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Arabic Medicine: Contributions and Influence

by

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Abstract

Modern western medicine has its roots in the time of the experimenters of 16th century Europe. Appealing to nature directly for knowledge led to revolutionary advancements and eventually brought medicine into the modern age. When this level of progress is compared to the medicine of the past, the latter often pales in comparison. A consequence of the contrast is a lack of appropriate recognition of those in history who contributed to the field of medicine.

The lack of attention given to pre-modern time's results from how the history of medicine in the west has been commonly interpreted. The separation of eras into timelines with clear breaks in the development of new ideas results in a greater emphasis on the contributions made during the renaissance and by the fathers of Greek medicine. This disjointed view of history has been challenged by the concept of continuity. Continuity proposes that ideas have developed continuously, passing through different cultures and places through the ages.

To exemplify these points, I examine the Arabian period (7th-13th centuries) in science and medicine. Contributions and influence from this period have been given only passing recognition. Having been largely separated from the "timeline of progress," Arabian Medicine has been devalued. The concept of continuity challenges the commonly held belief that the Arabs were simply custodians of Greek medicine. The history of Arabian medicine portrays a time of significant advancement in the practice, understanding and delivery of medicine. It also provides one of the most significant examples of culture-drift in history. This paper will discuss the medical influences from this region, their spread throughout Europe and lasting influences on the practice of medicine.

Introduction

The history of medicine has been divided into periods. These periods have been associated with particular advancements, but before the period of modern, are usually associated with a particular civilization. Western medicine, which reflects western civilization's dominance in modern period, has its roots in the history of Europe. Thus, when the history of the progress medicine is viewed, only those periods that correspond to European civilizations are highlighted. This tends to create a disjointed view of history where Greek medicine (400 BC to 200 AD) and the Renaissance (14th-17th centuries) are overrepresented. A more accurate view of the progress of medicine throughout history is one of continuity. It suggests that medical progress has occurred through the

collective efforts of many nations. Furthermore, the knowledge gained by each was shared and was influential in further development.

The disjointed view has caused significant periods to be ignored. One such period is the Arabic period (7th to 14th centuries). This period is considered one of the “most romantic” periods in the history of medicine and one of importance in the history of western medicine. The Arabian period corresponds with the Islamic civilization which became dominant after the fall of the Roman and Persian empires, and remained so throughout the middle-ages. While European history has often described the period as the “Dark Ages,” those living in Islamic lands lived at a time of intellectual curiosity and broad tolerance. They cultivated learning and brought advancements to civilization, including medicine. However, even when Arab Medicine is considered, some historians reduce the Arabs to simply inheritors and transmitters of Greek medicine. Indeed, that is not the case. In fact, they raised the dignity of the medical profession and advanced the medical and allied sciences. These accomplishments were achieved by the work of many Arabic medical authors, those of repute numbering over 400. Those who are known to have had a strong influence on later European medical thought will be mentioned.

The Early Period

The rise of the Arab civilization began with the advent of a Prophet named Mohammad (570-632 AD). The religion which he brought, *Islam*, united the Arabs into one nation with one language. As Islam presented itself as the religion for all of mankind, following Mohammad's death Islam spread rapidly. Persia became part of the Islamic lands in 636 AD, and it is here where Arab medicine found its roots. The famous medical school at Gundishapur was founded by exiled Nestorian physicians and exiled Pagan philosophers around 529. The Nestorian scholars were excommunicated by Byzantine Emperor Zeno (ca. 425-491) in 489 AD due to religious differences. As a result they moved east and found refuge in Arab and Persian lands. The Pagan philosophers, on the other hand, were excommunicated by Justinian I. (527-565) following the closure of Plato's Academy in 529 AD. The school was already an established university under the Sassanid Dynasty (2nd to 7th centuries) but was developed into a medical school when Greek medical literature came from the west. The first Arab to study at the medical school was in fact a cousin of Prophet Mohammad, Al Harith ibn Kilda. Following the rise of the Islamic empire, the school became its major centre of learning for the next 200 years, where the works of Hippocrates, Galen, and of other Greek physicians were studied. In addition, the physicians there were also exposed to the medical knowledge of Persia, India, and China.

A major shift occurred during the reign of the Abbasid Caliph al-Ma'mun (813-833) when he opened the University Beit-ul-Hikmat (the “House of Wisdom”) in 832 AD. He placed the school under the guidance of the Nestorian physician Yahia ibn Massawayh (777-857). Baghdad had become the capital of the Empire and the seat of economic activity. Soon after, many other Nestorian physicians followed. This helped Baghdad become the new dominant centre of learning. One of the schools achievements was the initiation of a translation movement. Paper had been brought from China and by the 9th century, was put to wide use by the Arabs. Yahia ibn Massawayh translated many Greek texts himself, but the most influential figure in the translation movement was one of his students the Nestorian Hunayn ibn Ishaq (826-882). He and his son organized a school of translation which in less than twenty years translated over 300 books into

Arabic and Syriac. Among them, was the entire body of Greek medical texts, including the works of Galen, Oreibasios (ca. 325-403), Paul of Aegina (625-690), Hippocrates, and the *Materia Medica* of Pedanios Dioscurides (1st century AD). This served two purposes. First, it allowed Greek medicine to be preserved, as the original manuscripts were lost, and second, it stimulated interest in medical learning across the empire. The Greek texts were now available for open study and served as the knowledgebase for further progress. The Arabs first wrote extensive commentaries on the books of Galen and Hippocrates then began producing original works by the middle of the 9th century. These works came from all corners of the kingdom, both from the eastern caliphate based in Baghdad and the Western caliphate based in Spain. And as the kingdom stretched across two continents, medical authors came from people of different cultures and religions who worked with the Muslim Arabs. They all however published in Arabic, the language of literature, arts and sciences, and the common tongue of the educated.

Donald Campbell in his book, *Arabian Medicine and its Influence on the Middle Ages*, wrote in 1926, "The Arabians raised the dignity of the medical profession from that of a menial calling to the rank of one of the learned professions." The statement reflects significant achievements made during the Arab period. These include the introduction of the use of licensing and qualifying examinations for admission to the medical profession, the separation of medicine and theology, and the systematizing of medical knowledge.

The first record referring to medical licences or an "*ijazah*" is in the mid 10th century during the time the Abbasid caliph Al Muqtadir (d. 932). Students would be required to pass an examination in their particular specialty, which included ophthalmology, medicine, and surgery. The certificate would then be issued by the Chief physician at the time, the first being Sinan ibn Thabit (908-946). However, there is no evidence that suggests all physicians were required to meet these standards aside from those that were employed at the state hospitals. Nonetheless, the standardization of the medical field lifted it above the level of the quack and the charlatans.

Secularism in Islamic lands has been largely attributed to the work of two individuals from the Western and Eastern caliphates. The first was the Abbasid caliph Harun al-Rashid (763-809) and the second was the Andalusian physician-philosopher Abdul Walid Muhammad ibn Ahmed ibn Muhammad ibn Rushd, known by his latinized name Averroes (1126-1198). Harun al-Rashid was the fifth Abbasid caliph born in Rayy, Iran and was known in Europe as "Aaron the Upright" and "Aaron the Just". His time was marked by scientific, cultural, and religious prosperity. He stood aloof from all religious sectarianism and boldly fought blind dogma. He upheld justice and tolerance and was open to Greek thought and philosophy irrespective of its pagan origins. Ibn Rushd was born in Cordoba, Spain some time after. He was a large proponent for the separation of religion and reason. His work became to be known as Averroism. As he lived in the Western caliphate his work also affected European thought. As a result he has been described as the founding father of secular thought in Western Europe. This work was a critical factor in allowing scientific thought, including medicine, to progress uninterrupted.

The last main feature of the Arab period which brought medicine into the field of one of the learned professions was the systematizing of all the then known medical knowledge. Once again this was facilitated by the widespread use of paper in Arab lands. Literature was published on specialized topics but other made comprehensive attempts at collecting and systematizing the fragmentary and unorganized Greco-Roman medical literature that had been translated into Arabic. Two authors who wrote such

compendiums were Ibn Sina or Avicenna (937-1037) and Al-Majusi or Haly Abbas (d. 994). Their works, *The Canon of Medicine (Kitab al-Qanun fi al-tibb)* and *The Complete Book of the Medical Art (Kitab Kamil al-sina`ah al-tibbiyah)*, were enormously successful in producing a coherent and orderly medical system.

Along with organizing the medical knowledge they received from other cultures, the Arabic medical authors added extensively to the medical sciences with their original works. The following are some of the most notable authors who also had a strong influence on European medical thought, written in order of time along with their Latinized names: Ibn Ishaq – Johannitius (809-873), Al-Razi – Rhazes (841-926), Al-Majusi – Haly Abbas (d. 994), Al-Zahrawi – Albucasis (936-1013), Ibn Sina – Avicenna (937-1037), Ibn Zuhr – Avenzoar (1090-1162), Ibn Rushd – Averroes, Musa ibn Maymun – Maimonides (1135-1204), and Ibn Nafis – Annafis (d. 1288).

Aside from being known for his translations of Greek texts, Ibn Ishaq (809-873) was also well known for his book, *Ten Treatises on the Eye*. It is considered to be the earliest existing systematic textbook of Ophthalmology.

Rhazes (841-926), a Persian, is regarded as Arab medicine's greatest clinician. Some western writers have compared him to the likes of Galen and the historian Max Meyerhof has considered him to be the second Hippocrates. He was a prolific writer, writing over two hundred books; over half being on medicine. One of his treatises, *The Diseases of Children*, has led some historians to regard him as the father of pediatrics. He advocated for the reliance on observation rather than received authority and through this conviction clinically described various pathology and normal physiology. For example, he was the first to describe hay fever and its cause, the first to observe papillary reaction to light, and the first to distinguish measles and smallpox. Rhazes was also one of the first systematizers of medicine as he wrote a medical encyclopedia called *Al-Kitab al Hawi* or *The Comprehensive Work*. It became known as *Liber Continens* when it was translated into Latin.

Arab Surgery

The most notable surgeon of Arab medicine was the Andalusian Albucasis Haly Abbas (936-994), also a Persian, was born around the time of Rhazes death. As previously mentioned he wrote an encyclopedia on medicine called *Kitab Kamil al-sina`ah al-tibbiyah* or *The Complete Book of the Medical Art*. Its Latin translation was known as *Liber Regius* or *Pantegni*. This work provides details on a scientific methodology that is similar to modern biomedical research and also included work on neuroscience and psychology. He described the neuroanatomy, neurobiology and neurophysiology of the brain and discussed various mental disorders, including sleeping sickness, memory loss, hypochondriasis, coma, vertigo, epilepsy, love sickness, and hemiplegia. He became one of the most renowned surgeons of his era and was the personal physician to King Al-Hakam II. (915-976). He learned from the works of Galen and Paul of Aegina before contributing his own work. He also wrote an encyclopedia on medicine entitled, *Kitab al-Tasrif li-man `ajiza `an al-ta`lif*, roughly meaning the "arrangement of medical knowledge for one who is not able to compile a book for himself". The *Tasrif*, as it came to be known, has three sections. The last on surgery was broken into three parts: on cautery, on incisions and bloodletting, and on bone setting. His book was one of the first to have systematically arranged illustrations in its writing, with over two hundred illustrations and

descriptions of surgical instruments. For example, he described a bevel-ended cannula for use in drawing off liquid when treating abdominal dropsy and developed variations of the vaginal speculum. Arab surgery was not specialized beyond ophthalmology and so the surgeons at the time were generalists. He described surgical procedures such as patellectomy, tonsillectomy, mastectomy for breast cancer, cauterization to avoid hemorrhage and described "Kocher's method" for reducing a dislocated shoulder before the Swiss surgeon Theodor Kocher (1841-1917) was born. He also worked in the realm of plastic surgery and urology. His technique for breast reduction is used to this day and he introduced a technique to treat urinary calculus using a fine drill inserted through the urethra. Most importantly, however, his work allowed surgery to become integrated into scientific medicine, removing it as a practice for cuppers and barbers.

Systematization

Avicenna, who has already been described as one of the great systematizers of medicine, was born in Persia in the 10th century. He is known in the history of medicine and science as one of the great polymaths of the Arab period and was called the "Prince of Physicians". He was to the Arab world what Aristotle was to Greece, Leonardo da Vinci (1452-1519) to the Renaissance, or Johann Wolfgang von Goethe (1749-1832) to Modern Germany. His most well known medical work was his compendium, *The Canon of Medicine (Al-Qanun fi al-Tibb)*. It is divided into five books; the first two on physiology and hygiene, the third and fourth on treatment, and the fifth on materia medica. In his work, he argued the contagious nature of some diseases, which he attributed to "traces" left in the air by those inflicted. Particularly, he argued the contagious nature of tuberculosis which found initially found opposition in Europe, though he was later proved right. He also described various conditions such as rabies, hydrocele, chronic nephritis, facial paralysis, and hepatitis. *The Canon* was also known for its introduction of systematic experimentation and quantification into the study of physiology and for laying out the basic rules of clinical drug trials. *The Canon* was the final codification of all Greco-Arabian Medicine and became the most influential compendium of medicine, surpassing the works of Haly Abbas and Rhazes.

Ibn Zuhr (1090-1162) or Avenzoar was born in Seville in the 12th century. Studying at the University of Cordoba, he became a well known physician, pharmacist, and surgeon of the Western caliphate. His affiliation with medicine was traditional as he belonged to the well known Banu Zuhr family, which produced five generations of physicians, including also two female physicians. One of the foremost thinkers of his time, he was opposed to medical mysticism and to the reliance on the classics. He was an advocate of observation and opposed the doctrines of Galen and Hippocrates such as the four humours. He refuted it by asserting the cause of scabies to be a parasite. Avenzoar is known for two his works *Al-Taisir (Theiser)* and *Taysir fi al-mudawat wa al-tadbir (Practical Manual of Treatments and Diet)*. In *Theiser* he introduced the experimental method into surgery, described surgical operations for renal calculus and tracheotomy, and described disorders such as serous pericarditis and mediastinal abscess. In *Practical Manual of Treatments and Diet*, he was the first to describe parenteral nutrition for humans using a silver needle. During his career he had the honour of teaching another great Arab physician Ibn Rushd (1126-1198).

Ibn Rushd, known in Europe as Averroes, was born in Cordoba in the 12th century. As previously mentioned he was known for his contributions to secular thought, but he was

also known for his contribution to the medical sciences. His principal work is a medical encyclopedia called *Kulliyat (General Medicine)*, translated into Latin as *Colliget*. Some of his original work included contributions to neuroscience and neurology as well as the physiology of sight. Averroes suggested the existence of Parkinson's disease and was the first to suggest that the principal organ of sight might be the arachnoid membrane (aranea). This led to much discussion in Europe in the 16th century of whether the principal organ of sight was the traditional Galenic crystalline humour or the Averroist aranea. This in turn led to the discovery of the retina.

Another famous physician-philosopher of the 12th century was the Andalusian Musa ibn Maymun (1135-1204), known in Europe as Maimonides. He, in fact, was the student of Averroes and when he moved east became the body physician of Sultan Saladin (1137/8-1193). It has been written that during the Third Crusade, Richard I. (1157-1199) of England tried to secure his services. Maimonides was regarded more as a theorist than as a practical physician. He wrote many specialized medical treatises during his career including one on poisons and their antidotes, diet and hygiene, hemorrhoids, and asthma. His most well-known work is *Fusul Musa (Chapter of Moses)* which is a book of aphorisms. His books were translated to Hebrew and Latin and were read widely in Europe.

A medical author who hasn't received proper recognition until recently is Ibn Nafis or Annafis (1213-1288). Ibn Nafis was born in 13th century. Damascus and was one of the Arab world's prominent polymaths. He was a physician, theologian, logician, philosopher, astronomer, and a science fiction writer. His best known medical treatise is a commentary on *The Canon* of Avicenna. He attempted to make the large compendium more accessible and named it appropriately, *Kitab Mujiz* (The Concise Book). In 1924 an Egyptian physician, Muhyi al-Din Altawi (b. 1893 ?), discovered a script titled "Commentary on the Anatomy of the Canon of Avicenna" in the Prussian State Library in Berlin, while studying the history of Arab Medicine at the Albert Ludwigs University of Freiburg in Germany. It was a section from Ibn Nafis' *Kitab Mujiz* where he describes subjects in anatomy, pathology, and physiology. The discovery contained an important scientific fact which up to then had been ignored; the first description of the pulmonary circulation. In his commentary Ibn Nafis challenges Galen's view that the venous system was separate from the arterial system except when in contact with unseen pores in the heart. Ibn Nafis professed there are no pores in the septum but that the blood moves from the right ventricle to the lungs via the pulmonary artery, "mingles with air," then return to the left chamber of the heart where the "vital spirit" is formed. He confirmed that the septum is not perforated with dissection. Prior to 1924, the discovery of pulmonary circulation was credited to Michael Servetus (1511-1553) of Spain who described it in his book *Christianismi Restitutio* in 1553. The correct description was again published by Andrea Vesalius (1514-1564) in 1555 and Realduus Colombo (1516-1559) in 1559, in their works *De Fabrica* and *De re Anatomica* respectively. Therefore, Ibn Nafis described the pulmonary circulation 300 years prior to its first description in Europe.

Medicine and Allied Sciences

In addition to the medical sciences, the Arab period was marked with advances in the allied sciences as well. These fields included dentistry, chemistry, and pharmacology: Dentistry during the Arab period was not a separate field but a part of medicine.

Physicians such as Albucasis and Rhazes had devoted certain chapters in their works to the subject. Rhazes' *Kitab-Al-Fakhir* has seven chapters on dentistry and Albucasis' book on surgery describes the procedure of replacing decayed teeth with false teeth made from bone. The seven chapters in *Kitab-Al-Fakhir* are "The Teeth," "Teeth on Edge," "Decay of Teeth," "Looseness of the Gums," "Suppuration of the Gums," "Pyorrhea and Bleeding Gums," and "Halitosis." However, one of the first references to oral health comes from the *Hadith*, the recorded oral traditions of Prophet Mohammad. He stressed oral hygiene by the use of the Siwak or Miswak before every one of the five daily prayers. Through cultural and religious tradition this practice became widespread and it is still followed today. The Miswak is a natural toothbrush made traditionally from twigs of the *Salvadora Persica* tree. It has antimicrobial properties and in a recent study published in *Oral Health and Preventative Dentistry* (2003) was shown to be better at reducing plaque and gingivitis than the regular toothbrush.

Al-kimiya, the Arabic word used for chemistry, is recognizable in the English language as "alchemy". Alchemy predates the Arab period by hundreds of years and was practiced all over the world up to the 19th c. It is considered to be an earliest form of the investigation of nature. One of the most well known goals of Alchemy was the transmutation of common metals into gold. The usual activities of alchemy were practiced in the Arab period, however it was in this time when it began taking a new form. Arab al-kimiya was taken into the realm of science and the beginning of modern chemistry was born. Jabir ibn Hayyan (702-765), also known as Geber, was involved in this shift. As a result he is considered the parent of modern chemistry. It was through his work in alchemy that modern chemical processes were created. These included distillation, sublimation, calcination, and filtration. Geber also discovered nitric acid and aqua regia. The origins of the modern classification of elements into metals and non-metals can be seen in his chemical nomenclature, where he proposed three categories, "Spirits" like arsenic, "metals," like gold and silver, and "non-malleable substances" such as stones.

The Arab period was also the time when the Apothecary was invented. In this new field, most of the techniques employed in the new al-kimiya were used for drug production. As a result, the "saydalani" or pharmacist introduced a large number of new drugs into clinical practice. Some of these include senna, camphor, sandalwood, musk, myrrh, cassia, and tamarind. New methods of administering medications were also developed including the solvents rose water and orange-blossom water. The pharmacists of the time added to the materia medica of Greek Dioscorides. This was partly accomplished by their travels to Africa, China, the Himalayas, and Southern India.

One new formulation that influenced surgery at the time was the "soporific sponge," a product that produced anesthesia by inhalation. The 'soporific sponge' was made by placing a sponge in a juice of hashish, papver, and hyocymine. When needed, it would be placed at the patient's nose for the fumes to be absorbed by the mucus membranes causing deep sleep and relief of surgical pains.

A well-known author of the Arab period who expanded the materia medica was Ibn al-Baytar (d. 1248). He was born in the kingdom of Granada towards the end of the 12th century and became the "chief of botanists" in Cairo in the first half of the 13th century. His treatise, *Kitab al-Jami li-mufradat al-adwiyah wa-al-aghddhiyah* (*The Comprehensive Book on Materia Medica and Foodstuffs*) contained over 1400 medicaments.

The contributions that were made to the various aspects of medicine were not confined to the dominions of Arab land. Through Arab Sicily and Arab Spain (Andalusia) their knowledge spread into Europe, influencing medical thought. Though many learned men and women came to study at universities in the Arab world, a larger influence on all of Europe occurred with a translation movement, the same process that stimulated the beginning of the Arab period.

Two individuals akin to Ibn Ishaq, who played key roles in the beginning of the translation movement, were Constantine the African (1020-1087) and Gerard of Cremona (1114-1187). Each was situated in Arab-Christian transition zones, the first at Salerno and latter at Toledo. Here Arabic works were translated into Latin. These not only included the treatises of Arabic authors but also the Arabic translations of Greek works. One of the books translated by Gerard of Cremona that later constituted part of the medical curricula of European universities was Avicenna's *The Canon*. The compendium which Constantine the African had translated which later formed the core curricula of the famous medical school at Salerno was Haly Abbas' *The Complete Book of the Medical Art* which became the *Pantegni*. Later in the 14th c. these works were given a more complete and accurate translation.

All the authors of the medical sciences and allied sciences mentioned previously had their works translated into Latin. Rhazes' book *Al Kitab al Hawi* (*The Comprehensive Work*) became known as *Liber Continens* and the 9th section of his *Kitab Mansuri* was taught in European universities until the end of the 17th century. Albucasis' *At-Tasrif* was being translated as late as the 18th century, when John Channing did so in 1778. His last book on surgery was also used as a medical textbook in the universities of Europe. Its influence can be seen in the French surgeon Guy de Chauliac's *Great Surgery*, completed in 1363, where he quotes *At-Tasrif* over 200 times. As previously mentioned, Averroes' *General Medicine* was also translated Latin and became known as *Colliget*. In addition, Maimonides' *Book of Counsel* was translated to Latin in 1485 in Florentine and again in 1518 in Augsburg. The materia medica of Ibn al-Baytar was also translated. This was done by Andrea Alpago of Belluno (b. 1522) who compiled the book *Ebn Bitar de malis limonis*. It was first published in Venice in 1593 and a German translation was made in Stuttgart as late as 1840.

The translation of the *Concise Book* of Ibn Nafis provides an interesting example of the impact Arabic literature had on subsequent European medical writing. As mentioned earlier, one of the unique features of his treatise was its accurate description of the pulmonary circulation. Andrea Alpago translated the treatise in 1547 and it was only six years later that Michael Servetus of Spain wrote about pulmonary circulation in 1553. The historian Max Meyerhof makes the observation in his book *Studies in Medieval Arabic Medicine* (p. 119):

It is all the more curious to observe that Servetus' [...] famous passage on the circulation of the blood [...] is very similar to certain passages in Ibn an-Nafis commentary. It reads as if it were an extract made from the latter's work.

Conclusion

The impact Arab medical translations had on Europe stretched from the 12th to the 17th century. During this time the works of Rhazes, Avicenna, Albucasis, Avenzoar, and Averroes received more attention than those of Hippocrates and Galen. Two famous European universities that acquired Arabic learning were Montpellier in Paris and Salerno in Italy. Each had a lasting impact on the scholasticism of Europe. The universities at Naples and Oxford, for example, were influenced by the curriculum at Montpellier and also used Arabic works as medical textbooks. The prominence Arabic medical authors had in England can be seen in the “General Prologue” of *The Canterbury Tales* by Geoffrey Chaucer, written in the 14th century. In it he identifies the authorities used by his “Doctor of Physic,” which include among European authors, Haly Abbas, Avicenna, Rhazes, and Averroes. Similarly, in the 16th century a reference to Arabic medicine is given in Shakespeare’s play *Othello*, where he mentions “the gum of Arabia” referring to myrrh. Evaluating the overall contributions made during the Arab period brings into question the disjointed view that the Arabs were merely transmitters of Greek Medicine. History shows that the Arab period was indeed a period of advancement and a significant link in the continuity of progress. The period not only brought medicine into the rank of one of the learned professions, it also advanced the medical and allied sciences. Preserving Greek knowledge and building upon it, the Arab period laid the foundations for the Renaissance. The translation movement that began the Arab period also ended it. And with that end came the rise of European scholasticism that would eventually lead to the period that is called modern medicine.

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