# Muslim Contribution to Pharmacy

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This article will focus on Medieval Muslim scholars – physicians, botanists, chemists and translators, who contributed profusely in the development of pharmaceutical knowledge and the art of drug making.

Interest in the development of pharmacy in Islamic lands was led by poisons, their antidotes and means of detecting the poisons. Therefore much of the groundwork for early pharmacy was laid down by toxicologists. Initially knowledge of medicinal substances was based upon the 600 plants or plant products described by Greek physician Dioscorides (90CE), covering a thousand remedies in his treatise *De materia medica*. Arabic translations of this Greek book formed the basis for much of the future advances made by Muslims in pharmacology and pharmacy. Subsequently numerous Arabic and Persian treatises were written on medicaments. The knowledge Muslim pharmacists inherited from Syria, Persia, India and the Far East formed the basis for future innovations. Muslim pharmacists remained unsurpassed in this field until the 17$^{th}$ century.

Islamic pharmacy (*Saydanah*), the art of preparing and dispensing drugs, separate from the profession of medicine was recognized in the 8$^{th}$ century. Sandalwood was used in pharmaceutical preparations and it soon became associated with the profession. Pharmacies were called in Arabic *as-Saydanah* and pharmacists were called *as-saydanani* or as-saydalani. In India sandalwood was used more than any other aromatic woods. In Sanskrit sandalwood was called *chandan* or *jandan*. In Arabic a person who sells amber is called *anbari*, therefore the person who traded in sandalwood was called *sandalani*. The title of saydalani is given to a qualified pharmacist. Supposedly the first person to be given the title of *al-Saydalani* was the Baghdad resident, Abu Quraysh al-Saydalani. Islamic pharmacy involved herbalists, collectors and sellers of medicinal herbs and spices, manufacturers, sellers of syrups, cosmetics, aromatic waters, and pharmacist authors.

Drug stores were first established in Baghdad in 754, where drugs were prepared and sold. The drug stores and the work carried on in them, was inspected by *Mohtasibs* (inspectors). Market Inspectors were responsible for checking the cleanliness of the containers, preparation of drugs and their dispensing. During the reign of Caliph Mamun al-Rashid (d.833) licensing system was introduced.

The druggists and the physicians had to pass an examination in order to obtain a license to practice. Licensed pharmacists were called *Sayadala*. **Sinan ibn Sabit** (d.943), director of Baghdad hospital, was the first administrator of licensing department and founder of public health system.
Islamic pharmacy introduced 2000 new substances including anise, cinnamon, cloves, senna, camphor, sandalwood, musk, myrrh, cassia, tamarind, nutmeg, cloves, aconite, ambergris, and mercury. They introduced hemp as an anaesthetic. They were first to develop syrups and juleps, new pills, elixirs, confections, tinctures, and inhalants. Muslim pharmacists made scientific investigations of the composition, dosages, uses, and therapeutic effects of drugs.

### *Pharmacy during Umayya Period*

The first figure associated with the development of Islamic pharmacy was grandson of Caliph Hadhrat Muawiyyah, **Prince Khalid bin Yazid** (d.704). Khalid was more interested in alchemy than to be a future ruler. He asked alchemist of Alexandria Marianos to teach him alchemy. In order to trans-mutate metals into gold, he collected various herbs, did some experiments but gained nothing. Under his direction, translations of Greek texts into Arabic were made for the first time in the Islamic world. Translators were given stipends, and soon several Egyptian and Greek books of medicine, chemistry and astrology were translated into Arabic. He was the first one to establish a library in the Islamic world.

### *During Abbasid Period*

**Jabir ibn Hayyan** (d. 815 Kufa) was a renowned chemist and alchemist. He is considered to be the father of modern chemistry. In chemistry he emphasized systematic experimentation, and freed chemistry from superstition. He is credited with the invention of over 22 types of basic laboratory equipment, such as the alembic and retort. He invented many commonplace chemical substances – such as the hydrochloric acid, nitric acid and processes – such as sublimation, calcinations, crystallization, evaporation, dissolution.

**Ali Bin Sahl Rabban al-Tabari** (d.870) served as a government officer and physician under the rule of Caliph al-Mu'tasim (833-842). Al-Tabari wrote a famous book *Firdaus al-Hikma* (Paradise of Wisdom) which was completed in 850. In addition to discussing diseases and their remedies, he included several chapters on materia medica. He urged that therapeutic value of each drug be reconciled with the particular disease. For storing the drugs he recommended glass or ceramic vessels for liquid drugs, small jars for eye liquid salves, & lead containers for fatty substances

The first medical formulary (*Aqrabadhin*) was written in Arabic by **Sabur bin Sahl** (d.869). The book included recipes for compounding the drugs, remedies for ailments, their pharmacological actions, dosage and the methods of administrations. It was written as a guidebook for pharmacists. Medical encyclopaedias always had one chapter on *materia medica*, & another on recipes for compound remedies. Drugs were classified into simple (*mufradat*) and compound (*murakkabat*). Compound drugs were considered more likely to be effective, the more complicated and rare ingredients they contained, the more expensive they were likely to be.

Yakoob Ibn Ishaq **Al-Kindi** (d.873) made important contributions in medicine, pharmacy and optics. Of the 265 works he penned, more than 30 dealt with pure medicine. He developed a mathematical scale to determine in advance, based on the phases of the Moon the most critical days of an illness. He invented a branch of medicine called posology, which dealt with the dosages of the drugs. Dosages for the drugs were a guessing game in the ancient world. He created easy-to-use table that pharmacists could refer to when filling out prescriptions. By documenting amounts with a mathematical formula that anyone could follow, al-Kindi revolutionized medicine. Drugs could now be formulated according to set amounts with the result that all patients would receive standardized dosages. His book on posology, *Risala fe ma'rifat quwa al-adwiya al-murakkaba* was translated into Latin as *De Medicinarum Compositarum Gradibus Investigandis Libellus* (The investigation of the strength of compound medicine). In his *Aqrabadain* (Medical Formulary), he describes many pharmaceutical preparations, including simple drugs virtually derived from natural botanical sources as well as animal and mineral sources.

Muhammad Ibn **Zakaria al-Razi** (d.925) introduced into pharmacy the use of mild purgatives, cupping for cases of apoplexy (sudden effusion of blood into an organ) and cold water for fevers. In Baghdad, he was made director of Muqtadari hospital, where he acted as a chemist to mix drugs for patients. He was the first to identify many diseases such as asthma, smallpox, chicken-pox and treated them successfully. He was the first physician who used alcohol as antiseptic. He invented many tools such as the mortar and pestle that are used by pharmacists. His books *Qarabadain Kabir* (The Great Book of Krabadain) , and *Qarabadain Saghir* (The Little Book of Krabadin) were important in pharmacology in that they introduced 829 novel drugs. He promoted the medical uses of chemical compounds. Razi was the first to write a book on home remedies, *Tibb al-Fuqara.* In its 36 chapters, he described diets and drugs that can be found in the kitchens, pharmacies, and military camps. Books on this theme continued to appear until the 20$^{th}$ century. In his famous *Kitab al-Mansuri* he devoted 4 chapters to diets and drugs, toxicology, antidotes, & compound remedies. In his

collection of *Mujarrabat*, i.e. medicine tested in actual cases, Razi described 650 cases of men, women and children. Thus the number of 650 can be extrapolated into a rather large medical practice. A manuscript of *Kitab al-Tajarib* is preserved at Topkapisarayi, Ahmad III, 1975, Istanbul.

**Muhammad ibn Ahmad al-Maqdassi** performed pharmaceutical experiments and wrote several books as guides to *materia medica*. Abu al-Qasim al-Zahrawi (936-1013) pioneered the preparation of drugs by sublimation and distillation. His *Kitab al-Tasrif* (Latin: Liber servitoris) provides the reader with recipes and explains how to prepare the `simples' from which were compounded the complex drugs then generally used.

**Prince of Physicians Ibn Sena** (d.1048) wrote a book *Adwiya al-Qalbiyya* (Cardiac Drugs) which contains 760 drugs. He prepared medications for many kings and Sultans of his time. He devoted a whole volume to simple drugs in his masterpiece *Kitab al-Qanoon fil Tibb*. His most enduring work in pharmacy was laying down the following rules for testing the effectiveness of a new drug or medication. 1. The drug must be free from any extreneous accidental quality. (2) It must be used on a simple, not composite disease. (3) The drug must be tested with two contrary types of disease, because sometimes a drug cures one disease by its essential qualities and another by its accidental ones. (4) The quality of the drug must correspond to the strength of the disease. For example, there are some drugs whose heat is less than the coldness of certain diseases, so that they would have no effect on them. (5) The time of action must be observed, so that essence and action are not confused. (6) the experimentation must be done with the human body, for testing a drug on a lion or a horse might not prove anything about its effect on man.

Ibn Sena's contemporary, **Al-Biruni** (973-1050) wrote one of the most valuable Islamic works on pharmacology entitled *Kitab al-Saydalah fee al-Tibb* (*The Book of Drugs*), where he gave detailed knowledge of the properties of drugs and outlined the role of pharmacy and the functions and duties of a pharmacist. The first part of the book contains authentic definitions of the apothecary art as well as pharmacology, therapeutics and related fields of the healing arts, lexicology and lexicography, toxicology, omissions and substitutions of drugs, and their synonyms. The second part is devoted to *materia medica* in which Biruni explains over 700 simple drugs of the three natural kingdoms scrupulously arranged in alphabetical order. Quite a few of these simples were never mentioned before by the Greco-Roman authors prior to the Arabian period. Many of these, Al Biruni must have observed during his 13 travels in the Indian subcontinent. A pharmacist, he said, is a professional who collects the best and

the finest of the simples and drugs and uses the best of methods for preparing his compounds."
He promoted the academic training of pharmacy students together with day to day practical experience with drugs. He expected these trainees to become familiar with the shapes, physical properties, and numerous kinds of drugs. Thus they would be able to differentiate one from the other. He argued that a pharmacist should be able to substitute one drug for another. The knowledge of how drugs work (pharmacology) is more important than the skill of preparing them. When substituting one drug for another, reactions of each drug should be considered. Cure can be sought through a draft, ointment, anointing oils or by fumigation. In seeking a substitute, therefore all these and other applications should be kept in mind.

**Yahya ibn Jazla** (d.1100) composed *Taqwim al-Abdan fi Tadbir al-Insan*, which consisted of 44 tables. 352 diseases were arranged like the stars in the *Zijes* (astronomical tables), He was the first one to use tabular form of summary. Ibn Jazla also wrote another .work, *Al-Minhaj fi Al-Adwiah Al-Murakkabah*, (Methodology of Compound Drugs), which was translated by Jambolinus and was known in Latin translation as the *Cibis et medicines simplicibus*.

The first pharmacological book by a Muslim was compiled by **Abu Mansur Muwaffaq** who lived in Herat in the 10th century, present day Afghanistan. He was apparently the first to think of compiling a treatise on *materia medica* in Persian; he traveled extensively in Persia and India to gather the necessary information. Around 977 he wrote, *the Kitab al-abniyia 'an Haqa'iq al-adwiya*, (The foundations of the true properties of Remedies) which is the oldest prose work in modern Persian. It deals with 585 remedies (of which 466 are derived from plants, 75 from minerals, 44 from animals), classified into four groups according to their action. The original manuscript of this book is preserved in a library in Vienna. Abu Mansur made a distinction between sodium carbonate and potassium carbonate, and seems to have had some knowledge about arsenious oxide, cupric oxide, silicic acid, and antimony. He knew the toxological effects of copper and lead compounds, the depilatory virtue of quicklime, the composition of plaster of Paris and its surgical use. He also describes the distillation of sea-water for drinking.

### *Pharmacy in Islamic Spain & Maghrib*

**Saeed ibn Abd Rab**bihi (d.960) was a pharmacist-physician of Cordoba. His *Kitab al-Dukkan* (The Pharmacy Shop) consisted of 17 chapters on compound drugs and recipes. **Ahmad Ibn al-Jazzar** (d.984) practiced medicine in Qayrawan, Tunisia. In his apothecary shop in the city of Manastir, he kept syrups, electuaries and other reparations. His shop assistant Rashiq helped in

dispensing the medications. He was well known in Islamic Spain during the rule of Caliph al-Hakam (961-976). By running a successful business he acquired much wealth and fame. His medical compendium *Za'ad al-Musafir* comprised of seven treatises, and divided into two parts. His book *Kitab al-I'timad* al-adwiya *al-Mufrida* was on the pharmacological effects of tried and useful simple drugs. It was translated into Latin, Hebrew and Greek and exerted a profound influence on medical education in Europe. However this book was refuted by Egyptian ibn al-Haitham in his book *Kitab al –Iqtisa'd wal Ijad fee Khata ibn al-Jazzar fil I'timaad".* His book *al-Bughiya* on compound drugs was written as a complimentary to *al-I'timad*. *Tibb al-Fuqara wal Masakin* was intended for poor people who could not afford a doctor and imported drugs. Anyone could cure common diseases by buying readily available herbs.

**Abul Qasim al-Zahrawi** (936-1013) was considered the greatest medieval surgeon and one of the fathers of modern surgery. In volume 27 of his 30 volume magnum opus *Kitab al-Tasreef*, he provided the readers with recipes for preparing *simples* from which were compounded the complex drugs then generally used. He pioneered the preparation of drugs by sublimation and distillation.

**Abu Salt Umaiyah Andalusi** (d. 1134) was a resourceful physician, astronomer, mathematician, and an eloquent poet. His brief compendium on *materia medica al-Adwiyah al-Mufradah* was in use in hospital pharmacies in Egypt. The *simples* were listed according to their therapeutic action on various body organs. The book was translated into Latin by Arnold of Villanova in second half of the 13$^{th}$ century. His works have received good attention especially from German speaking scholarship. **Abdul Malik Ibn Zuhr**( d.1161) wrote *Kitab al-Aghziya* describing various types of foods and drugs and their effects on a person's health. In his *Kitab al-Iqtisad* he gave a summary of diseases, therapeutics and hygiene, written especially for the benefit of the layman. His pharmacopoeia was the first Arabic book to be printed with a movable type in 1491. He developed drug therapy and medicinal drugs for the treatment of specific diseases.

**Qazi Ibn Rushd** (1126-1198) completed in 1162 his seven volume medical encyclopedia *Kitab al-Kulliyat fil Tibb* in which he devoted two volumes to *materia medica* and general therapeutics.

**Ibn Baytar** (d.1248) described some 1400 drugs derived from various plants including some 200 new plants in his book "*Kitab al-Jamey fil Adwiya al-Mufrada*". It was based on 300 actual plants discovered by him along the length of Mediterranean coast between Syria and Spain. This was one of the greatest botanical compilations dealing with medicinal plants in Arabic. The book refers to

works of some 150 previous Arabic authors, and also quotes 20 Greek scientists. According to Max Meyerhof, "it is a work of extraordinary erudition and observation". All the drugs were listed in alphabetical order. The book surpassed that of Dioscorides and remained in use until the 19th century. His second book on the subject *Kitab al-Mughni fil Adwiya al-Mufrada* was published around 1260 where drugs were listed therapeutically. It consists of 20 chapters, dealing with ailments of the head, eye, ear, and general antidotes. Ibn al-Baytar discovered the earliest known herbal treatment for cancer: *Hindiba*, a herbal drug which he identified as having anticancer properties and which could also treat other tumors and neo-plastic disorders. After recognizing its usefulness in treating neo-plastic disorders, *Hindiba* was patented in 1997 by Nil Sari, Hanzade Dogan, and John K. Snyder

Andulasian physician **Abu Ja'afar al-Ghafiqi** (13th century) was a pioneer in medical botany, pharmacy and materia medica. In his encyclopedic text On Simples, he gave more than 350 colored renderings of plants and animals arranged alphabetically. **Haji Zain al-Attar** (1329) wrote a small treatise *Miftah al-Khazain* in 1366 which contained pharmacological information in three parts. The first part is on simple drugs, second on their rectification and the third on compound drugs.

A book on pharmaceutical formulae, *Aqrabadain Kabir* was written by **Sabur ibn Sahl,** was so good that it was imitated by many during the Middle Ages. The original in Arabic was lost, but the Latin translation was used as a model for future Pharmacopeias.

**Ishaq ibn Imran** was an Iraqi physician who moved to Tunisia to serve the prince of Aghlabid dynasty, Ziyadatu –Allah. He was famous for his discourses on melancholy, a treatise on pulse and one on *materia medica*. **Ibn Sulayman al-Israili** was his eloquent student who served the Prince after his master's death. The manuscripts for Ishaq's book on diet and drug therapy entitled, *Aqwil fee Taba'i al-Aghziyya wal 'adwiya* are preserved in libraries of Istanbul, Madrid, Munich and Paris.

**Said al-Tamimi** was born in Jerusalem. His grandfather taught him all aspects of theory and practice of medicine. A Coptic monk Zakariyya bin Sawwab honed his skills in the use of therapeutics and the preparation and compounding of drugs. He also excelled in preparing the great theriac and composed a book on the topic entitled *Fee Sana't Tiryaq al-Farooq wa Na't Ashjarih.* He described therapeutic properties of plants mentioning the time of harvest, methods of collecting, compounding and final theriac preparation. His *al-Murshid* was excellent source for descriptions of natural products and their uses. Part 1 of the book was

devoted to aromatic medicinal plants, flowers, wines, and waters as well as a formulary for preparing syrups, elixirs and ointments. Discussing the theraupetic uses of Dead Sea waters, he says “its waters cur many diseases of man and beast.

### *Pharmacy in India*

Sultan Alauddin Khilji (1296-1316) had several eminent Hakims in his royal courts. This royal patronage was a major factor in the development of Unani practice in India, but also of Greco-Islamic (Unani) medical literature with the aid of Indian Ayur-vedic physicians.

During the reign of Moghul kings of India several Qarabadains were compiled like Qarabadain Shifae’ee, Qarabadain Zakai, Qarabadain Qadri and Elaj-ul-Amraz. In these pharmacopoeias quantities of drugs in a given prescription were specified, and methods of preparation. The court physicians supervised the preparations of royal medicine, which were sealed to ensure safety. Hakeem Ali Gilani was the chief physician of Emperor Akbar and used to accompany him in his travels. Hakim Gilani used to carry his pharmacy with him in these travels. He invented a kind of sweet wine for getting rid of traveling fatigue. During the reign of Emperor Jehangir, Itr-i-Jehangiri was discovered by Queen Noor Jehan. Hakim Ain-ul-Mulk Shirazi composed for his royal patron emperor Shah Jahan *Alfaz-al-Adwiyya* (vocabulary of drugs). It was printed in 1793 in Calcutta, and rendered into English by Gladwin. Hakim Akbar Arzani, was a court physician of Emperor Aurangzeb. He wrote *Tibbe Akbari*, and *Mizan al-Tibb*.

During the British rule, Eastern medicine in India declined. However the famous house of Hakim Sharif Khan of Dehli made a concerted effort to rejuvenate the decaying art of Unani medicine. Hakim Ajmal Khan founded the Hindustani Dawakhana and the Tibbiya College in Dehli. At the Tibbiya College, Dr Salimu-Zaman Siddiqui carried on chemical investigation of certain potent drugs and *Ajmailain* was produced. At Lucknow, the Talim al-Tibb college was established under the auspices of Hakim Abdul Aziz.

Hakim Kabir al-Din was a distinguished author who wrote four books on Eastern system of medicine: Masaela Dauran-ey-Khoon, Sharah Qanoon Shaikh, Tashrih Kabir, Ilm al-Adwiyya and Burhan.

Muhammad Husayn al-Aqili al-Alavi, a practitioner and grandson of a well-known Indian practitioner wrote in 1732 *Makhzan al-adwiyah dar-i bayan-i adwiya. The* illuminated Persian manuscript, now at the National Library of Medicine, USA is in alphabetical order.

At Lahore Hakim Ghulam Nabi and Hakim Ghulam Jeelani promoted Eastern medicine by writing books such as: *Tarikh al-Ittiba*, and *Makhzan al-Adwiyya*. After the demise of Hakim Ajmal Khan, Hakim abdul Majid (d.1922) started a

pharmacy in 1906 which blossomed into Hamdard Waqf Laboratories. Hamdard now is a leading pharmaceutical house in India and Pakistan.

Hakim Syed Zillur Rahman (b.1940**)** is well known for his contribution to Unani Medicine in India. He founded in Aligarh Ibn Sina Academy of Medieval Medicine and Sciences in 2000. He has served as Professor and Chairman, Department of Ilmul Advia (Pharmacology) at the Ajmal Khan Tibbiya College, Aligarh Muslim University, Aligarh, for over 40 years before retiring as Dean Faculty of Unani Medicine. He has authored 45 books and several papers on different aspects of Greco-Islamic medicine. The library named in his honor holds one of the most precious and valuable collection of 20,000 printed books, 500 manuscripts, some rare books, microfilms, compact discs.

### *Pharmacy in Pakistan*

The Unani medical system is still flourishing in Iran and the Indian sub-continent, it is especially strong in Pakistan. The Unani system is sometimes called Hikmat or Unani-Tibb. Its medical practitioners are called Hakims. In Karachi Hamdard is a household name and employs thousands of doctors, scientists, pharmacists, and chemists. The Society for the Promotion of Eastern Medicine has compiled a comprehensive pharmacopeia of Eastern medicine in Urdu and English. It sets out standard procedures for the preparation of drugs, powders, calcinated medicine i.e. Kushtas, syrups and sherbets.
Under the leadership of Hakim Mohammed Said (d.1998), Hamdard Dawakhana expanded its mission; in addition to becoming a mega Foundation, it established an academy that became a major University (which includes a department of Eastern Medicine as well as other medical sciences), and a trust to house scholars and students. The pharmaceuticals branches in Delhi and Karachi have become the world's largest producers of Unani products. There are nearly 30 other major herbal companies in Pakistan that follow Hamdard's lead. It has published 300 medical books.

| **Botanical Name** | **Common Name** |
|---|---|
| Terminalia species | Beleric myrobalans |
| Emblica spp. | Myrobalans |
| Ptychotis ajowan | Ajowan |
| Cassia angustifolia | Senna |
| Foeniculum vulgare | Fennel |
| Cinnamomum zeylanicum | Cinnamon |
| Sesamum indicum | Sesame seed |

| | |
|---|---|
| Piper nigrum | Black pepper |
| Coriandum sativum | Coriander |
| Glycyrrhiza glabra | Licorice root |
| Mentha spp. | Peppermint |
| Viola odorata | Violet |
| Rosa damascena | Red rose |

Note:
*Materia medica* are books that deal with known curative substances, their origin, identification, & classifications as natural products from plant, animal and mineral.
How these substances are collected, prepared, and administered in the treatment of disease is described in these books. (zakaria.virk@ontario.ca)

**References:**


Hakim Mohammad Said: Pharmacy and Medicine Thru the Ages, Karachi, 1980.
Hakim Mohammad Said: Medieval Muslim Thinkers, Dehli, 1991
http://www.ishim.net/ishimj/4/02.pdf - contributions of Razi in the history of Pharmacy.
http://www.cancerlynx.com/FRONTsection.PDF Dioscorides MateriaMedica online
Hakim Mohammad Said: Greco-Arab concepts on Cardio-vascular disease, 1983 Karachi
Mahmoud Sadek, Arabic materia medica of Dioscorides, Quebec, 1983
Franz Rosenthal, Science and Medicine in Islam, Vermont, USA, 1990
Howard Turner, Science in Medieval Islam, Illustrated Introduction, Austin, USA, 1995
http://www.ibnsinaacademy.org/ Ibn Sena Academy, India
Tony Abboud, Al-Kindi- father of Arab philosophy, New York, 2006
S.K. Hamarneh, Health Sciences in Islam, Dec. 1984
Dr. A.Y. al-Hassan, Science & Technology in Islam, part II, UNESCO, Paris, 2001