**Alchemy and Chemical Medicines in Early Colonial Lima, Peru**

Linda A Newsona

aInstitute of Latin American Studies, University of London

linda.newson@sas.ac.uk

The article explores the use of minerals and the nature of chemical methods employed in Lima in the sixteenth and early seventeenth centuries. It does so through examining the availability of mineral resources, including pre-European knowledge of their use, through surveying the books and equipment used by physicians and apothecaries, and finally by examining prescriptions for medicines that were used to treat patients. It concludes that minerals were probably more commonly employed in medicines in Lima than in Spain but suggests that their preparation and use at this time drew on Spain’s alchemical tradition rather than on writings by Paracelsus and his followers. It argues that this did not reflect the effectiveness of censorship by the Inquisition.

alchemy; distillation; minerals; apothecaries; Peru; Inquisition

**Introduction**

Much is known and debated about the history and practice of alchemy and chemical medicine in early modern Europe, but there are few studies on the subject in Latin America, either at this time or indeed prior to European arrival. For Latin America, studies in the history of medicine focus on institutional aspects of medical practice, especially the establishment of medical boards (*protomedicatos*), hospitals, and medical education.[[1]](#footnote-1) Other scholars have examined the transference of humoral medicine to the New World in general,[[2]](#footnote-2) but only a few studies have enquired into the medical use of minerals and chemicals. These include Paula De Vos’s research on apothecaries in late colonial Mexico, Enrique Laval’s, study of the Jesuit pharmacy in Santiago, Chile, and the author’s own book on apothecaries in early colonial Lima.[[3]](#footnote-3) The fact that it is apothecaries that are the focus of these studies rather than other medical practitioners accords with recent arguments that artisanal practice was formative in the development of science and that in medicine apothecaries played a particularly important role.[[4]](#footnote-4) Although this article focuses on apothecaries, they are not considered in isolation from physicians, for as several authors have demonstrated, artisans and scholars generally interacted.[[5]](#footnote-5) Indeed, the close relationship between physicians and apothecaries was recognised in seventeenth century Lima, where the satirical poet Juan del Valle y Caviedes, who, intent on criticising medical practice in the city, depicted the apothecary as an accomplice of physicians acting as an artilleryman – a *boticario artillero* – in preparing the deadly medicines that they prescribed.[[6]](#footnote-6)

The use of minerals in medicines cannot be understood without knowledge of the physical environment from which they are drawn or of the broader economic, political and religious contexts in which they are used. This study aims to provide a preliminary sketch of the use of minerals and chemicals in medicines by apothecaries and physicians in Peru in the sixteenth and early seventeenth centuries. It does this in the context of the abundance of mineral resources available in the Central Andes and of the movement of people, books and equipment across the Atlantic. In doing so, it seeks to contribute to knowledge of Latin America’s role in the development of science and redress the neglect highlighted by Juan Pimental and Jorge Cañizares-Esguerra among others.[[7]](#footnote-7)

It is necessary to view the employment of minerals and chemicals in medicines in early colonial Peru against the backdrop of medical practice and political developments in Spain at the time. In late Renaissance Spain, medical practice was based on humoral beliefs derived from the writings and interpretations of Galen and Hippocrates**.[[8]](#footnote-8)**Humoral beliefs considered sickness to derive from an imbalance in the humours that could be redressed through diet, bleeding, and the application of medicines that acted as purgatives or emetics. Ill health was regarded as divine punishment for sin and thus required no further explanation. Humoral medicine was based on a natural philosophy that was elaborated through the study of classical texts. However, new approaches to medical practice, commonly associated with Theophrastus Bombastus von Hohenheim, known as Paracelsus (1493–1541), and Jan Baptist Van Helmont (1580–1644), were beginning to challenge this orthodoxy. The Paracelsians, as they came to be called, saw some illness as caused by external factors, which through observation and experiment could be identified and the ailment treated.[[9]](#footnote-9) For them the development of medical knowledge lay in understanding nature rather than in scholasticism. The methods they advocated might therefore be seen as challenging the existing natural philosophy based on Christian interpretations of classical texts, which had been undertaken largely by clerics or by scholars working for institutions allied to the Church. Such opposition to the natural philosophy of the time might even be regarded as an attack on the Catholic Church itself.[[10]](#footnote-10) This was especially so since the methods promoted by Paracelsians were associated with Lutherans, even though Paracelsus distanced himself from Luther and died a Catholic.[[11]](#footnote-11) In addition, the chemical processes they employed were often associated with magic and thereby seen as dangerously close to witchcraft.

For these reasons, some scholars argue that the Spanish state and Catholic Church with the support of the Inquisition opposed Paracelsianism and that the measures they employed delayed the development of chemical medicine in Spain.[[12]](#footnote-12) They point to the ban in 1558 by the Spanish Crown on the importation of foreign literature and the introduction of formal procedures for censoring books deemed to be heretical, followed by the prohibition on scholars in Spain studying at medical centres overseas in 1559.[[13]](#footnote-13)

Apart from using the Inquisition to maintain medical orthodoxy, the Spanish state regulated medical practice more than any other European country.[[14]](#footnote-14) It did this through the founding of chairs in universities for the teaching of medicine and through the establishment of medical boards, known as *protomedicatos* that licensed practitioners and inspected pharmacies and hospitals.[[15]](#footnote-15) The Spanish aimed to replicate the bureaucratic and regulatory framework that had been developed in Castile, in the New World. Hence, if Paracelsianism was opposed in Spain and a regulatory framework existed to support medical orthodoxy, there might be grounds for arguing that the development of chemical medicine was delayed not only in Spain, but also in Spanish America.

Yet this proposition overlooks several important issues, relating both to the nature of medicine in Spain and conditions in the Americas. First, considerable doubt exists about the impact of the Counter Reformation and Inquisition on the development of medicine, and indeed science generally, in Spain.[[16]](#footnote-16) While scholars often viewed these policies as having a detrimental effect, more recent scholarship argues that the bans on scholars studying abroad and on the circulation of medical texts considered to be heretical did not hinder the spread of new medical knowledge. They maintain that few Spaniards sought training overseas and the laws were often circumvented or ignored. At the same time, works by Paracelsus were not unknown. Controls on the production and circulation of literature, which only applied to Castile, proved ineffective in part because the book trade in Spain depended heavily on imports from other regions of Europe.[[17]](#footnote-17) Moreover, as will be shown below, knowledge of alchemical processes, including distillation, was so widespread that the Inquisition was powerless to impede the transfer of knowledge of chemical methods to the New World.

Second, while the use of minerals and chemical methods was central to those used by Paracelsians, recent research indicates that they were already employed quite widely in Spain, including by Galenists.[[18]](#footnote-18) In fact, Efraim Lev, Zohar Amar and Paula De Vos indicate that the medicinal use of some minerals dates back to ancient Egypt and classical times, even though they historically accounted for less than 10 percent of the medicinal substances used by physicians.[[19]](#footnote-19) This was despite the development of alchemy in ancient Egypt that generated an increased demand for minerals. Alchemists in the search for the Philosophers’ Stone focussed initially on the transformation of minerals containing mercury and sulphur using methods of distillation, calcination and sublimation. By the late thirteenth and early fourteenth centuries, these processes had produced the discoveries of alcohol and mineral acids, notably sulphuric acid (oil of vitriol) and nitric acid (*aqua fortis*).[[20]](#footnote-20) Distillation and mineral acid dissolution aimed to produce purer forms of waters or oils - ‘fifth essences’ or quintessences - that were seen to have healing properties.[[21]](#footnote-21) These processes often involved the use of mercury, sulphur and antimony, as well as spirits (vitriol, laudanum and tartar). Galenists used methods of distillation to produce simple waters and oils using botanical materials, but they generally refrained from employing alchemical methods using high heat believing that it destroyed the qualities of the substance being processed. However, Paula De Vos has shown through an analysis of the Arab treatise by Albucasis, *Liber Servitoris*, that Galenists were also using distillation and chemical methods using high heat in Córdoba in the eleventh century.[[22]](#footnote-22)

Initially the most renowned texts on alchemy produced in the thirteenth and fourteenth centuries were attributed to Arnold of Villanova and Ramón Llull. However, the alchemical methods described in these texts were widely known and Villanova and Llull are no longer considered their authors, who are now referred to as Pseudo-Villanova and Pseudo-Lull.[[23]](#footnote-23) Joseph Ziegler suggests that the attribution of the alchemical writings to Villanova took off around 1350.[[24]](#footnote-24) Although Villanova and Llull may not have been the authors of alchemical writings ascribed to them, their names are still used here since sources do not provide us with actual book titles. By the fifteenth century, the alchemical knowledge in the texts attributed to Villanova and Lull had spread beyond the Iberian Peninsula.[[25]](#footnote-25) Paracelsus was familiar with their works, showing a particular interest in the preparation of quintessences and in the work of Rupescissa, who first described the processing of antimony (*stibio* or *antimonio*).[[26]](#footnote-26) The extensive use of alchemical methods is also evident in Philip II’s well-known interest in distillation and his establishment of three distilleries, the first at Aranjuez in 1564.[[27]](#footnote-27) Hence, it is now argued that the chemical methods that developed in Spain were not introduced by Paracelsus and his followers, but were part of a long-established local alchemical tradition; what Paracelsus did was to popularise them in Europe.[[28]](#footnote-28)

On the other side of the Atlantic, several factors should have encouraged the use of minerals and chemicals and the development of chemical medicines at an early date. First, mountain building processes and volcanic activity have produced in the Central Andres one of the richest sources of minerals in the world. These include mercury, sulphur and antimony, which were central to alchemical processes in Europe. The Huancavelica district in Peru is the largest source of mercury in the western hemisphere,[[29]](#footnote-29) while the extensive deposits of silver in Peru and Bolivia are often accompanied by mercury, antimony, sulphur, lead, and arsenic; antimony is also found in small quantities on its own.[[30]](#footnote-30) Bolivia possesses about 20 percent of the world’s reserves of antimony, ranking third after China and Russia.[[31]](#footnote-31) There was therefore an abundance of minerals available for the development of chemical medicine. In addition, the encounter with the New World revealed new environments and cultures that often challenged old ideas, provoking new thinking and encouraging experimentation.

Finally, if a conservative intellectual environment existed in Spain that opposed the development of new approaches to medicine, this might have encouraged some medical practitioners to migrate to Spanish America, particularly to more remote geographical locations such as Peru, where they could practise more freely. Migration might be particularly attractive to medical practitioners of Jewish or Muslim heritage, known as *Conversos* and *Moriscos* respectively, who although they had converted to Christianity were particularly vulnerable to scrutiny by the Inquisition and with being charged with heresy. In Spain and Spanish America those who could not present certificates of *limpieza de sangre* (purity of blood) and legitimacy were not allowed to practice medicine.[[32]](#footnote-32) Neither were they legally permitted to migrate to the New World. However, in both cases the legislation was difficult to enforce and often circumvented.[[33]](#footnote-33)

 In the context of these debates, this article explores the use of minerals and the nature of chemical methods employed in Lima in the sixteenth and early seventeenth centuries. It does so through examining the availability of mineral resources in Peru, including pre-European knowledge of their use, through surveying the books and equipment used by physicians and apothecaries, and finally by examining prescriptions for medicines that were used to treat patients. It will show that medicines more commonly incorporated minerals in Lima than in Spain, but it will argue that their preparation and use at this time, including by Galenists, drew on Spain’s alchemical tradition and did not require the introduction of texts by Paracelsus and his followers.

***A New World of Minerals***

In theory the abundance of minerals in the Central Andes, particularly of mercury, sulphur and antimony that were central to alchemical processes, should have encouraged the early development of chemical medicines. At the beginning of the seventeenth century, the Jesuit and naturalist, Bernabé Cobo, compiled an extensive account of the characteristics and use of plants, animals and minerals found in the Andes. Cobo based his detailed descriptions of individual items on close personal observations and, because he knew both Quechua and Aymara, on interviews with native informants. He recorded that indigenous people were using some minerals for medicinal purposes and that several of their treatments dated back to pre-Spanish times.[[34]](#footnote-34)

Among the minerals being used for medicinal purposes at that time was an earth that he likened to Armenian bole (*bol arménico*) that the Indians called *tacu* in Aymara. He distinguished three varieties: a blood coloured earth that was used as a pigment by painters;[[35]](#footnote-35) an unspecified brown earth; and the most common, a yellow earth. Cobo recorded that the last was sold in the market place in the form of blocks and balls and, made into a powder, taken in *chicha* (maize beer) to cure dysentery.[[36]](#footnote-36) According to the Spanish physician and long-term resident in Peru, Antonio de Robles Cornejo, some earths that were being sold as *bol arménico* and causing many deaths.[[37]](#footnote-37) What type of earths these may have been is unknown, though it is worth noting that the use of comestible earths in Peru and Bolivia is thought to date back at least 2,500 years.[[38]](#footnote-38) *Haquimasci*, which Cobo likened to *piedra judaica* (Jews’ stone), was also used to cure dysentery and to prevent blood loss, especially from women who had just given birth; it was also employed to heal wounds and treat contagious diseases, in addition to being used as an anti-venom and anti-depressant.[[39]](#footnote-39) Another mineral used by indigenous peoples for medicinal purposes was *copaquira*, also known as *piedra lipes* (blue vitriol or copper sulphate), which was employed as an astringent and to treat toothache.[[40]](#footnote-40) They also used a copper-based green stone called *coravari* as an astringent and in the preparation of an eyewash.[[41]](#footnote-41) Cobo noted that indigenous people were familiar with other minerals but did not use them for medicinal purposes. Hence, he claimed that prior to the arrival of the Spanish indigenous people did not know how to extract *azogue* (mercury) from a rock they called *llimpi*, but did use vermillion (mercury sulphate or cinnabar), with which it was generally found, as a red pigment in paints, ink, and dyes.[[42]](#footnote-42) This pre-European use of vermillion as a colourant parallels its early use in other parts of the world.[[43]](#footnote-43)

***Medical Knowledge, Books and the Inquisition***

As noted above, Spain sought to maintain medical orthodoxy in part through the establishment of chairs in universities for teaching medicine. However, in Peru formal medical education was slow to become established. The University of San Marcos was founded in 1551 and some medical instruction started in 1569 with the arrival of the royal *protomédico*, Antonio Sánchez Renedo, who taught natural philosophy and astrology. However, despite various proposals to establish medical chairs that would enable the University to award medical degrees, due to the lack of funds and student interest, they did not materialise until 1634.[[44]](#footnote-44)

With limited educational opportunities available locally, in the sixteenth century licensed physicians and apothecaries often came from Spain. Nevertheless, many apothecaries learned their art primarily through on-the-job training.[[45]](#footnote-45) In these circumstances, medical texts and practical manuals were particularly important in guiding medical practice. However, most of the texts available in Lima were published in Latin, and observers noted that numerous errors were made since many medical practitioners had no knowledge of the language. This prompted the physician Antonio de Robles Cornejo to compile his ‘Examen de los simples medicinales’ in Spanish. This 700-page manuscript, sometimes regarded as the Peruvian equivalent of Francisco Hernández’s *Quatro Libros de la naturaleza y virtudes de plantas y animals* (1615) for Mexico, remains unpublished.[[46]](#footnote-46)

Robles Cornejo’s text, as its title suggests, was a list of simples and their characteristics. It is arranged in seven books according to the nature of the medicinal product: roots, wood and bark, leaves and shoots, flowers, seeds and fruits, gums and resins, animals and minerals. It was written for residents in the New World who were unfamiliar with its natural history. He does not include formulas or describe how to prepare medicines. Instead he describes each medicinal product in turn and notes what other writers have said about it, generally recognising the authority of ‘los antiguos’ especially Dioscorides, but adding his own observations, including those from other parts of the Americas. In its use of the vernacular and the inclusion of a prologue on the characteristic of a good apothecary, according to Paula De Vos’s classification of pharmacopeia, it can be categorised as ‘pedagogical’.[[47]](#footnote-47)

Even where medical practitioners could read Latin, medical texts and manuals were in short supply, since few were imported or printed locally. At first, the Crown banned the establishment of a printing press in Lima fearing that it might facilitate the spread of heretical literature. It was not until 1580, therefore, that an Italian printer, Antonio Ricardo, having set up a printing press in Mexico City, was encouraged to move to Lima and four years later received permission to establish a press under the supervision of the Jesuits at the College of San Pablo.[[48]](#footnote-48)

Any text printed in Lima had to be licensed by the viceroy or *audiencia*; ecclesiastical authors in addition had to obtain permission from their superiors. These bureaucratic obstacles were probably less significant barriers to publication than the practical difficulties that authors and printers faced. These included the cost of printing, shortages of paper, and poor quality typefaces that generally resulted in physically inferior books. These limitations meant that in Lima relatively few texts were produced, print runs were short, and authors commonly sought publication in Europe.[[49]](#footnote-49) Those books published locally were predominantly theological, though legal texts also figured significantly.[[50]](#footnote-50) Pedro Guibovich has calculated that only seven percent of over 1,000 books published in Lima before 1700 were in the field of applied sciences, and of those only ten were on medicine.[[51]](#footnote-51) The first medical text to be published in Lima was Matías de Porres’s book, *Breve advertencies para beber frío con nieve*, published in 1621.[[52]](#footnote-52)

With few books being printed locally, the majority of those circulating in Lima either accompanied their immigrant owners to Peru or were brought by merchants for booksellers on commission or for sale on their own account. In theory the Inquisition inspected all books imported, whether they were carried by individuals or merchants, when they were loaded onto ships in Seville and again when they arrived in Callao. In Lima, printing presses, bookshops and public and private libraries, including the extensive ones owned by the religious orders, were all subject to inspection.[[53]](#footnote-53) The focus of the Inquisition was on books of a heretical nature, which sometimes included those on alchemy and astrology, especially judicial astrology where practices were often associated with magic and witchcraft.[[54]](#footnote-54)

The inquisitors’ task was informed by the Indexes of prohibited books drawn up by the Inquisition at intervals after 1559. From 1583 books attributed to Arnold of Villanova and Paracelsus were lightly expurgated, though not totally banned, unlike those of the Paracelsian Conrad Gesner.[[55]](#footnote-55) In fact, investigations by inquisitors into Paracelsus focussed more on his theological allegiance than his science.[[56]](#footnote-56) Similarly, those scrutinising the writings of Ramón Llull were more concerned with his potentially heretical beliefs than with the alchemical writings no longer attributed to him.[[57]](#footnote-57) López Pérez suggest that works on alchemy may have escaped censure because, with the exception of its links to astrology, alchemy was not regarded as heretical but rather viewed an integral part of existing natural philosophy.[[58]](#footnote-58) Nevertheless, authors might self-censure to ensure that their works did not attract Inquisitorial attention or might circulate their writings in manuscript form.[[59]](#footnote-59) Pedro Guibovich has argued that Juan Gerónimo Navarro’s *Sangrar y purgar en días de convención*, published in Lima in 1645, which employed empirical methods to challenge prevailing ideas about bloodletting on particular days, escaped censure because he was part of Lima’s small elite that included the Jesuits who scrutinised his work.[[60]](#footnote-60)

In general, the inquisitorial process was most intense in the first part of the seventeenth century,[[61]](#footnote-61) but, as in Spain, it was imperfect. Books might be hidden in cargoes of other merchandise or bound in with other works, while often there were insufficient personnel to conduct inspections, which were often cursory.[[62]](#footnote-62) In 1583 Inquisitor Ulloa was concerned that cargoes destined for Lima were being unloaded in the ports of Guayaquil, Manta, and Paita where there were no commissioners to carry out inspections.[[63]](#footnote-63) Even where books were inspected, it has been argued for Mexico that examinations were often conducted by theologians with little knowledge of science and medicine, so that unless books were obviously related to magic or witchcraft banned items might easily slip through the inquisitorial net.[[64]](#footnote-64) Among the belongings of one Pedro Durango de Espinosa, a deceased Spanish bookseller who became domiciled in Lima, were two copies of the Koran![[65]](#footnote-65) One shipment of books to two booksellers in Cuzco, Rodrigo de Fajardo and Bartolomé Arias contained a text entitled ‘fisonomía natural’.[[66]](#footnote-66) This might be *Libro de phisonomia natural y varios secretos de naturaleza* by Jerónimo Cortés, a scientist and astrologist, which was published in Valencia in 1598. Although this volume was not censored, a popular almanac by the same author entitled *Lunario y pronostico perpetuo*, that was first published in Valencia in 1594, was expurgated in 1632.[[67]](#footnote-67)

Good evidence exists for the texts that were used by medical practitioners in early colonial Lima. The medical titles included in cargo lists, in testaments and pharmacies were overwhelmingly traditional texts, such as those by Galen, Hippocrates, Dioscorides, Mesuë, or their interpreters.[[68]](#footnote-68) In the field of surgery Juan Fragoso’s *Chirugía universal* (1581) dominated and in pharmacy Bernardino de Laredo’s *Modus faciendi* (1527).[[69]](#footnote-69) Most hospitals and practitioners possessed only a small number of texts, although occasionally eminent physicians might own or trade larger numbers of books.[[70]](#footnote-70) Table 1 indicates the typical range of books found in these sources. Particularly instructive is the list of eleven books imported from Spain for the establishment of the first pharmacy in the Hospital of Santa Ana in 1551, which pre-dated policies emanating from the Council of Trent.[[71]](#footnote-71) Although there was no copy of Galen’s *De Simplicibus*, most were written in the Galenic tradition, including various Arab treatises based on his works, such as those by Avicenna, Mesuë, and Serapion.[[72]](#footnote-72) Apothecary exams in Lima required the candidate to read a text in Latin by Mesuë.[[73]](#footnote-73) Other texts destined for the hospital included Luis Lobera Ávila’s *Banquete de los nobles caballeros* (Augsburg, 1530). Lobera de Ávila was *protomedico* to Charles I and his text focussed on ailments commonly found among the privileged, but he had a deep knowledge of alchemy and made use of mercury (solimán) and antimony in various preparations.[[74]](#footnote-74) Another book on pharmacy shipped for the hospital was Bernardino de Laredo’s *Modus faciendi* (Seville, 1527). This followed the Galenic-Arab tradition but incorporated his own experiences and in citing Albucasis reveals his familiarity with methods of distillation; it was the first to be written in the Spanish language.[[75]](#footnote-75) On surgery, there was a volume by the Italian Giovanni da Vigo (Juan de Vigo), possibly *Practica in arte chirurgica copiosa* (Rome, 1514). He was noted for his powders of red precipitate of mercury which were used to treat skin diseases and syphilitic ulcers.[[76]](#footnote-76) Finally, however, was the inclusion of ‘un arnaldo’, which probably referred to a Pseudo-Villanova text. Works attributed to him, whose titles were unspecified, were also ordered for the pharmacy of Diego and Juan Tineo in 1555 and were owned by two other pharmacistsin Lima, Juan Sánchez[[77]](#footnote-77) and Bartolomé Díaz Cabeza de Vaca.[[78]](#footnote-78) In fact, the last appears to have been selling medical books, since in his testament he recorded that one Licenciado Alvaro Núñez, possibly a physician, owed him for five large copies of Galen and one “Arnaldo de Villanova.”

Despite the predominance of Galenic texts, there is some evidence of books associated with more experimental methods, though the extent to which they were associated with the preparation of chemical medicines remains unknown. They include a work entitled‘esperimentos médicos’ which was imported by the booksellers of Cuzco, Rodrigo de Fajardo and Bartolomé Arias.[[79]](#footnote-79) This was probably Jerónimo Soriano’s,*Libro de experimentos médicos, fáciles y verdaderos* (Zaragoza, 1598). It was a collection of ‘experiments’ or remedies assembled for use by the public at large that included treatments that had been proposed by eminent medical experts to which the author suggested modifications that he had gleaned from his own experience.[[80]](#footnote-80) From a different perspective, but potentially relevant to the development of chemical medicines, there is evidence for the possession of texts dealing with minerals, no doubt stimulated by their abundance in Peru.

One book found in many cargoes was Gaspar de Morales *Libro de las virtudes y propiedades maravillosas de las piedras preciosas* (1605). In fact, in 1606 a bookseller in Lima, one Juan de Sarria, certified that he had received nineteen copies of this book from Spain.[[81]](#footnote-81) In this text the Spanish apothecary links the curative powers of precious stones to celestial bodies so that it was later banned by the Inquisition due to its association with astrology.[[82]](#footnote-82)

The limited evidence for ‘experimental’ texts does not necessarily mean that chemical methods were not known or employed, or that Galenists did not employ experimental methods. It is clear that works attributed to Arnold of Villanova circulated widely and that alchemical methods were often described in what might be regarded as orthodox texts. For example, Juan Fragoso’s discussion of distillation in the *Antidotario*, contained in his *Chirugia universal*, drew on followers of Pseudo-Llull and referred to the writings of Paracelsus and of the Paracelsian Conrad Gesner.[[83]](#footnote-83) Gesner’s works drew on the recipes attributed to Villanova, Repuscissa and Llull, but were banned by the Inquisition. Moreover, the ownership of texts is an imperfect guide to the *extent* of medical knowledge. Books might be circulated between practitioners. The College of San Pablo had a library of some 4,000 volumes that contained a substantial collection of medical texts for use in its renowned pharmacy, many brought by Jesuit priests from diverse parts of Europe.[[84]](#footnote-84) These texts were not only used by the Jesuits but were loaned to the general public.[[85]](#footnote-85) Hence, the physician Juan Gerónimo Navarro in his testament in 1644 noted that he had eighty books in his possession that he had borrowed from the College.[[86]](#footnote-86) Printed books were not the only form in which medical knowledge circulated; information could be passed by word of mouth, while handwritten treatises and recipes probably played a significant role in the dissemination of knowledge of pharmacy methods. Unfortunately, few of these handwritten texts have survived.

***Migrating Medical Practitioners***

Another way in which new knowledge was disseminated was through physicians and apothecaries migrating from Spain. In Spain the actions of the Inquisition served to create a conservative intellectual climate which, even if it did not result in the imprisonment of offenders or the confiscation of goods, may have encouraged some medical practitioners to migrate to Spanish America where they could practice more freely. One clear example, though, for Cartagena in present-day Colombia rather than Lima, is Pedro López de León who arrived in the city in 1590 as surgeon to its hospital, garrison and the galleons that visited the port.[[87]](#footnote-87) López de León spent more than twenty-five years in Cartagena and published a notable manual entitled *Práctica y teórica de las apostemas en general y particular. Questión y prácticas de cirugía, de heridas, llagas y otras cosas nuevos y particulares* (1628). López de León was a student of the surgeon, Bartolomé Hidalgo de Agüero (1530–1597) at the Hospital del Cardenal in Seville, who as a result of experimentation had come to oppose the traditional treatment of trepanation and periosteotomy in favour of drying and closing wounds to prevent contamination.[[88]](#footnote-88) A copy of Hidalgo de Agüero’s *Thesoro de la verdadera cirugía y via particular contra la común* (Seville, 1604) was kept in the library of the College of San Pablo and was commonly used by surgeons in Peru.[[89]](#footnote-89)

Even though a tribunal of the Inquisition was established in Lima in 1570, in theory the greater distance of Peru from the metropolis should have made it an attractive destination for medical practitioners seeking to escape the scrutiny of the Inquisition.[[90]](#footnote-90) *Conversos* were particularly vulnerable to being charged with heresy, as were those who employed chemical methods who might be accused of witchcraft. However, from the limited evidence available, it seems that the licenced medical practitioners that migrated to Peru generally had an orthodox training at a Spanish university, very often at the University of Salamanca. One experimental physician and surgeon who did arrive was Pedro Gago de Vadillo. He worked in hospitals in Huamanga and the mining district of Castrovirreyna, and ultimately in the Hospital of San Andrés in Lima. Although not a student of Hidalgo de Agüero, he similarly advocated the drying of wounds, a procedure that challenged traditional Galenic methods that used unguents and kept wounds open.[[91]](#footnote-91) In his book, *Discurso de la verdadera cirujía y discursos de censura de ambas vías* (1632), he described various cures he had undertaken in the Hospital of San Andrés. Prior to 1640 only two physicians and two surgeons were brought before the Inquisition in Lima and it was for judaizing or promoting heretical beliefs rather than for unorthodox medical practices.[[92]](#footnote-92) One was a surgeon from Flanders, Alexandre Pérez. When the Inquisition seized his possessions in 1612, his library contained a mixture of traditional and “modern” medical texts, including books on surgery by Doctor León,[[93]](#footnote-93) Doctor Hidalgo,[[94]](#footnote-94) Doctor Francisco Díaz,[[95]](#footnote-95) and Doctor Murillo.[[96]](#footnote-96) Even though there may be little evidence of “progressive” medical practitioners migrating to Peru, this does not mean that all those who arrived were ignorant of new methods. Antonio de Robles Cornejo in his Examen de los simples medicinales often refers to what he called “los modernos” and in discussing minerals he mentions Paracelsus specifically, though generally with the aim of contesting their methods.[[97]](#footnote-97) Neither does the limited evidence for Paracelsian texts mean that chemical methods were not employed. In fact, inventories of the equipment used by apothecaries suggests the opposite.

***Distillation and Chemical Methods***

It is clear from the equipment found in pharmacies that apothecaries extensively employed distillation techniques. The equipment shipped for the establishment of the hospital of Santa Ana in 1551 suggests the type and range of apparatus employed.[[98]](#footnote-98) The shipment consisted of two *alquitaras* (metal stills) and two tin-plated boilers with four ladles and two skimmers. Other items included a measuring bowl, a balance, various weights and measures, brass funnels, golden spatulas, sieves, baskets, syrup jars and numerous jars, pots, vases and boxes of different sizes. *Alquitaras* were essential for the functioning of a hospital pharmacy and as such were regularly repaired or replaced.[[99]](#footnote-99) Distillation methods were not confined to hospitals. The inventory of pharmacy of the prominent pharmacist, Francisco de Alva, drawn up in 1576 listed four *alquitaras*, six mortars, including one each of lead and marble, three boiling pans, three ladles, two funnels, a press, and eight spatulas, of which three were of silver.[[100]](#footnote-100) Similarly, in 1608 the private *botica* belonging to Bartolomé Díaz Cabeza de Vaca possessed an unspecified number of *alquitaras*, along with mortars, spatulas, sieves, ladles, a variety of boxes and phials, an oven and other essential tools.[[101]](#footnote-101) The range of equipment found in pharmacies in Lima was similar to that found in *boticas* in Spain.[[102]](#footnote-102)

Significantly, these stills were *alquitaras* rather than *alambiques*. In 1589 the *Protomédico* in Madrid, Francisco de Valles, ordered that all distilled waters that were to be drunk, including syrups, were to be produced using a glass *alambique* in a *bain marie* rather than a copper *alquitara*.[[103]](#footnote-103) This view was also held by Antonio de Robles Cornejo, who advised *boticarios* in Peru that the best essences were distilled using a double *bain marie*.[[104]](#footnote-104) *Alambiques* were said to produce better quality extracts, while *alquitaras* were believed to result in contamination by verdigris. However, not everyone agreed. *Boticarios* in Madrid argued that distillation using a *bain marie* was suitable for delicate plants, such as violets, but not for extracting the essences of other plants which required more heat.[[105]](#footnote-105) Others claimed that the waters (*aguas*) produced in a *bain marie* were not as effective for as long and that glass was more expensive than copper, a factor that may have been of greater consideration in Peru than in Spain. The belief that metal stills resulted in the contamination of distilled waters ultimately prevailed and the requirement to use glass *alambiques* for waters that were to be drunk was incorporated into legislation in Spain.[[106]](#footnote-106) However, there is no evidence that *alambiques* were used in Lima at this time, whereas *alquitaras* were widely employed.[[107]](#footnote-107) A later inventory of a pharmacy in Potosí in 1678 records that, even though it contained a number of glass utensils, the stills were *alquitaras* rather than *alambiques*.[[108]](#footnote-108) The extensive use of distillation equipment does not necessarily mean, however, that it was used for the processing of minerals or the production of mineral salts.

The construction of a private pharmacy shop in Lima that was commissioned from Seville by one Diego de Tineo in 1555 also reflects an alchemical tradition.[[109]](#footnote-109) This pharmacy, costing some 5,000 pesos was designed to be exceptionally well-appointed with its installations fashioned by skilled artisans. The ceiling, measuring twenty-two feet square, was to be painted with golden stars and a large sun with golden rays. Tineo specified that the boxes for medicines were to be finely decorated with gilt and the labels (*medallas*) were to be paintings that depicted notable historical figures. One of these was to portray the legend known as ‘Virgil in a basket’. In this legend, Virgil, being enamoured of Nero’s daughter, allowed himself to be lowered from a window in a basket, but was suspended by her halfway thereby exposing him to public ridicule.[[110]](#footnote-110) In revenge for his humiliation, Virgil employed magic to extinguish the fires of Rome that could only be rekindled by holding a torch or candle to the woman’s private parts. This popular legend was applied to many historical figures, including Hippocrates, and became attached to Virgil in the thirteenth century because of his association with magic and divination. Virgil was regarded as an authority by astrologers and alchemists and was even thought to possess the secret of the Philosophers' Stone.[[111]](#footnote-111)

***Minerals and Chemicals in Pharmacies and Prescriptions***

While evidence from the books, equipment, and medical practitioners that existed in Peru in the sixteenth and early seventeenth centuries suggests the type of medicine practised, more direct testimony follows from the presence of minerals and chemicals stored in pharmacies and used in medicaments.

The use of minerals in medicines dated back to ancient Egypt and classical times, but it was limited. A checklist for apothecaries and pharmacy inspectors drawn up by the Spanish *protomedico general*, Andés Zamudio de Alfaro, in the 1590s contained over 400 items of which only eleven products were minerals. Although the list included antimony, it omitted sulphur, mercury and mineral salts.[[112]](#footnote-112) (See Table 2) A detailed examination of pharmacies in Spain in the sixteenth century is beyond the scope of this study, but inventories of pharmacies in Seville mirror the *protomedico’s* list in their inclusion of relatively few minerals.[[113]](#footnote-113) As for Peru, Table 2 indicates that despite the local abundance of minerals not all minerals were found in all pharmacies, whether they be in Lima, Cuzco or Potosí.

Galenic alchemists and Paracelsians alike were especially interested in mercury, sulphur and antimony, and in the preparation of mineral salts and spirits.[[114]](#footnote-114) However, a key difference between them was that the former used minerals in treatments that were applied *externally*, generally in ointments and plasters used to treat skin infections and wounds; Paracelsians advocated their inclusion in medicines that were taken *internally*. Whereas, some medicines containing minerals and chemicals had been used internally prior to Paracelsus’s writings, it was the *extent* to which he and his followers promoted their internal use that distinguished them.[[115]](#footnote-115)

Antimony was probably used in *unguento de plomo* (lead ointment),[[116]](#footnote-116) but it was also a strong purgative.[[117]](#footnote-117) Hence, Robles Cornejo writing in Peru at the beginning of the seventeenth century observed that antimony was not only being used externally, but taken internally as a purgative, with perhaps 10 or 12, or even 15 grains being used in a single dose, noting that the Italian physician-botanist Mattioli had judged this quantity to be reckless.[[118]](#footnote-118) It was also used to treat melancholy.[[119]](#footnote-119) Other hints at the use of antimony are to be found in Robles Cornejo’s observation that apothecarieswere not following recipes precisely, but adding ingredients such as *estibio*, scammony, and spurge (*lechetrezna*).[[120]](#footnote-120) According to him, *estibio* was the crude mineral and *antimonio*, also referred to as alcohol, was the name given to the product when it was employed in medical treatments.[[121]](#footnote-121) The latter was probably antimony sulphide.[[122]](#footnote-122) Despite the local abundance of antimony, small quantities were imported by the apothecaries Juan and Pedro de Bilbao, and when the latter died in 1634 the inventory of his pharmacy recorded that it contained 8.5 pounds of antimony and 2.75 pounds of *estibio*.[[123]](#footnote-123) The apothecariesFrancisco Martín Reyna and Gerónimo Pujadas also imported about a dozen pounds of antimony with each fleet. The latter regularly imported minerals in larger quantities than otherapothecaries. Two cargoes consigned to him in 1618 and 1619 together contained 37 pounds of antimony, as well as sulphur and arsenic sulphide (*oropimente* and *rejalgar*).[[124]](#footnote-124)

Another toxic mineral acid promoted by Paracelsus was *solimán* (mercuric chloride). In Lima this was quite widely employed in the form of unctions to treat syphilis, which in the Hospital of Santa Ana were often applied by African slaves.[[125]](#footnote-125) The Hospital of Santa Ana acquired *solimán* mainly from retail shops, though it is not clear whether it had been imported or obtained locally. Related to mercury but also used externally were *polvos de Juanes* or *Vigo* containing red precipitate of mercury. These powders had been formulated by the Italian surgeon Giovanni da Vigo (ca. 1450-1525) as an astringent for the treatment of wounds and they were commonly used in Spain.[[126]](#footnote-126) Despite their high cost, the *botica* of the Hospital of Santa Ana acquired *polvos de juanes* in large quantities when it was established in 1551.[[127]](#footnote-127)

Arsenic sulphide (*oropimente*) and red arsenic sulphide (*rejalgar*) were imported more frequently. These were toxic minerals used in medicines that were applied externally, including in an eyewash called *agua de Lanfranc*.[[128]](#footnote-128) These mineral products and *solimán* were particularly common among the imports of three private *boticarios* – Francisco Martín Reyna, Gerónimo Pujadas, and Francisco Crespo – where they accounted for about 10 percent of the minerals they imported by value. The proportion is surprisingly high given that these minerals were widely available locally. In fact they were so readily available that in 1551 the city council of Lima limited the sale of “solimán or rejalgar or oropimente or any other product that might be fatal” to Spaniards over 15 years old, banning its sale to slaves because some had died from using it.[[129]](#footnote-129) Evidence from legal cases resulting from the sale of slaves with undeclared illnesses also reveals that slave owners were regularly using “agua de solimán” to treat those slaves suffering from syphilis[[130]](#footnote-130) and employing “piedra lipes” (copper sulphate) to wash their lower parts.[[131]](#footnote-131) In 1634, the *protomedico*, Doctor Juan de Vega, complained that everyone was selling *solimán*, and that the authorities should make it a monopoly and use the proceeds to support the university.[[132]](#footnote-132)

Another mineral product employed in medicines that were taken internally was copper sulphate (*caparrosa*),which Robles Cornejo observed was abundant in the kingdom of Peru especially in the valleys of Chayanta, Guantapita and Quilaquila in Charcas (today Bolivia). He suggested that a scruple taken in a drink safeguarded people in an epidemic and a dragma (three scruples) in fennel water helped against poisoning and killed fungus.[[133]](#footnote-133) Clearly then, some were experimenting with minerals and mineral acids and some minerals were being used in medicines taken internally. However, despite these observations on the widespread use of toxic minerals, which probably attracted attention due to their potentially harmful effects, this study has found only a small proportion of prescriptions actually using them.

It is clear from an analysis of about 30,000 medicines listed in sixteen claims by pharmacists against elite persons for medicines they had dispensed, and of about 2,000 medicines contained in two other claims for medicines supplied for the treatment of African slaves,[[134]](#footnote-134) that minerals were employed most commonly in ointments and plasters. These were normally used to treat of ailments of the skin, such as scabies, and less commonly for venereal disease and muscle strain.[[135]](#footnote-135) Others were used as astringents to dry, clean, and heal wounds and ulcers, or to harden and smooth the skin.[[136]](#footnote-136) Even though minerals were used most commonly in these medicines, these ointments accounted for only 15 to 20 percent of the total number. These are very rough estimates that do not take account of the quantity of ointments prepared or the illnesses that were being treated that would have required different medicines and doses, but they do suggest that ointments containing minerals represented a relatively small proportion of the total.

The minerals that were most commonly utilised were *alumbre* (aluminium potassium sulphate), *cardenillo* (verdigris or basic copper acetate), *albayalde* (lead carbonate or white lead) and *almártaga* (lead oxide - *litargirio*). The main ointments containing a mineral were white ointment (*blanco*) made with lead carbonate (*albayalde*), *egipciaco* prepared from an oximel of copper, honey, sharp vinegar, and *cardenillo*[[137]](#footnote-137) and the more complex Condesa ointment composed of oil and berries of myrtle, yellow wax, galls, cypress nuts, pomegranate rind, seeds of senna and plantain, mastic and *alumbre*.[[138]](#footnote-138)

Plasters accounted for only about five percent of all medicines prescribed and of those less than ten percent contained a mineral. The three most common plasters were *diaquilón*, which contained litharge and was used as an emollient and to treat tumours, *emplasto confortativo* (containing litharge and *bol arménico*) employed to heal fractures and wounds, and *emplasto geminis* which contained *albayalde* and rose oil and was also used to treat wounds.[[139]](#footnote-139) These particular types of plaster were applied more commonly in the treatment of African slaves.

Meanwhile, the medicines containing minerals that were prescribed for *internal* consumption were generally small quantities of ground precious and semi-precious stones, which had not been produced by distillation but formed part of complex powders or electuaries, such as *confección jacint* and *diamargaritón*.[[140]](#footnote-140) Even though the majority of medicines containing minerals were therefore applied externally, they appear to have been employed more extensively in Lima than in Mexico where chemical medicines did not appear until the late seventeenth century at the earliest and where the minerals used were primarily precious and semi-precious stones.[[141]](#footnote-141) Minerals also figured more prominently in pharmacies in Peru than in Seville at this time, which did not commonly stock mercury.[[142]](#footnote-142)

**Conclusion**

Despite the abundant mineral resources in Peru, physicians and apothecaries there made only marginally more use of minerals than did medical practitioners in other regions, such as Spain and Mexico. Nevertheless, the books and equipment that they used indicate that medical practitioners in Lima were familiar with alchemical methods and of the use of minerals. However, the absence of evidence for the extensive use of mineral salts suggests that distillation methods were being used primarily to process botanical materials. Even where minerals were used, they were largely applied externally in ointments and plasters. Although the Inquisition was active in scrutinising medical texts and practices for heretical beliefs in Peru as well as Spain, it seems doubtful that the material absence of Paracelsian writings and of evidence for the extensive use of chemical medicines can be attributed to the Inquisition's effectiveness. Richard Palmer has noted that Paracelsianism only began to emerge in the late sixteenth century in Europe and that chemical drugs only became widely available in the early seventeenth century.[[143]](#footnote-143) Even then, he argues, they added to rather than replaced traditional remedies.[[144]](#footnote-144) In Spain, the delay appears to have been longer due to its strong alchemical tradition, which meant that the new chemical methods may not have appeared altogether novel and the philosophical distinction between Paracelsianism and Galenism not entirely obvious.[[145]](#footnote-145) In any case, apothecaries in Lima appear to have been less concerned with challenging the philosophy underlying the methods they used and more focused on the practical task of preparing medicines in the face of shortages of imported *materia medica* on which medical practice continued to depend. From the equipment found in hospitals and pharmacies in Lima at this time it is clear that alchemical methods were widely used, while the books and manuals that physicians and apothecaries possessed and the types of medicines they prepared suggest that they were working within a Galenic framework. This parallels Paula De Vos’s findings for colonial Mexico, where she sees the alchemical tradition prevailing in the early colonial period and the wider use of chemical medical texts, chemical medicines and specialised chemical equipment only emerging in the late seventeenth century.[[146]](#footnote-146) Later inventories of pharmacies and the libraries of medical practitioners in Lima suggest that the development of chemical methods similarly occurred at a late date in Peru.[[147]](#footnote-147)

Acknowledgements

The author would like to thank Paula De Vos for her helpful comments on an earlier draft of this paper. The views expressed here are those of the author.

Table 1 Books associated with pharmacy in Lima in the sixteenth century.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Author recorded | Hospital of Santa Ana 15511 | Pharmacy of Diego and Juan Tineo 15552 | Juan Sánchez, migrating apothecary, 15913 | Shipped to Lima by Sevillian apothecary Francisco Marroquín 15984 | Date | Language |
| Dioscorides, Pedanius |  | x | x | x | Roman | Greek and translations |
| Mesüe, John | x | x | x | x | Medieval islamic | Arabic and translations |
| Avicenna, Ibn Sina |  | x |  |  | Medieval islamic | Arabic and translations |
| Serapion, Juan  | x | x | x |  | Medieval islamic | Arabic and translations |
| Villanova, Arnold de | x | x | x |  | Medieval Europe | Latin |
| Pandecta (Silvaticus Matthaeus) | x |  |  |  | 1317 | Latin |
| Guido de Cauliaco | x | x | x |  | 1363 | Latin |
| Anglicus, Bartolomé |  |  | x |  | 1472 | Latin |
| Senio, Bernardo de |  |  |  | x | 1490 | Latin |
| Ketham, Johann von |  |  | x |  | 1491 | Latin |
| Vocabulario de Antonio | x |  |  |  | 1492 | Latin/Castilian |
| Luminario mayor (Mesüe – Giovanni Giacomo Manlio) | x |  |  |  | 1496 | Latin |
| Vigo, Juan de | x |  |  |  | 1514 | Latin  |
| Sepúlveda, Fernando de |  | x |  |  | 1523 | Latin |
| Laredo, Bernardino | x | x | x |  | 1527 | Castilian |
| Lobera de Avila, Luis | x |  |  |  | 1530 | Castilian |
| Musa Brasavola, Antonio |  | x | x | x | 1537 | Latin |
| Chaves, Jeronimo de |  |  | x |  | 1548 | Castilian |
| Aguilera, Antonio de |  |  | x |  | 1569 | Castilian |
| Fragoso, Juan |  |  |  | x | 1572 | Castilian |
| Susio, Giovanni Battista |  |  |  | x | 1576 | Italian |
| Jubera, Alfonso |  |  | x |  | 1578 | Castilian |
| Tovar, Simón de |  |  |  | x | 1586 | Latin |
| Acosta, José de |  |  | x | x | 1590 | Castilian |

1 AGNP Protocolos 63 Diego Gutiérrez fols. 177v.-178 Quenta de la botica 20 Oct. 1551.

2 JCB Mss codex Sp 136 fols. 861-868 Francisco Martínez y compañía obligación - Diego de Tineo y consortes 1555.

3 AGI Contratación 1097 N5 fol. 197 Registro de Juan Sánchez 1591.

4AGI Contratación 1127 N2: 94 Registro de Francisco Marroquín 1598.

Table 2 Minerals and chemicals in pharmacies in Spain and Peru

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Spanish name | Andrés Zamudio de Alfaro, Spain,1590s1 | Hospital of Santa Ana, Lima, 15512 | Hospital of Santa Ana, Lima, 16063 | Diego de Tineo pharmacy, Lima, 15554 | Francisco de Alva pharmacy, Lima, 15765 | Bartolomé Díaz Cabeza de Vaca pharmacy, 16086 | Pedro de Bilbao pharmacy Lima, 16367 | Fernando de Cartagena pharmacy, Cuzco, 16188 | Pharmacy of Juan de Salazar, Potosí, 16789 | English name |
| *Metals and minerals* |  |  |  |  |  |  |  |  |  |  |
| Acero quemado [preparado] |  |  |  |  | X |  |  |  | X | Steel |
| Albayalde | X | X |  | X | X | X |  | X | X | White lead, lead carbonate |
| Alhadida |  | X |  |  |  |  |  |  |  | Burnt copper |
| Almártaga |  |  |  |  | X |  |  | X | X | Litharge, lead oxide |
| Alquitrán |  |  |  |  |  | X |  | X |  | Tar, pitch |
| Alumbre  |  | X |  | X | X |  |  | X | X | Alum, potassium aluminium sulphate |
| Alumbre de pluma |  |  |  | X | X |  |  |  |  | Alum in the form of filaments |
| Antimonio |  |  |  | X |  |  | X |  | X | Antimony |
| Arsénico |  | X |  |  |  |  |  |  |  | Arsenic |
| Atutía preparada | X | X |  |  | X | X |  | X | X | Tutty, zinc oxide, chimney soot from smelting of a mineral |
| Atutía [alejandrina] |  |  |  |  |  |  |  | X |  | Tutty, zinc oxide, chimney soot from smelting of a mineral |
| Azarcón |  |  |  |  | X |  |  | X | X | Lead oxide |
| Azogue |  |  |  |  |  | X |  | X | X | Mercury |
| Azufre |  |  |  | X |  | X |  |  |  | Sulphur |
| Azufre amarillo y verde |  | X |  |  |  |  |  |  |  | Yellow and green sulphur |
| Bol arménico |  | X |  | X |  |  |  | X |  | Armenian bole, aluminium silicate (coloured with ferrous oxide to give red earth) |
| Bol arménico oriental preparado |  |  |  |  | X | X | X | X | Armenian bole from the Levant |
| Caparrosa de castilla [calcinada] |  |  |  | X |  | X |  |  | X | Copper sulphate, vitriol from Castile |
| Cardenillo | X | X |  | X |  |  |  |  | X | Verdigris, acetate of copper |
| Escoria ferri | X |  |  |  | X |  |  |  |  | Iron slag |
| Espodio | X |  | X | X | X | X |  | X |  | Mineral ash |
| Espodio preparado |  |  |  |  |  |  |  | X |  | Processed mineral ash |
| Estibio de matriolo | X |  |  |  |  |  | X |  | X | Antimony |
| Estibio preparado | X |  |  |  |  | X |  | X |  | Processed antimony |
| Lapis hematicus preparado |  |  |  |  |  | X |  |  | X | Bloodstone |
| Lapis judaicus |  |  |  | X |  | X |  |  | X | Jews' stone |
| Limadura de cascitis | X |  |  |  |  |  |  |  |  | Filings of copper sulphate or oxide |
| Litargirio | X |  |  | X |  |  |  |  |  | Litharge, almartaga, lead oxide |
| Litium |  |  |  | X |  |  |  |  |  | Lithium |
| Minio |  |  |  | X |  | X |  | X |  | Minium, red lead oxide |
| Mumia |  |  |  | X | X | X |  | X | X | Mummy |
| Oropimiento | X | X |  |  | X | X |  | X | X | Orpiment, sulphide of arsenic |
| Panes de oro |  |  |  | X |  |  |  |  |  | Gold leaf |
| Pez de ávila |  |  |  |  |  |  |  | X | X | Pitch from Avila |
| Piedra lipes |  |  |  |  |  | X |  | X | X | Copper sulphate |
| Plomo quemado [preparado]] | X |  |  |  |  | X |  |  |  | Burnt lead |
| Polvos de juanes [de Vigo] | X | X |  | X |  | X | X | X |  X | Red precipitate of mercury |
| Rejalgar  |  |  |  | X |  | X |  |  |  X | Realgar, arsenic sulphide |
| Sal gema [sar jema] |  | X |  | X |  |  |  |  |  | Halite |
| Solimán crudo |  | X |  | X |  |  |  |  | X | Crude mercury chloride |
| Solimán labrado |  | X |  |  |  |  |  |  |  | Processed mercury chloride |
| Vermellon |  |  |  | X |  | X | X |  | X | Cinnabar |
| Number of products | 12 | 13 | 1 | 20 | 12 | 19 | 5 | 19 | 22 |  |
| *Chemicals* |  |  |  |  |  |  |  |  |  |  |
| Alcohol |  |  |  |  |  | X |  | X |  | Alcohol |
| Atincar fino |  | X |  | X |  |  |  | X | X | Refined tincal, or borax of commerce |
| Sal armoniaco |  | X |  |  |  |  |  |  |  | Salt of ammonium chloride |
| Sali[s]tre |  | X |  |  |  |  |  |  |  | Saltpetre |
| Vitriol |  | X |  |  |  | X |  | X |  | Vitriol, sulphuric acid |
| Number of products | 0 | 4 | 0 | 1 | 0 | 2 | 0 | 3 | 1 |  |

Sources:

1Recommendations of the Spanish *protomédico* Andrés Zamudio de Alfaro in the 1590s: *Catálogo de las cosas que los boticarios han de tener en sus boticas* in Davis and López Terrada, “Protomedicato y farmacia,” 591-612.

2First pharmacy of the hospital of Santa Ana: AGNP Protocolos 63 Diego Gutiérrez fols. 177v.-178 Quenta de la botica 20 Oct. 1551. See also: Miguel Rabí Chara, “La primera botica de los hospitales de la ciudad de Lima en el siglo XVI,” *Asclepio* 52 (2000): 276-77.

3Inspection of the pharmacy of the hospital of Santa Ana in 1606. ABPL 9086 fols. 118-123 Visita of the *botica* of the hospital of Santa Ana by Doctor Melchor Romero 9 and 10. Oct. 1606.

4Pharmacy imported by Diego de Tineo: JCB Mss codex Sp 136 fols. 861-868 Francisco Martínez y compañía obligación - Diego de Tineo y consortes 1555.

5Inventory of the pharmacyof Francisco de Alva: AGNP Real Audiencia. Causas civiles legajo 16 cuad. 81 fols. 10v-15 Inventario de los bienes del bachiller Alba [sic], después de fallecido. 1576.

6Inventory of the pharmacy of Bartolomé Diaz Cabeza de Vaca: AAL Testamentos 5 exp. 1 fols. 44-49v. Memoria de drogas y medicinas…6 Sep. 1608.

7Inventory of the pharmacyof Pedro de Bilbao: AGNP Protocolos Sánchez Vadillo 1789 fols. 1372v.-1378v. Inventario de bienes de Pedro de Bilbao 25 Aug. 1636.

8Inventory of the pharmacyof Francisco Cartajena, Cuzco 1618. “Una botica colonial.” *Revista del archivo histórico del Cuzco* 4 (1953): 263-82.

9Sale of pharmacy of Juan de Salazar, Potosí, 1678. Archivo Histórico de Potosí, Escrituras notariales, 130 fols. 563v-576v. 27 Jun. 1678.

1. For the history of medicine for Latin America as a whole, see the suggested readings in Marcus Cueto and Stephen Palmer, *Medicine and Public Health in Latin America: A History* (New York: Cambridge University Press, 2015), 279-81. Key texts for Peru are: Hermilio Valdizán and Ángel Maldonado, *La medicina popular peruana*, 3 vols. (Lima: Torres Aguirre, 1922); **Juan B. Lastres, *Historia de la medicina peruana*, 3 vols. (Lima:** Impr. Santa María, 1951); John Tate Lanning, *The Royal Protomedicato: The Regulation of the Medical Professions in the Spanish Empire*, ed. John Jay TePaske (Durham: Duke University Press, 1985); Miguel Rabí Chara, *Del hospital de Santa Ana (1549 a 1924) al hospital nacional Arzobispo Loayza (1925 a 1999): 450 años de protección de la salud de las personas* (Lima: INDECOPI, 1999) and *El hospital de San Bartolomé de Lima: la protección y asistencia de la gente de color de 1646 a 1821 y evolución posterior* (Lima: Grahuer, 2001); Adam Warren, *Medicine and Politics in Colonial Peru: Population Growth and the Bourbon Reforms*. (Pittsburgh, PA: University of Pittsburgh Press, 2010); and Gabriela Ramos, “Indian Hospitals and Government in the Colonial Andes,” *Medical History* 57, no. 2 (2013): 186-205. [↑](#footnote-ref-1)
2. #  GeorgeM. Foster, *Hippocrates’ Latin American Legacy: Humoral Medicine in the New World* (Langhorne, PA: Gordon and Breach, 1994); Rebecca Earle, *The Body of the Conquistador: Food, Race and the Colonial Experience in Spanish America, 1492–1700* (Cambridge: Cambridge University Press, 2012), 19-41.

 [↑](#footnote-ref-2)
3. Paula S. De Vos, “The Art of Pharmacy in Seventeenth- and Eighteenth-Century Mexico,” (PhD diss., University of California, Berkeley, 2001) and “From Herbs to Alchemy: The Introduction of Chemical Medicine to Mexican Pharmacies in the Seventeenth and Eighteenth Centuries,” *Journal of Spanish Cultural Studies* 8, no 2 (2007): 135-68; Enrique Laval, *Botica de los Jesuitas de Santiago* (Santiago: Asociación Chilena de Asistencia Social, 1953); and Linda A. Newson, *Making Medicine in Early Colonial Lima, Peru: Apothecaries, Science and Society* (Leiden: Brill, 2017) on which this article draws. [↑](#footnote-ref-3)
4. Pamela H. Smith, *The Business of Alchemy: Science and Culture in the Holy Roman Empire* (Princeton: Princeton University Press, 1997), 5, *The Body of the Artisan: Art and Experience in the Scientific Revolution* (Chicago: University of Chicago Press, 2004), 6-8, and “Science on the Move: Recent Trends in the History of Early Modern Science,” *Renaissance Quarterly* 62, no. 2 (2009): 355-56. See also Paula De Vos, “Apothecaries, Artists, and Artisans: Early Industrial Material Culture in the Biological Old Regime,” *Journal of Interdisciplinary History* 45, no. 3 (2015): 277-336. [↑](#footnote-ref-4)
5. Marcos Martinón-Torres, “Some Recent Developments in the Historiography of Alchemy,” *Ambix* 58, no. 3 (2011): 223-26; Henrique Leitão and Antonio Sánchez, “Zilsel’s Thesis, Maritime Culture, and Iberian Science in Early Modern Europe,” *Journal of the History of Ideas* 78, no, 2 (2017): 191-210. [↑](#footnote-ref-5)
6. Carlos F. Cabanillas Cárdenas, ed., *Juan del Valle y Caviedes: guerras físicas, proezas medicales, hazañas de la ignorancia* (Madrid: Iberoamericana Editorial Vervuert, 2013), 227. [↑](#footnote-ref-6)
7. Juan Pimentel, “The Iberian Vision: Science and Empire in the Framework of a Universal Monarchy, 1500–1800,” *Osiris* 15 (2001): 17–30; Jorge Canizares-Esguerra, “Iberian Science in the Renaissance: Ignored How Much Longer?” *Perspectives on Science* 12 (2004): 86–124. [↑](#footnote-ref-7)
8. #  Paula De Vos traces the textual history of Galenic pharmacy from its origins with the Romans and Greeks, its interpretation by Islamic authors, and its entry into Europe from the south through Spain and Italy (“Pharmacopoeias and the Textual Tradition in Galenic Pharmacy,” in *Drugs on a Page: Pharmacopoeias and Healing Knowledge in the Early Modern Atlantic World*, eds. Michel J. Crawford and Joseph M. Gabriel. (Pittsburgh: University of Pittsburgh Press, 2019), 19-44.

 [↑](#footnote-ref-8)
9. Fundamentally, however, illnesses arose as the result of the internal malfunctioning of a “vital force” or *archeus* that governed chemical transformations and was often referred to as the “internal alchemist.” See Dane T. Daniel, “Invisible Wombs: Rethinking Paracelsus's Concept of Body and Matter,” *Ambix* 53, no. 2 (2006): 129-142. [↑](#footnote-ref-9)
10. Steven Shapin, *The Scientific Revolution* (Chicago: University of Chicago Press, 1996), 69, 126, 136; William B. Ashworth, “Catholicism and Early Modern Science,” in *God and Nature: Historical Essays on the Encounter between Christianity and Religion*, eds. David C. Lindberg and Ronald L. Numbers (Berkeley: University of California Press, 1986), 148-53. [↑](#footnote-ref-10)
11. Miguel López Pérez, “Spanish Paracelsus Revisited and Decontaminated,” *Azogue* 7 (2013): 341, URL: <http://www.revistaazogue.com> [Accessed 13 Sep 2019]; Lyke de Vriesa and Leen Spruit, “Paracelsus and Roman Censorship – Johannes Faber’s 1616 Report in Context,” *Intellectual History Review*, 28, no. 2 (2018): 227. [↑](#footnote-ref-11)
12. José Maria López Piñero, “Paracelsus and his Work in Sixteenth and Seventeenth Century Spain,” *Clio Medica* 8, no. 2 (1973): 119-31; Henry Kamen, *The Spanish Inquisition: An Historical Revision* (London: Weidenfeld and Nicolson, 1997), 103-34; Allen G. Debus, “Paracelsus and the Delayed Scientific Revolution in Spain: A Legacy of Philip II,” in *Reading the Book of Nature: the Other Side of the Scientific Revolution*, eds. Allen G. Debus and Michael T. Walton (Kirksville-Missouri: Sixteenth Century Journal Publishers, Inc., 1998), 148-49. [↑](#footnote-ref-12)
13. Some controls on printing dated back to 1502. [↑](#footnote-ref-13)
14. Guenter B. Risse, “Medicine in New Spain,” in *Medicine in the New World: New Spain, New France*, *and New England*, ed. Ronald L. Numbers (Knoxville: University of Tennessee Press, 1987), 15; De Vos, “Art of Pharmacy,” 6. [↑](#footnote-ref-14)
15. Michele Clouse, *Medicine, Government and Public Health in Philip II’s Spain: Shared Interests, Competing Authorities* (Farnham: Ashgate, 2011). [↑](#footnote-ref-15)
16. José Maria López Piñero, *Ciencia y técnica en la sociedad española de los siglos XVI y XVII* (Barcelona: Labor Universitaria 1979), 141-44; David C. Goodman, “Philip II’s Patronage of Science and Engineering,” *The British Journal for the History of Science* 16, no. 1 (1983): 50-53 and *Power and Penury: Government, Technology and Science in Philip II’s Spain* (Cambridge: Cambridge University Press, 1988), 220-21; Kamen, *Spanish Inquisition*, 104-108. For recent evaluations of the impact of Paracelsus in Spain see: José Rodríguez Guerrero, “Censura y Paracelsismo durante el Reinado de Felipe II,” *Azogue* 4 (2001), URL: <http://www.revistaazogue.com> [Accessed 31 Jan. 2020]; Mar Rey Bueno, “Los paracelsistas españoles: medicina química en la España moderna,” in *Más allá de la Leyenda Negra: España y la revolución científica*, eds. Victor Navarro Brotons and William Eamon (Valencia: Instituto de Historia de la Ciencia y Documentación López Piñero, 2007), 41-55; Miguel López Pérez, “Spanish Paracelsus Revisited and Decontaminated,” *Azogue* 7 (2013), URL: <http://www.revistaazogue.com> [Accessed 31 Jan. 2020]. [↑](#footnote-ref-16)
17. Kamen, *Spanish Inquisition*, 105: López Pérez, “Spanish Paracelsus,” 344-45. [↑](#footnote-ref-17)
18. Miguel López Pérez, “La influencia de la alquimia medieval hispana en la Europa moderna,” *Asclepio* 54, no. 2 (2002): 225-26. [↑](#footnote-ref-18)
19. Efraim Lev and Zohar Amar, *Practical* Materia Medica *of the Medieval Eastern Mediterranean According to the Cairo Genizah* (Leiden: Brill, 2008), 61-64; Paula De Vos, “European Materia Medica in Historical Texts: Longevity of a Tradition and Implications for Future Use,” *Journal of Ethnopharmacology* 132, no 1: 32 Table 4 and “Apothecaries, Artists, and Artisans,” 286-88. [↑](#footnote-ref-19)
20. Allen G. Debus, *The Chemical Philosophy: Paracelsian Science and Medicine in the Sixteenth and Seventeenth Centuries* (New York: Science History Publication, 1977), vol. 1, 20-23; Robert P. Multhauf, “The Significance of Distillation in Renaissance Medical Chemistry,” *Bulletin of the History of Medicine* 30 (1956): 330-33 andBruce T. Moran, *Distilling Knowledge: Alchemy, Chemistry, and the Scientific Revolution* (Cambridge, Mass.: Harvard University Press, 2005), 12-25. [↑](#footnote-ref-20)
21. Multhauf, “Significance of Distillation,” 333-36 and “John of Rupescissa and the Origin of Medical Chemistry,” *Isis* 45, no. 2 (1954): 359-361; Rey Bueno and Alegre Pérez, “Renovación,” 33; De Vos, “Apothecaries, Artists, and Artisans,” 325-26 and Paula De Vos, “Rosewater and Philosopher’s Oil: Thermo-chemical Processing in Medieval and Early Modern Spanish Pharmacy,” *Centaurus* 60 (2018): 161-62. [↑](#footnote-ref-21)
22. Paula De Vos, “Rosewater and Philosopher’s Oil,” 159-72. She gives a useful summary account of the different methods employed. [↑](#footnote-ref-22)
23. There is considerable debate about the authors of particular texts and tracts. Volume 14 of Arxiu de Textos Catalans Antics published in 1995 is dedicated to this issue. See also William R. Newman, *"Summa Perfectionis" of Pseudo-Geber: A Critical Edition, Translation and Study* (Leiden: Brill, 1991), 194-208;

Leah DeVun, *Prophecy, Alchemy, and the End of Time: John Rupescissa in the Late Middle Ages* (New York: Columbia University Press, 2009), 90-95, 200n-202n. See also Michela Pereira, “Raymond Llull and the Alchemic Tradition,” *Catalònia cultural* 43 (1995): 40-43; Michael McVaugh, “Chemical Medicine in the Medical Writings of Arnau de Vilanova,” *II* Trobada Internacional d’Estudis sobre Arnau de Vilanova. Arxiu de Textos Catalans Antics 23–24 (2004–2005): 239–264. [↑](#footnote-ref-23)
24. Joseph Ziegler, “Alchemy in *Practica Summaria*: a Footnote to Michael McVaugh’s Contribution,” *II* Trobada Internacional d’Estudis sobre Arnau de Vilanova. Arxiu de Textos Catalans Antics 23–24 (2004–2005): 267. [↑](#footnote-ref-24)
25. López Pérez, “Spanish Paracelsus Revisited,” 353-56 and “La influencia de la alquimia,” 220-24; Mar Rey Bueno, “Los paracelsistas españoles,” 45-47. [↑](#footnote-ref-25)
26. Robert P. Multhauf, “Medical Chemistry and the Paracelsians,” *Bulletin of the History of Medicine* 28, no. 2 (1954): 120-123; William R. Newman, “From Alchemy to ‘Chymistry’,” in *The Cambridge History of Science*, eds. Katharine Park and Lorraine Daston (Cambridge: Cambridge University Press, 2006), 3: 502-506. [↑](#footnote-ref-26)
27. Francisco Javier Puerto Sarmiento, “Alquimia aúrea: alquimia y destilación en la corte de Felipe II (1527-1598),” *Dynamis* 17 (1997): 118-26; Mar Rey Bueno and María Esther Alegre Pérez, “Los distiladores de Su Magestad: distilación, espagiria y paracelsismo en la corte de Felipe II,” *Dynamis* 21 (2001): 331-47 and Mar Rey Bueno and Maria Esther Alegre Pérez, “Renovación en la terapéutica real: los destiladores de su magestad, maestros simplicistas y médicos herbolarios de Felipe II,” *Asclepio* 53, no. 1 (2001): 27-55; William Eamon, “Spanish Science in the Age of the New,” in *A Companion to the Spanish Renaissance*, ed. Hilaire Kallendorf (Leiden: Brill, 2019), 487-88. [↑](#footnote-ref-27)
28. De Vos, “From Herbs to Alchemy,” 136-37, 150. [↑](#footnote-ref-28)
29. Donald C. Noble and Cesar E. Vidal C., “Association of Silver with Mercury, Arsenic, Antimony, and Carbonaceous Material at the Huancavelica District, Peru,” *Economic Geology* 85, no. 7 (1990): 1645-1650. [↑](#footnote-ref-29)
30. Bernabé Cobo, *Obras* (Madrid: Ediciones Atlas, 1956 [1653]), vol. 1, 108-153; Archivo del Real Jardín Botánico Madrid (hereafter ARJBM) División 1, leg. 17 fol. 588 Libro de examen de los simples medicinales Antonio de Robles Cornejo 1617; George G. Peterson, *Mining and Metallurgy in Ancient Perú*. *The Geological Society of America Special Paper 467* (Boulder, Col.: The Geological Society of America, Inc., 2010), 27-31. [↑](#footnote-ref-30)
31. US Geological Survey, *Mineral Commodity Summaries 2019*, 23 and *Antimony* [Available at <https://pubs.usgs.gov/pp/1802/c/pp1802c.pdf> Accessed 29 Jan.2020. [↑](#footnote-ref-31)
32. *Recopilación de las leyes, pragmáticas reales* (Muñoz), cap. 6 art. 2: 73-74; Goodman, *Power and Penury*, 219-20. For obvious reasons, indigenous candidates were not required to demonstrate *limpieza de sangre* (Hernández Sáenz, *Learning to Heal*, 148), but there is no evidence that any sought licenses to practice in Lima at this time. [↑](#footnote-ref-32)
33. #  See for example, Karoline P. Cook, *Forbidden Passages: Muslims and Moriscos in Colonial Spanish America* (Philadelphia: University of Pennsylvania Press, 2016), 38, 56-79.

 [↑](#footnote-ref-33)
34. Cobo, *Obras*, vol. 1, 108-53. [↑](#footnote-ref-34)
35. De Vos, “Apothecaries, Artists, and Artisans,” 322 indicates its use for painting as well as for treating diarrhoea. [↑](#footnote-ref-35)
36. Cobo, *Obras*, vol. 1, 116. If it was burnt, it was also used to treat all kinds of wounds and, if not, it was mixed with vinegar, rose water or plantain to treat inflammations. [↑](#footnote-ref-36)
37. ARJBM División 1, leg. 17 fols. 619-20 Libro de examen…Antonio de Robles Cornejo 1617. [↑](#footnote-ref-37)
38. David L. Browman and James N. Gundersen, “Altiplano Comestible Earths: Prehistoric and Historic Geophagy of Highland Peru and Bolivia,” *Geoarchaeology* 8, no. 5 (1993): 413-25. It is thought that geophagy or the ingestion of comestible mineral earths provides dietary supplements that counteract the phytotoxins found in local foods. [↑](#footnote-ref-38)
39. Cobo, *Obras*, vol. 1, 127. [↑](#footnote-ref-39)
40. Cobo, *Obras*, vol. 1, 126; Antonio de la Calancha, *Corónica moralizada del orden de San Agustín en el Perú* (Barcelona: Pedro Lacavallería, 1639), 54. [↑](#footnote-ref-40)
41. Cobo, *Obras*, vol. 1, 127. [↑](#footnote-ref-41)
42. Cobo, *Obras*, vol. 1, 150; “Relacion de la ciudad de Guamanga y sus terminos 1586,” in *Relaciones geográficas de Indias* (Madrid: Tip. Manuel G. Hernandez, 1881), vol. 1, 111; Peterson, *Mining*, 4. On azogue and vermillion see also Garcialaso de la Vega, *Comentraios reales*, lib. 8 cap. 25 in *Obras completas* (Lima: Ministerio de Relaciones Exteriores, 2015), vol. 2, 471. [↑](#footnote-ref-42)
43. Pamela H. Smith, “Vermilion, Mercury, Blood, and Lizards: Matter and Mining in Metalworking,” in Urusla Klein and E.C. Spary, *Materials and Expertise in Early Modern Europe: Between Market and Laboratory* (Chicago: University of Chicago Press, 2010), 35-45; De Vos “Apothecaries, Artists, and Artisans,” 312, 316, 322, 330. [↑](#footnote-ref-43)
44. Luis Antonio Eguiguren, *Alma mater: origines de la Universidad de San Marcos (1551-1579*) (Lima, 1939), 257-58, 337; Lastres, *Historia de la medicina peruana*, 49-55, 87-94; Lanning, *Royal Protomedicato*, 29-30, 328; Gustavo Delgado Matallana, *Historia de la enseñanza médica en el Perú* (Lima: Universidad Nacional Mayor de San Marcos, 2008), 76, 104-106. [↑](#footnote-ref-44)
45. Newson, *Making Medicines*, 22-28 [↑](#footnote-ref-45)
46. ARJBM División 1, leg. 17 Libro de examen…Antonio de Robles Cornejo 1617. [↑](#footnote-ref-46)
47. Paula De Vos, “Pharmacopeias and the Textual Tradition in Galenic Pharmacy,” in *Drugs on the Page: Pharmacopeias and Healing knowledge in the Early Modern Atlantic World*, ed. Matthew J. Crawford and Joseph M. Gabriel (Pittsburgh: University of Pittsburgh Press, 2019) distinguishes between four types of pharamcopeias: books of simples; formulary; procedural; and pedagogical. [↑](#footnote-ref-47)
48. Rubén Vargas Ugarte, *Impresos peruanos (1584-1650)* (Lima: Universidad Nacional San Marcos, 1953), vol. 1, 6-10; José Toribio de Medina, *La imprenta en Lima,* 1584-1824 (Santiago: Impreso y grabado en casa del autor, 1904),xx-xxx; Pedro M. Guibovich Pérez, “Printing Press in Colonial Peru: Production Process and Literary Categories in Lima,” *Colonial Latin American Review* 10, no. 2 (2001): 168-69. [↑](#footnote-ref-48)
49. Fray Buenaventura de Salinas y Cordova, *Memorial de las historias del Nuevo Mundo Pirú* [sic] (Lima: Universidad Nacional Mayor de San Marcos, 1957 [1630]), vol. 1, 257; Guibovich Pérez, “Printing Press,” 168-73; Catalina Romero Romero, “Libros, cultura y sociedad en el Perú virreinal: Las bibliotecas de los colegios jesuitas de Arequipa, Potosí y las misiones de Moxos en el siglo XVIII.” (PhD diss., Universidad de Complutense de Madrid, 1992), vol. 1, 4-21. [↑](#footnote-ref-49)
50. Antonio Rodríguez-Buckingham, “Change and the Printing Press in Sixteenth-Century Spanish America,” in *Agent of Change: Print Culture Studies after Elizabeth L. Einstein*, eds. Sabrina Alcorn Baron, Eric N. Lindquist and Eleanor F. Shevlin (Amherst and Boston: University of Massachusetts Press, 2007), 228-30. [↑](#footnote-ref-50)
51. Guibovich Pérez, “Printing Press,” 179. [↑](#footnote-ref-51)
52. Vargas Ugarte, *Impresos peruanos*, vol. 1, 90. For a discussion of Porres and his work see: Mar Rey Bueno, “Concordias medicinales de entrambos mundos,” *Revista de Indias* 66, no. 237 (2006): 347-62. [↑](#footnote-ref-52)
53. Luis Antonio Eguiguren, *Diccionario histórico cronológico de la universidad real y pontificia de San Marcos y sus colegios* (Lima: Torres Aguirre, 1940), vol. 1, 664; Pedro M. Guibovich Pérez, *Censura, libros e inquisición en el Perú colonial, 1570-1754* (Seville: Universidad de Sevilla, Secretariado de publicaciones, 2004), 99-132.

For the process in Spain see: José Pardo-Tomás, *Ciencia y censura: la inquisición española y los libros científicos en los siglos XVI y XVII* (Madrid: CSIC, 1991), 29-45. The Archivo General de Indias, Seville (hereafter AGI) contains the records of all cargoes sent to the Americas in individual ships, which the titles of all books dispatched. For the period studied here see AGI Contratación 1080-1184 Registros de navíos 1583-1640. [↑](#footnote-ref-53)
54. José T. Medina, *Historia del tribunal del Santo Oficio de la Inquisición de Lima* (Santiago, Chile: 1956), vol. 2, 35-41; Virgilio Pinto Crespo, *Inquisición y control ideológico en España del siglo XVI* (Madrid: Taurus, 1983), 287-292; Pardo-Tomás, *Ciencia y censura*, 154-82, 248-64; Guibovich, *Censura*, 219-20. [↑](#footnote-ref-54)
55. *Index et catalogus librorum prohibitorum* (Madrid: Apud Alphonsum Gomezium, 1583), 10, 60.

For other medical texts banned by the Inquisition in the sixteenth century see José Pardo-Tomás, “Autores médicos en los índices inquisitoriales españoles del siglo XVI,” *Dynamis* 5-6 (1985-1986): 201-14. [↑](#footnote-ref-55)
56. De Vries and Spruit, “Paracelsus and Roman Censorship,” 226-27. [↑](#footnote-ref-56)
57. Virgilio Pinto Crespo, “La censura inquisitorial, inquietud e incertidumbre: el caso Ramón Llull (1559-1610),” in *Miscelánea conmemorativa* (Madrid: Universidad Autónoma de Madrid, 1982), 297-314. [↑](#footnote-ref-57)
58. López Pérez, “Spanish Paracelsus,” 349. [↑](#footnote-ref-58)
59. Guibovich, *Censura*, 249, 268, 274. [↑](#footnote-ref-59)
60. Pedro Guibovich, “Autores, censores y producción de libros en el virreinato peruano” (2015), 7-8. Unpublished manuscript at: <https://escriturasvirreinales.files.wordpress.com/2015/05/guibovich-autores_y_censores-u-c.pdf> [Accessed 28 Jan. 2020] [↑](#footnote-ref-60)
61. Guibovich Pérez, *Censura*, 346. [↑](#footnote-ref-61)
62. Irving A. Leonard, *Los libros del conquistador* (Mexico: Fondo de Cultura Económica, 1996 [1949]), 145-156; Guibovich, *Censura*, 266-67. [↑](#footnote-ref-62)
63. Archivo Histórico Nacional, Madrid. Inquisición 1034 fol. 355 Licenciado Antonio Gutiérrez de Ulloa 1 Feb. 1583. [↑](#footnote-ref-63)
64. Guibovich, *Censura*, 263. [↑](#footnote-ref-64)
65. AGI Contratación 273 R3 N73 (fol.37) Bienes de difuntos de Pedro Durango de Espinosa 1606; Carlos A. González Sánchez, “Consideraciones sobre el comercio de libros en Lima a principios del siglo XVII,” *Anuario de Estudios Americanos* 54, no. 2 (1997): 681. [↑](#footnote-ref-65)
66. AGI Contratación 1138B N8: 366 Registro del navío Nuestra Señora del Rosario 1601 [↑](#footnote-ref-66)
67. López Piñero, *Ciencia y técnica*, 195; Pardo-Tomás, *Ciencia y censura*, 282. [↑](#footnote-ref-67)
68. De Vos in “From Herbs to Alchemy,” 140-41 notes the same predominance of Galenic texts in Mexican pharmacies in the sixteenth and seventeenth centuries. [↑](#footnote-ref-68)
69. Irving A. Leonard, “Best Sellers of the Lima Book Trade,” *Hispanic American Historical Review* 22, no. 1 (1942): 5-33; Eguiguren, *Diccionario histórico cronológico*, 697-722; Pedro M. Guibovich Pérez, “Bibliotecas de médicos en Lima colonial,” in *Del autor al lector*, ed. Carmen Castañeda (Mexico City: CIESAS, 2002), 302. Laredo in citing Albucasis reveals familiarity methods of distillation (De Vos, “Rosewater and Philosophers’ Oil,” 168). [↑](#footnote-ref-69)
70. For a list of over 70 books imported to Panama by Doctor Melchor de Amusco, who became *protomédico* in Lima, see Newson, *Making Medicines*, 135-36, 297-302. The library of the physician, Juan Gerónimo Navarro, in 1647 contained some 400 books, though not all were on medicine (AAL Testamentos 28A-1 fols. 127-147 Testamento de Juan Gerónimo Navarro 1648). [↑](#footnote-ref-70)
71. Archivo General de la Nación, Peru (hereafter AGNP) Protocolos 63 Diego Gutiérrez fols. 177v.-178 Quenta de la botica 20 Oct. 1551. See also: Miguel Rabí Chara, “La primera botica de los hospitales de la ciudad de Lima en el siglo XVI,” *Asclepio* 52 (2000): 276-77. [↑](#footnote-ref-71)
72. These works were recommended for *boticarios* by the fifteenth century Italian pharmacist Saladino d’Ascoli, whose *Compendio de los boticarios* was translated into Spanish by Alonso Rodríguez de Tudela in 1515 (Saladino de Ascoli, *Compendio de los boticarios* (Valladolid: Arnao Guillén de Brocar, 1515)). [↑](#footnote-ref-72)
73. Archivo Histórico Municipal de Lima, Libro 4 de cédulas y provisiones, fol. 161 Título de Bernardo Gil, boticario 7 Nov. 1609. [↑](#footnote-ref-73)
74. López Pérez, “Spanish Paracelsus Revisited,” 363. [↑](#footnote-ref-74)
75. José María López Piñero and Francesc Bujosa Homar, “Tradición y renovación en la medicina española del siglo XVI,” *Asclepio* 30-31 (1978-1979): 293; De Vos, “Rosewater and Philosophers’ Oil,” 168. [↑](#footnote-ref-75)
76. Laval, *Botica*, 139. [↑](#footnote-ref-76)
77. AGI Contratación 1097 N5 fol. 197 Registro de Santa Catalina 1592. [↑](#footnote-ref-77)
78. AGNP Protocolos 819 Hernández Francisco Testamento de Bartolomé Díaz Cabeza de Vaca boticario 1608, fol. 176v. [↑](#footnote-ref-78)
79. AGI Contratación 1138B N8: 365 Registro del navío Nuestra Señora del Rosario 1601. [↑](#footnote-ref-79)
80. Michael Solomon, *Fictions of Well-Being: Sickly Readers and Vernacular Medical Writing in Late Medieval and Early Modern Spain* (Philadelphia: University of Pennsylvania Press, 2010), 54-55, 58-60. [↑](#footnote-ref-80)
81. Leonard, *Libros del conquistador*, 343. [↑](#footnote-ref-81)
82. González Sánchez, “Consideraciones sobre el comercio,” 683, 689; Pardo-Tomás, *Ciencia y censura*, 361; Guibovich, *Censura*, 339. [↑](#footnote-ref-82)
83. López Pérez, “Influencia de alquimia,” 224-26. [↑](#footnote-ref-83)
84. Cobo, *Obras*, vol. 2, 425; Luis Martín, ***The*** *Intellectual* ***Conquest of Peru: The Jesuit College of San Pablo, 1568-1767* (**New York: Fordham University Press, 1968), 106-108 and “La biblioteca del Colegio de San Pablo (1568-1767), antecedente de la Biblioteca Nacional,” *Fénix* (Lima) 21 (1971): 15-36. [↑](#footnote-ref-84)
85. Guibovich, “Bibliotecas de médicos,” 302. [↑](#footnote-ref-85)
86. Archivo Arzobispal, Lima (hereafter AAL) Testamentos 28A-1 fols. 81v-82, 207v.-208 Testamento de Juan Gerónimo Navarro 1648. [↑](#footnote-ref-86)
87. Jairo Solano Alonso, *Salud, cultura y sociedad en Cartagena de Indias siglos XVI y XVII* (Universidad del Atlántico: Barranquilla, 1998), 127-29. [↑](#footnote-ref-87)
88. Solano Alonso, *Salud, cultura y sociedad*,110-11; Kristy Wilson Bowers, “Tradition and Innovation in Spanish Medicine: Bartolomé Hidalgo de Agüero and the Vía Particular,” *The Sixteenth Century Journal* 41, no. 1 (2010): 29-47. [↑](#footnote-ref-88)
89. Martín, *Intellectual Conquest*, 107. [↑](#footnote-ref-89)
90. Kamen, *Spanish Inquisition*, 103-34; Medina, *Historia del tribunal del Santo Oficio,* vol.1, 1-18. [↑](#footnote-ref-90)
91. #  Wilson Bowers, “Tradition and Innovation,” 46-47.

 [↑](#footnote-ref-91)
92. Medina, *Historia del tribunal del Santo Oficio,* vol. 1, 39, 310, 319; vol. 2, 137. The two physicians, Juan Álvarez and Álvaro Nuñez, and the surgeon Tomé Cuaresma were all accused of judaizing. On Tomé Cuaresma see Linda A. Newson and Susie Minchin, *From Capture to Sale: The Portuguese Slave Trade to Spanish South America in the Early Seventeenth Century* (Leiden: Brill, 2007), 264. [↑](#footnote-ref-92)
93. This would not have been the book by Pedro López de León since it was not published until 1628. Possibly it was Andrés de León’s *Tratados de medicina, cirugía, y anatomía* (Valladolid: Luis Sánchez, 1605). [↑](#footnote-ref-93)
94. Probably Bartolomé Hidalgo de Agüero, *Thesoro de la verdadera cirugía* (Seville, 1604). [↑](#footnote-ref-94)
95. Possibly Francisco Díaz, *Tratado nuevamente impresso, de todas las enfermedades de los riñones, vexiga, y carnosidades de la verga, y urina* (Madrid. F. Sánchez, 1588). [↑](#footnote-ref-95)
96. AGNP SO CO ca. 16 doc. 194 fols. 1-8 Secuestro de Alexandre Pérez, cirujano, de Flandes, en el pueblo de Yllimo (Saña) 1612. Murillo probably referred to Jerónimo Murillo, *Therapeutica, método de Galeno en lo que toca a cirugía* (Zaragoza, 1561). [↑](#footnote-ref-96)
97. ARJBM División 1, legajo 17 fols. 588-91 Libro de examen…Antonio de Robles Cornejo 1617. [↑](#footnote-ref-97)
98. AGNP Protocolos Diego Gutiérrez 63 fols. 167-88 El hospital de los españoles y naturales con Francisco de Bilbao de la botica 9 Mar. 1552. For the use of *alquitaras* in the hospital of San Andrés see AGI Lima 131 Petition from Francisco Molina, mayordomo of the hospital de los españoles [San Andrés] 9 Mar. 1563. [↑](#footnote-ref-98)
99. AGI Lima 131 Hospital de los españoles de la ciudad de los Reyes 13 Jan. 1564; Archivo de Beneficencia Pública, Lima (hereafter ABPL) 9085 Libro de la razón que toma Bartolomé de la Cueva 1595-1597. [↑](#footnote-ref-99)
100. AGNP Real Audiencia leg. 16 cuad. 81 fols. 14v.-15 Inventario de los bienes del bachiller Francisco de Alva 9 Feb. 1576. [↑](#footnote-ref-100)
101. AAL Testamentos 5 leg 1 fol. 165v. Memoria de las medicinas que tenía esta botica cuando la compraron... Bartolomé Díaz Cabeza de Vaca 1608. [↑](#footnote-ref-101)
102. Feliz Francisco Pastor Frechoso, *Boticas, boticarios y materia médica en Valladolid: siglos XVI y XVI* (Salamanca: Consejería de Cultura y Turismo, 1993),171-201. [↑](#footnote-ref-102)
103. Francisco de Valles, *Tratado de las aguas destilladas, pesos y medidas* (Madrid: Luis Sánchez 1592); Mar Rey Bueno, “El informe Valles: Los desdibujados límites del arte de boticarios a finales del siglo XVI (1589-1594),” *Asclepio* 56, no. 2 (2004): 245-68. [↑](#footnote-ref-103)
104. ARJBM División 1, leg. 17 cap. 2 del arte del boticario, Libro de examen…Antonio de Robles Cornejo 1617. [↑](#footnote-ref-104)
105. Today *alambiques* are considered preferable because they enable the separation of the processes of vaporisation and condensation better and allow greater control of the process. [↑](#footnote-ref-105)
106. *Recopilación de las leyes, pragmáticas reales, decretos, y acuerdos del Real Proto-Medicato* (Valencia: Imprenta de la Viuda de Antonio Bordazar, 1751), cap. XIV ordinance 5: 177 [↑](#footnote-ref-106)
107. For example, RGI 2: 7-8 Relación de la ciudad de Cuzco, Vasco de Contreras y Valverde 1 Jan. 1650. [↑](#footnote-ref-107)
108. Archivo Histórico de Potosí (AHP), Escrituras notariales 130 fols. 563v-576v. Venta de botica de Juan de Salazar Muñatonez 17 Apr. 1678. I am grateful to Kris Lane for drawing my attention to this source. [↑](#footnote-ref-108)
109. John Carter Brown Library Mss codex Sp 136 Francisco Martínez y compañía obligación - Diego de Tineo y consortes 1555. [↑](#footnote-ref-109)
110. John Webster Spargo, *Virgil the Necromancer: Studies in Virgilian Legends* (Cambridge, Mass.: Harvard University Press, 1934), 136-55, 198-206. [↑](#footnote-ref-110)
111. Spargo, *Virgil the Necromancer*, 277-79. [↑](#footnote-ref-111)
112. Charles Davis and María Luz López Terrada, “Protomedicato y farmacia en Castilla a finales del siglo XVI: edición crítica del *Catálogo de las cosas que los boticarios han de tener en sus boticas*, de Zamudio de Alfaro, protomédico general (1592-1599),” *Asclepio* 62, no. 2 (2010): 579-626. [↑](#footnote-ref-112)
113. Fernández-Carrión and Valverde, *Farmacia y sociedad,* 85. [↑](#footnote-ref-113)
114. Debus, *Chemical Philosophy,* vol. 1, 20-23; Multhauf, “Significance of Distillation,” 330-33; Moran, *Distilling Knowledge*, 12-25. [↑](#footnote-ref-114)
115. López Pérez, “La influencia de la alquimia medieval,” 218. [↑](#footnote-ref-115)
116. Davis and López Terrada, “Protomedicato y farmacia,” 609; Laval, *Botica*, 195. [↑](#footnote-ref-116)
117. José Luis Fresquet Febrer, “Uso de productos del reino mineral en la terapéutica del siglo XVI: El libro de los *Medicamentos Simples* de Juan Fragoso (1581) and el *Antidotario* de Juan Calvo (1580),” *Asclepio* 51 (1999): 68. [↑](#footnote-ref-117)
118. Very often Robles Cornejo compares ideas and preparations to those of Mattioli, who he held in high esteem and referred to as ‘the good Mathiolo’. [↑](#footnote-ref-118)
119. ARJBM División 1, leg. 17 fols. 588-62 Libro de examen…Antonio de Robles Cornejo 1617. [↑](#footnote-ref-119)
120. ARJBM División 1, leg. 17 Prohemiales 11 Libro de examen…Antonio de Robles Cornejo 1617. [↑](#footnote-ref-120)
121. ARJBM División 1, leg. 17 fol. 588 Libro de examen…Antonio de Robles Cornejo 1617. [↑](#footnote-ref-121)
122. Georgius Agricola, *De re metallica*, trans. Herbert Clark Hoover and Lou Henry Hoover (New York: Dover Publications, Inc., 1950), 110, 428. [↑](#footnote-ref-122)
123. AGNP Protocolos 1789 Diego Sanchez Vadillo fols. 1372v.-1374v. Inventario de los bienes de Pedro de Bilbao difunto 8 Jul. 1636. [↑](#footnote-ref-123)
124. AGI Contratación, 1166 N10 425-429 Registro del navío San Pedro 1618; AGI Contratación 1168 N1 191-96 Registro del navío San Salvador 1619. [↑](#footnote-ref-124)
125. ABPL 9806 fols.104-105 Visita al Hospital de Santa Ana sin fecha [1588]; AAL Causas de Negros leg. 1 doc. 2 Expediente de los autos que sigue el Doctor Vásquez Fajardo contra Gaspar Guerrero 1593; Fresquet Febrer, “Uso de productos del reino mineral,” 86. [↑](#footnote-ref-125)
126. **Luis de Oviedo, *Methodo de la colección, y reposición de las medicinas simples, de su corrección, y preparación* (Madrid: Luis Sánchez, 1622 [1581]), 441. For their historical use see Lev and Amar, *Practical* Materia Medica, 104-106.** [↑](#footnote-ref-126)
127. AGNP Protocolos Diego Gutiérrez 63 fols. 167-188 Quenta de la botica que va en la nao 20 Oct. 1551. (AGNP Cajas Reales, Lima H-3 leg. 4 Libro 24-a fols. 1-30 Aranceles para cálculo del almojarifazgo (1617)). [↑](#footnote-ref-127)
128. Laval, *Botica*, 147-48; Davis and López Terrada, “Protomedicato y farmacia,” 601. [↑](#footnote-ref-128)
129. *Libros de cabildos de Lima,* eds. Bertram T. Lee, Juan Bromley, Sophy E. Schofield, and Emilio Harth-Terré (Lima: Torres Aguirre**, 1935), vol. 3**, 416 Ordenanza de solimán 24 Jul. 1551. [↑](#footnote-ref-129)
130. AAL Causas de negros leg. 2 doc. 4 Bartolomé Verdugo pone demanda al Bachiller Juan Manuel Carrasco 1610. [↑](#footnote-ref-130)
131. AAL Causas de negros leg. 2 doc. 29 Diego de Vílchez…contra el Licenciado Don Diego Gatica, presbítero, acerca de la venta de Catalina Beafara 1615. [↑](#footnote-ref-131)
132. AGI Lima 45 N 4 fols. 146-147 Conde de Chinchón 21 Apr. 1634. [↑](#footnote-ref-132)
133. ARJBM División 1, leg. 17 fols. 599-602 Libro de examen…Antonio de Robles Cornejo 1617. [↑](#footnote-ref-133)
134. For the sources of those dispensed to elites associated with the church found in the Archivo Arzobispal de Lima see Newson, *Making Medicines*, 165 n. 96. For the bills incurred by Manuel Bautista Pérez with Pedro de Bilbao and Alonso de Carrión for medicines for slaves see: AGNP SO CO Ca. 57 doc 431 1629, 1635-1640. [↑](#footnote-ref-134)
135. #  Anastasio Rojo Vega, *Enfermos y sanadores en la Castilla del siglo XVI* (Valladolid: Universidad De Valladolid, 1993), 75; Laval, *Botica*, 189-97.

 [↑](#footnote-ref-135)
136. Laval, *Botica*, 45, 49-51, 84; Fresquet Febrer, “Uso de productos del reino mineral,” 65-66, 77. [↑](#footnote-ref-136)
137. Oviedo, *Methodo,* 409; Laval, *Botica*, 192. [↑](#footnote-ref-137)
138. Laval, *Botica*, 193. [↑](#footnote-ref-138)
139. Laval, *Botica*, 107-108; Davis and López Terrada, “Protomedicato y farmacia,” 610; Oviedo, *Methodo*, 508-10. [↑](#footnote-ref-139)
140. Oviedo, *Methodo,* 163, 171. [↑](#footnote-ref-140)
141. De Vos, “From Herbs to Alchemy,” 141, 144, 150-151, 154. [↑](#footnote-ref-141)
142. Fernández-Carrión and Valverde, *Farmacia y sociedad*, 85. [↑](#footnote-ref-142)
143. Richard Palmer, “Pharmacy in the Republic of Venice in the Sixteenth Century,” in *The Medical Renaissance of the Sixteenth Century*, eds. A. Wear, R.K French and I.M. Lonie (Cambridge: Cambridge University Press, 1985), 100-117. De Vries and Spruit, “Paracelsus and Roman Censorship,” 225-226, note that Paracelsus’ works were written in German and were only widely available once they had been translated into Latin in the 1560s. [↑](#footnote-ref-143)
144. Palmer, “Pharmacy in the Republic of Venice in the Sixteenth Century,” 100-117. [↑](#footnote-ref-144)
145. López Pérez, “Spanish Paracelsus Revisited,” 353-57; De Vos, “From Herbs to Alchemy,” 137. [↑](#footnote-ref-145)
146. De Vos, “From Herbs to Alchemy,” 135-36. [↑](#footnote-ref-146)
147. Newson, Making Medicines, 223-224. [↑](#footnote-ref-147)