MINI-REVIEW

The Interaction between Hellenic and Persian Pharmacology: What's the output?

Azam Khosravi¹, Saeed Changizi-Ashtiyani¹* and Saeed Amini²

¹Department of the History of Medical Sciences, Traditional and Complementary Medicine Research Center, Arak University of Medical Sciences, Arak, Iran
²Department of Health Services Management, Khomein University of Medical Sciences, Khomein, Iran

Abstract:

Background: Pharmacology has always been of utmost significance to Persian and Hellenic ancient scientists and presented their viewpoints in medical texts. The aim is to assess the interaction between Hellenic and Persian pharmacologists and the resulting output.

Methods: Using descriptive-analytical method, primary Persian sources written by scholars such as Raban Tabari, Rhazes, Avicenna, and Jorjani, and also the works by prominent Greek scholars including Theophrastus, Hippocrates, Dioscorides, and Galen were searched using selected keywords, based on inclusion and exclusion criteria, without time limit in domestic and foreign databases. Finally, the PRISMA diagram was drawn.

Results: Studies show that Persian and Greek doctors have tried to develop the concepts of pharmacology and its applications interactively. In this research, pharmacology in Persian and Greek medical traditions is studied, and their mutual contributions are depicted. The concepts of medicine and pharmacology in Greek and Persian medicine are first analyzed. The reciprocal impacts of these two schools of pharmacology are explored, and at the end, the Persian scholars who have cited Greek scholars in their works are introduced.

Conclusion: With the expansion of territories, ancient theories from the farthest lands entered the realm, introducing new drugs and ideas, which by the critical approach of the Persian scholars were sometimes modified and developed.

Keywords: Pharmacology, Greek medicine, Persian medicine, Cure, Drug, Hellenic and persian pharmacologists.

1. INTRODUCTION

Since the beginning of their creation, human beings discovered that some natural materials could heal or relieve pain, which they later called drugs [1]. A drug is a substance that can alter the function of cells and organs [2]. However, according to Avicenna (980-1037 AD), the best medical school is the one that never prescribes drugs [3]. On the other hand, Hippocrates (460–377 BC) says that disease is first treated with medicine, surgery, and finally, cauterization. If it is not cured even by cauterization, it is not curable. Medication was just one of the three most essential treatments [4].

Medicine and medication in ancient Persia had a valuable status. In the Achaemenid period, the medical achievements of other nations were welcomed in Persia, and their knowledge in that field was fully adapted and used. There was a knowledge of medicine and pharmacy in ancient Persia before the Avestan period. With the advent of Zarathustra, a distinguished physician, this knowledge, together with various other sciences, spread and extended to other civilizations [5, 6].

The present study deals with the impact of two medical schools of Persian Greek on medicine progress, especially pharmacy.

2. METHODS

In this descriptive-analytical library research, the first
articles related to pharmacology, pharmacology works, Greek medicine, Persian medicine, Unani Medicine, Rhazes, and Hippocrates, were done in databases Ovid, Pubmed, Science direct. After saturating the information according to PRISMA’s statement, the articles were screened (Fig. 1), and finally, the report was taken into note. Also, to examine the books of prominent sages of Persian and Greek medicine in more detail, such as the book Al-Hawi Fi Al-Tib (Liber Continens), Al-Qanun Fi Al-Tib (The Canon of Medicine), Hippocratic Corpus, and De materia medica. After completing the notes, collecting related materials, and analyzing them, each was placed in the appropriate place in the article. Finally, the final summary and research were presented.

3. RESULTS

On the one hand, pharmacological terms in Greek have been derived from the Pahlavi language. Throughout the later developments, drugs such as camphor and tamarind entered the Islamic pharmacopeia, which did not exist in Greek sources [7 - 9]. On the other hand, the influence of Greek pharmacology on Islamic pharmacology was tremendous and widespread. Many of the drugs and pharmacological terms in Persian-Muslim pharmacopeia in Arabic and Persian are derived from Greek. The word “Qarabadin,” meaning pharmacology book, is taken from the Greek word graphidion, meaning “booklet.” Other examples include theriac, stater, apisinton, skilla and staphylinos [10].

3.1. The influence of Persian Civilization on Greek Medicine

According to various sources, in the 5th-3rd centuries BC, the Greeks were very advanced in science and technology, especially medicine. Achieving these fantastic advances, especially in a short time, is practically impossible without a previous scientific background. For example, even the Greeks themselves called The theory of the four humours (blood, phlegm, yellow bile, black bile) a foreign and Iranian hypothesis. Generally, Hippocrates' works and speeches are pretty new, and there is no sign of gradual scientific evolution. Naming compounds and buildings as common everyday objects, naming body parts with Indian and European roots, and the abundance of Babylonian names are examples of these [11].

Regarding the influence of Persian pharmacy in different eras, Professor Howard writes: "The creator and innovator of modern chemistry and modern pharmacy is Rhazes. It must be admitted that the new pharmaceutical system is the product of Rhazes’s experiments on animals [12, 13]."

![PRISMA flow chart for search and article selection method.](image-url)
3.2. Greek Medicine and its Impact on the Persian School of Medicine

In ancient Greek medicine, the prescription of drugs was only one of the three most important treatment methods. The other two were regimen and surgery. It was a very privileged categorization in the healthcare sector because the doctor had to have a comprehensive overview of the human body for treatment and preserving the body's balance. There is very little information about pharmacology in early Greek poetry (the 8th century BC). In Iliad, the drugs used were mentioned only briefly. The medications used in the Iliad and Odyssey were not named [12, 14].

In ancient Greece, making, preparing, and prescribing drugs were done by doctors or under their supervision, but sometimes the professions of physicians and pharmacists were not sharply differentiated [15]. The wine was the basis of many drugs as it had different effects when consumed because alcohol alleviated the person and affected skill control. However, regarding addiction to it and its damaging impact, some Christian sects demanded the destruction of all vineyards [16].

The way the Greek knowledge reached Iran, the Achaemenid Empire highly respected scholars and experts. Among prisoners who fell into the hands of the Persians in wars or refugees who sought asylum in the Achaemenid Empire, the craftsmen and scholars were treated with open arms. The physicians had a special place in the Achaemenid court, a fact many sources prove. One of the famous Greek doctors who served in the Achaemenid court was Katzias [17]. After Alexander's invasion and the spread of Greek culture in Persia, there established a very influential university-based on Greek sciences during the Sassanid period, which remained active even long after the advent of Islam. In addition, it served as one of the reasons why Muslims in the early centuries of the Islamic era became interested in Greek medicine [18].

According to the existing documents, Theophrastus (287-371 BC) was the first person in the West and ancient Greece to specialize in studying plants in a specialized way. He wrote extensively about plants, minerals, and perfumes. He described more than 500 plants by their morphology, biological properties, and medicinal uses [19]. After him, Diocles of Caristius wrote the oldest known book on medicinal plants around 295 BC, and the peak of Greek pharmacology emerged in the first century AD. A scientist named Dioscorides wrote a pharmacopoeia called De materia medica in 5 volumes, which remained valid until the 17th century [20, 21]. After him, Galen introduced various cooling ointments in pharmacology. The development of pharmacology culminated in the time of Galen but declined in the 3rd century AD with the collapse of the Roman Empire and the dominance of spiritual healing ideas. At this time, Muslims rescued it from decline by translating a Greek pharmacology book and adding new material to it. The Iranians of the Islamic era continued the path of pharmacological development and surpassed the knowledge of Theophrastus and Dioscorides.

This tradition reached its peak in the Safavid period, which was called the “Golden Age of Pharmacology.” Muslims divided drugs into compound and specific categories and called them “aqiqir.” There were several types of drug books in the field of toxins, including a list of combination drugs. Rhazes, an Iranian scientist, was one of the first scientists to make chemical drugs in the laboratory. He referred to 800 medications (primarily herbal) and discussed pharmacology's theoretical and practical foundations. In addition, Abu Rihan al-Biruni (937-1048 AD) was known as the founder of native botany in pharmacy. In addition, Iranian physicians reject the old idea that bad-tasting drugs work best. Instead, they made great efforts to make their forms of medicine by covering the tablets with gold or silver foil (gilding or silvering) and using sweeteners. They also preserved pharmacological knowledge by translating a variety of books. In the tenth century AD, with the resurgence of medical science in Europe, these books were translated from Arabic into Latin and taught in emerging European universities such as Salerno [12, 19].

3.3. Greek Scientists Cited by Persian Scholars

Muslim Persian medical practitioners used to refer to the Greeks in their works. However, Muslim scholars never dogmatically followed the writings of Greek scientists. They transformed the raw materials from Greece and Persia and evolved a new school of medicine based on their own experience. When Islamic physicians started to study the works of the ancient scholars critically, they managed to write over a thousand books in medicine that greatly surpassed all the books of the olden time of Hippocrates. They highly influenced the works of their successors up to the 16th and 17th centuries [11, 12, 22].

Following are some of the essential Persian botanists and pharmacologists who cited Greek scholars in their works.

3.3.1. Ali ibn Sahh Rabban Tabari (838-870 A.D.)

Ali ibn Rabban Tabari was the first great Islamic physician at the beginning of the eighth century A.D. Ferdos al-Hakma cited 20 new plants that the Greek scientists had not identified, with Persian and Arabic names. He combined Hippocratic and Galenid medicine with Indian knowledge [23 - 25]. Ibn Rabban in Ferdos al-Hakma referred to Galen repeatedly: "The Galinid pill is good for neutralizing dense and sticky phlegms and beneficial for treating headache [26]."

3.3.2. Mohammad ibn Zakaria Razi (865-925 A.D.)

The role of Mohammad ibn Zakaria Razi (Latinized as Rhazes) in Islamic medicine is similar to that of Hippocrates in Greek medicine [24, 27, 28]. Perhaps, it can be said that Rhazes and Avicenna founded modern western medical science by enriching the Greek medical tradition. The books of these two scholars, Al-Mansouri Fi Al-Tib (The text on medicine dedicated to al-Mansour) and The Canon of Medicine, were studied as important books throughout Europe. They are still in use in different libraries in different libraries Europe [29, 30]. Rhazes is the first person who benefited from Hippocratic writings on a large scale for the formation of his medical system. He also set the principles of Hippocrates as his guidelines in the practice of medicine. In Al-Hawi Fi Al-Tib (the comprehensive book on medication), Rhazes cited
traditional single and compound medicines. The author Din Ali ibn Hussein available today. The book contains Khanzeer disease (scrofula), Tuberculosis of the lymph nodes. The reason, according to Galen, is that it weakens the overeaten. Galen believes it to be warm in apposition to subtle and soon evaporates; it causes cold and harms if warm tendency. However, Avicenna says this warm nature is believes it to be dry at the third degree. Galen says it has a cold at first and dry at second degree. Ibn Jerih, however, "Coriander is bitter, astringent and delicate, and is said to be writings of various nations and scientists. he writes: "And Galen states that the Indian oyster is excellent for heart pain relief and, when it is ground and applied with vinegar to the parotids, it permanently cures headache and cold [41]."

3.3.8. Mohammad Momen Tonekaboni (16th century)
Tonekabni, in his book Tohveh Hakim Momen, incorporated the Indian and Greek knowledge with his experiences and discoveries about medicinal plants and described them alphabetically [40]. He repeatedly referred to Greek scientists and physicians in his book, including Galen, Hippocrates, Plato, Aristotel, Dioscorides, Ptolemy, Oribasius, and Paul and Hermes. For example, under the entry of oyster, he quoted Galen: "And Galen states that the Indian oyster is excellent for heart pain relief and, when it is ground and applied with vinegar to the parotids, it permanently cures headache and cold [41]."

3.3.9. Seyyed Mohammad Hossein Alavi Aghili Khorasani (18th century)
His most important work was the majma al javameh (the Most Comprehensive Book), which itself included 3 books of the Great Qarabadj, Makhzhan al Advieh (the Treasure of Drugs), and Kholasat al Hekma (the Summary of Medical Science). As an example, in the book of the Great Qarabadjneh on the combination of antidote Farouk (theriac-farouk), he explained:
"The antidote Farouk was developed in the course of one thousand four hundred and sixty-nine years due to the endeavors of nine great scholars, that is, Andromachus I, Euclid, Philagrius, Faraghlis, Pythagoras, Marinus, Magnus of Mesa, Andromachus II, and Galen. All, except Galen, tried to improve it. Galen did not change it as it had come to ultimate perfection by Andromachus II [42]".

CONCLUSION
In conclusion, it is possible to determine that the Islamic school of medicine had a significant role in preserving the pre-Hellenic knowledge of pharmacology. In addition, Islamic civilization added a lot to this knowledge to the extent that pharmacology was recognized as one of the epochs of Islamic culture. With the expansion of Islamic territories, ancient theories of farthest lands entered the realm of Islam, introducing new drugs and ideas, which by the critical approach of the Islamic scholars were sometimes modified and developed.

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CONFLICT OF INTEREST
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REFERENCES
[1] Jamshidi-Kia F, Lorrigoozini Z, Amini-Khoei H. Medicinal plants: Past history and future perspective. Journal of herbed pharmacology 2018; 7(1): 1-7.
[2] Almraooz OA, Miah MK, Venkataramanan R. Drug metabolism in the liver. Clin Liver Dis 2017; 21(1): 1-20. [http://dx.doi.org/10.1016/j.clld.2016.08.001] [PMID: 27842765]
[3] Shahpesandy H. Abu Ali Sina (Avicenna): Treatment of The Boyid Prince suffering from melancholy with delusional metamorphosis of boanthropy. Int J Methods Psychiatr Res 2020; 3(1): 1-4.
[4] Goyette M. Deep Cuts: Rhetoric of Human Dissection, Vivisection, and Surgery in Latin Literature The Body Unbound. Springer 2021; pp. 101-37.
[5] Eslamifar Z, Karimi B, Ahansazan H. European Medicine and Physicians in Safavid Iran. Journal of Research on History of Medicine 2021; 10(2): 113-26.
[6] Farahi OR, Mozaffarpur SA, Gasemi V, et al. Diagnostic Properties and Significance of Tongue in Persian Medicine and Chinese Medicine. Curr Tradit Med 2021; 7(3): 362-71. [http://dx.doi.org/10.2174/221508380992008111612446]
[7] Montgomery S. Mobilities of Science: The Era of Translation into Arabic. Isis 2018; 109(2): 313-9. [http://dx.doi.org/10.1086/698236]
[8] Sadeghi S, Ghaffari F, Heydarian G, Alizadeh M. Galaen’s place in Avicenna’s The Canon of Medicine: Respect, confirmation and criticism. J Integr Med 2020; 18(1): 21-5. [http://dx.doi.org/10.1016/j.jiome.2019.11.002] [PMID: 31787564]
[9] Sachan A, Kumar S, Kumari K, Singh D. Medicinal uses of spices used in our traditional culture: Worldwide. Journal of Medicinal Plants Studies 2018; 6(3): 116-22.
[10] Alem M, Khan MI, Danish M, Ahmad A. History and Traditional uses of Tisyaq (Theriac): An important formulation in Unani medicine. Journal of Phytopharmacology 2020; 9(6): 429-32. [http://dx.doi.org/10.31254/phyto.2020.9608]
[11] Sigerist HE. A history of medicine. Oxford University Press 1987.
[12] Higby GJ, Urick BY. History of pharmacy Remington. Elsevier 2021; pp. 3-22.
[13] Farsam H. Brief History of pharmacy ethics in Iran. J Med Ethics Hist Med 2009; 2: 13. [PMID: 23080877]
[14] Limneos P, Kostroglov A, Siotis S, Markatos K, Saranteas T, Mavrogenis AF. The Asclepian art of medicine and surgery. Int Orthop 2020; 44(10): 2177-83. [http://dx.doi.org/10.1007/s00264-020-04640-8] [PMID: 32500309]
[15] Nagales LM. An epic history of pharmacy: Pharmacy in the ancient world: Ediciones Universidad de Salamanca. 2018.
[16] Nikolova P, Stoyanov Z, Doncheva D, Trendafilova S. Wine as a traditional and folk food product in Bulgaria: Ediciones Universidad de Salamanca. 2018.
[17] Padmanabhan T, Padmanabhan V. The legacy from the arab world The dawn of science. Springer 2019; pp. 55-67.
[18] Mohammadifar S. Classification of Plants in De Materia Medica (al-Hashîl ish) of Dioscorides. J Sci His 2015; 13(2): 213-36. [In Persian].
[19] Pormann PE. The formation of the Arabic pharmacology between tradition and innovation. Ann Sci 2011; 68(4): 493-515. [http://dx.doi.org/10.1080/00015458.2011.594619] [PMID: 22332490]
[20] Broumand B. The contribution of Iranian scientists to world civilization. Arch Iran Med 2006; 9(3): 288-90. [PMID: 16859071]
[21] Azimirad A. Cesarean Section Beyond Cesar’s Borders: A Mini Review on the Cultural History of Cesarean Section High Prevalence rates in the Middle East. Arch Iran Med 2020; 23(5): 335-7. [http://dx.doi.org/10.34172/aim.2020.23] [PMID: 32383618]
[22] Jeer H, Ed. Avicenna, Al-Qanun fi’l-tibb. Beirut: Dar-ul-Hilal: Beirut: Dar-ul-Hilal 2009.
[23] Fatimi SO. Abu mansur on ayurveda. Anc Sci Life 1981; 1(1): 32-40. [PMID: 22556459]
[24] Movafagh-Heravi A. Al-Abniyeh An-Haqaeqe al-adawiye. Tehran: Tehran University of Medical Sciences 2009.
[25] Jorjani SE. Zakhireh Kharazmshahi. Tehran: Safir Ardehal 2000.
[26] Montgomery S. Linking omics approaches to medicinal plants and human health: Ediciones Universidad de Salamanca. 2018.
[27] Adams N, Al-Ansari N. The Greeks and the Sassanids: A new Glorious Era for Agriculture (330-625 AD). J Earth Sci Geotech Eng 2020; 10(3): 113-5.
[28] Khorasani A. Brief review of Al-Azhari’s views on diagnosis of diseases through urine examination. Iran J Kidney Dis 2014; 8(4): 278-85. [PMID: 25501133]
[29] Atarzadeh F, Jaladat AM, Daneshfard B, Dastgheib L, Kamalinejad M, et al. A review on medicinal and traditional uses of Zeyad colocasia (Albizzia) and its extracts in treatment of gout. Iran Red Crescent Med J 2012; 14(2): 108-12. [PMID: 22737564]
[30] Fatimi SO. Abu mansur on Ayurveda. Anc Sci Life 1981; 1(1): 32-40. [PMID: 22556459]
[31] Movafagh-Heravi A. Al-Abniyeh An-Haqaeqe al-adawiye. Tehran: Tehran University of Medical Sciences 2009.
[32] Jorjani SE. Zakhireh Kharazmshahi. Tehran: Safir Ardehal Publications 2015.
[33] Amidzad A. Cesarean Section Beyond Cesar’s Borders: A Mini Review on the Cultural History of Cesarean Section High Prevalence rates in the Middle East. Arch Iran Med 2020; 23(5): 335-7. [http://dx.doi.org/10.34172/aim.2020.23] [PMID: 32383618]
[34] Prusa L. Ctesias in the achaemenid persia?. 2021.
[35] Adamo N, Al-Ansari N. The Greeks and the Sassanids: A new Glorious Era for Agriculture (330-625 AD). J Earth Sci Geotech Eng 2020; 10(3): 113-5.
[36] Kumar A, Kumar S, Thomas TD, Ramchiary N, Swamy MK, Ahmad I. Linking omics approaches to medicinal plants and human health Natural bio-active compounds. Springer 2019; pp. 31-57. [http://dx.doi.org/10.1007/978-981-13-7438-8_2]
[37] Urzun M, Kuyucucu AD, Gunduz O. 3D-printed lanolin-based sodium alginate wound dressings Engineering materials for stem cell regeneration. Springer 2019; pp. 217-36. [http://dx.doi.org/10.1007/978-981-16-4420-7_9]
[38] Gutiérrrez-Rodilla B, Quijada-Diez C. Stranded encyclopedic medical dictionaries in eighteenth-and nineteenth-century spain Stranded encyclopedias, 1700-2000. Springer 2021; pp. 169-97.
[39] Aliagzi Z. Reflections on avicenna’s impact on medicine: His reach beyond the middle east. J Community Hosp Intern Med Perspect 2020; 10(4): 310-2. [http://dx.doi.org/10.1080/20009666.2020.1774301] [PMID: 32850806]
[40] Meyerhof M. ‘All at-Tabarî’s “Paradise of Wisdom”, one of the oldest arabic compendiums of medicine. Isis 1931; 16(1): 6-54. [http://dx.doi.org/10.1086/346382]
[41] Atarzadeh F, Jaladat AM, Daneshfard B, Dastgheib L, Kamalinejad M, Amin G. A review on botanicals with wound healing activity for pemphigus vulgaris: perspective of traditional Persian medicine and conventional medicine. Avicenna J Phytomed 2017; 7(6): 486-94. [PMID: 29299431]
[42] Aghil-Alavi MH. Gharbghan kabir. 10th ed. Tehran: Marvi 1996.