hippocrates - Top 439	Degree of Consistency – Simples in Common as Percentage of Simples in Work	Difference from Average Degree of Consistency (absolute value)
Dioscorides	311	129	41.48	2.08
Celsus	97	53	54.64	11.08
Galen	277	123	44.40	.84
Paul of Aegina	315	138	43.81	.25
Serapion	248	106	42.74	.82
Platearius	203	89	43.84	.28
Sylvatico	255	107	41.96	1.6
Saladino	179	75	41.89	1.67
Fragoso	296	115	38.85	4.71
Palacios	302	123	40.73	2.83
Farmacopea Espanola	268	120	44.78	1.22
Average degree of consistency			43.56	

Table 6

Correlation between Dioscorides and Other Works (n=439)

Dioscordean Tradition – Degree of Consistency between Dioscorides and…	Number of Simples in Top 439	Simples in Common -Top 439	Degree of Consistency – Simples in Common as Percentage of Simples in Work	Difference from Average Degree of Consistency (absolute value)
Hippocrates	168	129	76.79	4.64
Celsus	97	81	83.50	11.35
Galen	277	226	81.59	9.44
Paul of Aegina	315	253	80.32	8.17
Serapion	248	167	67.34	4.81
Platerius	203	133	65.52	6.63
Sylvatico	255	175	68.63	3.52
Saladino	179	123	68.71	3.44
Fragoso	296	205	69.26	2.89
Palacios	302	197	65.23	6.92
Farmacopea Espanola	268	179	66.79	5.36
Average degree of consistency			72.15	

Table 7

Correlation between Dioscorides and later works, all simples (n=985)

Dioscordean Tradition – Degree of Consistency between Dioscorides and…	Number of Simples in work, total	Simples in Common – Total	Degree of Consistency – Simples in Common as Percentage of Simples in Work	Difference from Average Degree of Consistency (absolute value)
Hippocrates	257	129	50.19	7.27
Celsus	99	81	81.82	24.36
Galen	808	223	27.59	29.86
Paul of Aegina	398	250	62.81	5.35
Serapion	261	166	63.60	6.14
Platearius	207	133	64.25	6.79
Sylvatico	278	174	62.59	5.13
Saladino	199	123	61.80	4.35
Fragoso	340	204	60.00	2.54
Palacios	488	197	40.37	17.09
Farmacopea Espanola	312	178	57.05	0.41
Average degree of consistency			57.46	

Table 8

Correlation between works of similar periods of Top 439 Medicines – ancient, medieval, 16th–17th, 18th–19th

Author/Period	Number of Simples in Common – Top 439	Number of Simples in Work – Top 439	Degree of Consistency within Time Period (Simples in Common as Percentage of Simples in Work – Top 439)	Difference from Average Degree of Consistency (absolute value)
Ancient	**86**			
Hippocrates	86	168	51.19	16.90
Dioscorides	86	311	27.65	6.63
Galen	86	277	31.04	3.24
Paul of Aegina	86	315	27.30	6.98
Average Degree of Consistency –Ancient Period			**34.29**	
Medieval	**131**			
Serapion the Younger	131	248	52.82	3.42
Platerius	131	203	64.53	8.29
Silvaticus	131	255	51.37	4.87
Average Degree of Consistency – Medieval Period			**56.24**	
15th–16th Centuries	**128**			
Saladino	128	179	71.51	14.13
Fragoso	128	296	43.24	14.13
Average Degree of Consistency – 15th–16th Centuries			**57.38**	
18th–19th Centuries	**215**			
Palacios	215	302	71.19	4.51
Farmacopea Española	215	268	80.22	4.51
Average Degree of Consistency – 18th–19th Centuries			**75.71**	

Table 9

Survey of Healing Qualities/Uses of Top 14 Simples (found in 12 out of 12 sources consulted)

Simple	Description of Healing Qualities/Uses by Dioscorides, *De Materia Medica*, 1st Century (from Beck translation, 2005)	Description of Healing Qualities/ Uses from Paul of Aegina, *De Re Medica Libri Septem*, Book 7, 7th Century (from Adams translation, 1844)	Description of Healing Qualities and Uses from Serapion, *Liber de Simplici medicina*, 12th Century (from Alpagus Bellunensis translation, 1550)
Acacia	(Shittah Tree) Astringent and cooling properties; helps with eye diseases and erysipelas, shingles, chilblains, eye growths, mouth sores, and prolapses of the eyes and uterus; stops diarrhea.	Desiccant in the 3rd degree, cooling in the first (but if washed, of the second). It is sour and terrene.	Cold and dry in first degree. Comforts eye and ulcers of the mouth and eyes; gets rid of old humors from womb.
Alum	Warm, astringent, clear the corneas, reduce overgrown fleshes; beneficial for thrush, pustules, ear rheums, leprosies, itches, chilblains, cancers, spreading ulcers, nits, pediculosis, burns, swellings, and armpit and groin odors. Induces menstruation, stops barrenness, and expels embryos/fetuses. Helps with inflammation sof the gums, uvulas, tonsils, and mouth.	Sour.	Calefactive, abstergent; heals scabies and other ulcers; abscindit menstruation.
Asphalt/Bitumen	Anti-inflammatory, agglutinative, dispersive, emollient, and beneficial for uterine suffocations and prolapses; checks epileptic attacks; provokes menstruation; helpful for chronic coughs, asthma, tics, dyspnea, snake bits, pains of the hip joints and side, bowel ailments, catarrhs, toothache, gout, and arthritis.	Hot and dry in the second degree; agglutinative of fresh wounds.	Hot and dry in second degree. Prevents abscesses; is softening and resolutive; used for epilepsy; provokes urine and menstruation.
Balsam	Counteracts uterine chills and draws down afterbirth and embryos/fetuses; dilates cervix; cleanses sores, eyes, and wild animal bites. Aids in pleurisy, inflammations of the lungs, coughs, epileptics, dizziness, colic. Diuretic.	Desiccant and heating in second degree.	Hot and dry in the second degree. Comforts frigidity of the womb for birth, moves ulcers, provokes urine; good for asthma because it matures superflidities (superfluitates).
Cardamom	Has warming, astringent, desiccative, soporific, and analgesic properties. Soothes inflammations of the eyes, internal organs, liver disease, kidney disease, gout, and female disorders.	Acrid, bitter, destroys intestinal worms, clears away scabies.	Hot and dry in first degree. Resolves and fortifies; comforts stomach, syncopi (fainting), and vomiting.
Cassia (linea and fistula)	Has warming, diuretic, desiccative, and mildly astringent properties. Improves shortsightedness; removes birthmarks; draws down the menses, helps for snake bits, all internal inflammations and for the kidneys; used by women in sitz baths and to dilate the cervix.	Heating and desiccative in the third order, acrid, astringent, incisive, discutient, imparts strength to organs, is emmenagogue.	Temperate; extinguishes activity of the blood, resolves hard apostemas, comforts the stomach and liver pain; purges cholera; relaxes the stomach.
Myrrh	Has heating, soporific, agglutinative, desiccative, and astringent properties; softens the uterus and opens it when closed; draws down the menses and embryos/fetuses; also helps with chronic cough, pain of the side and chest, diarrhea, dysentery, and shivering fits; mends roughness of the trachea and horseness of voice; kills intestinal worms, cures bad breakth and armpit odor; strengthens teeth and gums; heals head- wounds, bruised ears, exposed bones, ear afflictions, facial eruptions, afflictions of the eyes.	Heating and desiccative in the 2nd order; emmenagogue, promotes expectoration from the chest and lungs. Agglutinates wounds of the head; bitter; abortifacient; kills worms. Detergent, expectorant.	Hot and dry in 3rd degree. Cleanser, coagulant; gets rid of worms. Helps with cough, asthma, and pain in the lungs. Heats, mollifies, and resolves. Provokes menstruation and expels fetus.
Pennyroyal	Warms, thins, promotes digestion. Draws the menses, afterbirth, and embryos/fetuses. Brings up phlegm from the lungs; relieves nausea and stomach pain; soothes inflammations, gout, and itching. Use in a sitz	Strongly calefacient and attenuant; rubefacient when applied externally; promotes expectoration of thick humor lodged in chest and lungs.	Drying and heating in the 3rd degree. Resolvent, diuretic; calefactive, applied externally for pleurisy; helps with asthma, nausea, purges

Simple	Description of Healing Qualities/Uses by Dioscorides, *De Materia Medica*, 1st Century (from Beck translation, 2005)	Description of Healing Qualities/ Uses from Paul of Aegina, *De Re Medica Libri Septem*, Book 7, 7th Century (from Adams translation, 1844)	Description of Healing Qualities and Uses from Serapion, *Liber de Simplici medicina*, 12th Century (from Alpagus Bellunensis translation, 1550)
	bath for uterine inflations, indurations, and twistings..		flegmatic humors; provokes menstruation, expels fetus; rubefacient, helps spleen.
Pepper	Warms, helps digestion, promotes urine production, perspiration, and cleanses eyes; helps with shivering fits, wild animal bites, draws embryos/fetuses; causes barenness; helps for all chest afflictions, spleen inflammation, digestion, and sore throats, ends colic, purges phlegm, stimulates appetite; analgesic, warming; dissipates scrofulous swellings of the glands and leprosies.	Acrid, heating, dessicative.	Both white and black pepper are hot and dry in 4th degree. desiccative, calefactive, fortifying, cleansing. Provokes urine.
Rue	Warms, burns, ulcerates, is diuretic and emmenagogic; ends diarrhea; is antidote to poison; stops colic; good for pains on the side and chest, coughs, inflammation of the lungs, pain of the hips or joints; good for inflations of the colon, uterus and intestine; relieves uterine suffocation; expels intestinal worms, sharpens vision; helps with headaches, inflammation of the testicles, leprosy, warts, earaches, erysipelas, shingles and scurf.	Terrene, cold and subtile substance. Hence it relieve sprains and ruptures and astringent. Alleviates spitting of blood, coliac and dysenteric affections. Cures hepatic (liver) complaints.	Hot and dry in 3rd degree. Resolves thick, viscous humors; purges and expels through urine; provokes urine and menstruation, comforts suffocation of the uterus. Helps digestive ailments.
Southernwood	Helps with orthopnea, ruptures, spasms, hip ailmets, difficult micturation, and delayed menstruation; serves as antidote for poisons and for shivers; helps with spider and scorpion bites, and inflammations of the eyes.	Warm, dry in third degree, discutient (dispersive), desiccative; cures periodical rigors, alopecia (hair loss).	Hot and dry in 3rd; abstersive, resolutive, incisive. Helps with retention of menstruation.
Spurge	Removes hair; allays toothache; removes warts, carbuncles, cankers, gangrenes, fistulas; purges the bowel.	Caustic.	Hot and dry in 4th degree. Cleanses the eye; warms humors; aids dropsy and other similar cold afflictions.
Storax	Has heating, emollient, and digestive properties; is effective for coughs, catarrhs, discharges from the hostrils, hoarseness of voice, loss of voice, and ringing in the ears. Draws down the menses, stimulates cervical dilation, softens the bowel; warms, softens, and is soporific.	Calefacient, emollient, digestive. Useful in coughs, catarrhs, and defluxion; promotes menstruation.	Hot and dry in the first degree. Emollient, maturative, aids in coughs, colds; cleanses uterus after birth and provokes menstruation.
Turpentine	Warms, softens, relaxes; helps with coughs, cleanses impurities from the chest; diurectic; softens stool, helps with digestion, genital itching, leprosy, and pains in the side.	Heating in the second degree and desiccative in the first, in the second when dried. Fruit is desiccative in the third order. Diuretic and useful for the spleen.	Hot and dry in 3rd degree. (Softening) Mollifactive, dissolutive, cleansing, comforts cough and ulcers of the lungs and bloody sputum; provokes urine, softens the stomach.

Table 10

List of Modern Simples – Herbs and Supplements on Medline Plus (http://www.nlm.nih.gov/medlineplus/herbalmedicine.html)

Medicines from Medline Plus "All Herbs and Supplements"
Alfalfa
Aloe
Arginine
Belladonna
Betel Nut
Bilberry
Black Tea
Blessed Thistle
Boron
Bromelian
Burdock
Calendula
Chamomile
Clay
Clove
Copper
Cranberry
Creatine
Dandelion
Danshen
Devil's Claw
Don quai, Chinese Angelica
Echinacea
Elder
Ephedra
Eucalyptus
Evening Primrose
Flaxseed
Garlic
Ginger
Ginko
Ginseng
Green Tea
Horse Chestnut
Horsetail
Iodine

Medicines from Medline Plus "All Herbs and Supplements"
Iron
Kava
Lavender
Licorice
Passion flower
Pennyroyal
Peppermint
Propolis (Bees)
Psyllium
Pygeum (Africa)
Red yeast rice
Saw Palmetto (America)
Scotch Broom (Broom)
Seaweed
Soy
Spirulina
St. John's Wort
Sweet Almond
Tea Tree Oil (Australia)
Turmeric and Curcumin
Valerian
White Horehound
Wild Yam (Americas – Mexico)
Yohimbe
Zinc

Table 11

Number of NCCAM/Medline Herbs and Supplements in Traditional Western Pharmacopoeia

In Common –Total – 985 (in at least 1 of 12 sources)	In top 439 (in at least 4 of 12 sources)	In top 267 (in at least 6 out of 12 sources)	In top 150 (in at least 8 of 12 sources)	In Top 26 Simples (in at least 11 of 12 sources)	In Top 14 Simples (in 12 of 12 sources)
Almond, Sweet/Bitter	1	1	1	1	
Aloe	1	1	1		
Blessed Thistle (Cardus Beneditctus)	1	1			
Bitter Orange (2)					
Calendula (2)					
Chamomile	1	1	1		
Clay (Stamped Earth)	1	1			
Clove	1	1	1		
Copper	1	1	1		
Don quai, Chinese Angelica (as Angelica) (3)					
Elder	1	1	1		
Evening Primrose (3)					
Fenugreek	1	1	1		
Flaxseed	1	1	1		
Garlic	1				
Ginger	1	1	1		
Ginkgo (Maidenhair)	1	1	1		
Ginseng (Quinquefolium)	1	1			
Hawthorn	1				
Horsetail (3)					
Iron	1	1	1		
Licorice	1	1	1		
Pennyroyal	1	1	1	1	1
Peppermint (Mint)	1	1	1		
lPropolis (3)					

In Common –Total – 985 (in at least 1 of 12 sources)	In top 439 (in at least 4 of 12 sources)	In top 267 (in at least 6 out of 12 sources)	In top 150 (in at least 8 of 12 sources)	In Top 26 Simples (in at least 11 of 12 sources)	In Top 14 Simples (in 12 of 12 sources)
Psyllium	1	1	1		
Scotch Broom (Broom)	1				
St. John's Wort	1	1	1		
Turmeric (3)					
Valerian	1	1			
White Horehound	1	1	1	1	
Zinc (as Calamine)	1				
Total: 33	25	21	17	3	1

Table 12

Degree of Consistency between Contemporary Herbs/Supplements and Traditional European Pharmacopoeia

Simples	Number	Degree of Consistency for traditional medicines (n=985)
Medline Simples in Top 14 Medicines (cited in 12 of 12 sources)	1	0.1%
Medline Simples in Top 26 Medicines (cited in at least 11 of 12 sources)	3	0.3%
Medline Simples in Top 150 Medicines (cited in at least 8 of 12 sources)	17	1.7%
Medline Simples in Top 267 (cited in at least 6 of 12 sources)	21	2.1%
Medline Simples in Top 439 (cited in at least 4 of 12 sources)	25	2.5%
Medline Simples in all simples (cited in at least 1 of 12 sources)	33	3.4%

Table 13

Healing Qualities/Uses of Three Most Common Simples Modern Pharmacopoeia

Simple	Dioscorides – 100 AD	Paul of Aegina – 600 AD	Late Medieval Texts, 1000 AD – 1300 AD	National Institutes of Health, 2009
Almond (Bitter and Sweet)	Laxative, soporific, diuretic; use for pain, inflammation of the lungs, sores, flatulence, cough, stones, heartburn, dog bites, shingles, headache; provokes menstruation when used as a pessary. Gets rid of freckles. Bitter is stronger than sweet.	Bitter: attenuant and deobstruent of thick humors; detergent. Sweet: moderately hot.	Hot and humid in 1st degree. Sweet almond is weaker than bitter; provokes urine. Bitter is warming, abstergent, expels thick viscous humors from the chest and lungs; cures pain of the side, spleen; brings on birth, provokes menstruation; helps with pain, abscesses, ulcers.	Sweet almonds are a popular nutritious food. Researchers are especially interested in their level of monounsaturated fats, as these appear to have a beneficial effect on blood lipids. Note: Sweet almond should not be confused with bitter almond, which contains amygdalin and can be broken down into the poisonous substance hydrocyanic acid (cyanide). http://www.nlm.nih.gov/medlineplus/druginfo/natural/patient-sweetalmond.html Accessed 14 January 2010.
Horehound (White)	Given to tuberulars, asthmatics, and people who cough; brings up congestive matter from the chest; brings on menstruation and afterbirth; cleanses sores and ulcers; relieves side pain; sharpens the sight; used for earaches.	Calefacient in 2nd degree but more dessicative. Removes obstructions about the liver and spleen and those of the chest and lungs. Promotes menstruation. Detergent, discutient, incisive.	Hot and dry in the 3rd degree. Is diuretic; helps chest and asthma by moving cold and viscous humors; works against cough; helps with strangury (inability to urinate).	Since ancient Egypt, white horehound (*Marrubium vulgare* L.) has been used as an expectorant (to facilitate removal of mucus from the lungs or throat). Ayurvedic, Native American, and Australian Aboriginal medicines have traditionally used white horehound to treat respiratory (lung) conditions. The U.S. Food and Drug Administration (FDA) banned horehound from cough drops in 1989 due to insufficient evidence supporting its efficacy. However, horehound is currently widely used in Europe, and it can be found in European- made herbal cough remedies sold in the United States (for example, Ricola®). There is a lack of well-defined clinical evidence to support any therapeutic use of white horehound. The expert German panel, the Commission E, has approved white horehound for lack of appetite, dyspepsia (heartburn), and as a choleretic. There is promising early evidence favoring the use of white horehound as a hypoglycemic agent for diabetes mellitus and as a non-opioid pain reliever. http://www.nlm.nih.gov/medlineplus/druginfo/natural/patient-whitehorehound.html Accessed 14 January 2010.
Pennyroyal	Warms, thins, promotes digestion. Draws the menses, afterbirth, and embryos/fetuses. Brings up phlegm from the lungs; relieves nausea and stomach pain; soothes inflammations, gout, and itching. Use in a sitz bath for uterine inflations, indurations, and twistings.	Strongly calefacient and attenuant; rubefacient when applied externally; promotes expectoration of thick humor lodged in chest and lungs.	Drying and heating in the 3rd degree. Resolvent, diuretic; calefactive, applied externally for pleurisy; expels viscous humors in the 3rd from the chest and lungs; helps with asthma, nausea, purges phlegmatic and superfluous humors; provokes menstruation, expels fetus; rubefacient, helps spleen. (humors?), helps with asthma, nausea, purges flegmatic humors, helps with wind in the uterus [ventositabus matrices].	The essential oil of pennyroyal may act as an emmenagogue (menstrual flow stimulant) and induce abortion. However, it may do so at lethal or near-lethal doses, making this action unpredictable and dangerous. Future research to determine the safety and efficacy of the less toxic parts of the pennyroyal plant on the menstrual cycle is needed before a recommendation can be made. Medline Plus website, http://www.nlm.nih.gov/medlineplus/druginfo/natural/patient-pennyroyal.html Accessed 14 January 2010.