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Some of the pharmaceutical contributions of Abul-Qasim Al-Zahrawi.

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ABSTRACT

The present article sheds the light onsome of the pharmaceutical contributions of Abul-Qasim Al-Zahrawi, known in Western literature as Abulcasis. He lived during the middle Ages from 936 to 1013 AD, and wrote a 30-volume treatise on medicine entitled *Al-Tasrif Leman Ajiz an al-Taalif*. The 28th volume, known as *Liber Servitoris*, was devoted to pharmacy and therapeutics. It was thought that this volume is the only pharmaceutical contribution of Abulcasis, but this view was proven to be wrong, as many other volumes were later found to comprise a lot of pharmaceutical preparations and chemical processes. The *Al-Tasrif*, after all, was written for physicians, not apothecaries; henceforth much of the text dealt with the use of drugs. The *Al-Tasrif* now exists only as volumes and fragments scattered around the world in different libraries, and until the publication of the study by Hamarneh and Sonnedecker (A *Pharmaceutical View* of Abulcasis al-Zāhrāwī in Moorish Spain), and subsequent publications by Hamarneh, only the *Liber Servitoris* and the surgical sections were generally known in the West.

Keywords: pharmaceutical, medicine, abulcasis.

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INTRODUCTION

The great Arabic culture began to thrive after the Muslim conquests. During the enlightened reign of 'Abd al-Rahman III (912-961), Cordoba, and in particular the suburb of the Umayyad royal palace, competed Baghdad in its grandeur until its conquest by the Berbers a century later. With a library of 400 000 manuscripts, it became a great center of learning and scholarship where physicians could study the ancient classics [1, 2].Among the sciences that have been developed by Muslims during the powerful establishment of the Muslim sovereignty in the East are botany, pharmacy and chemistry [3-5]. The study of medicine and other branches of science was reinvigorated and attained a scientific basis between the ninth and the sixteenth centuries [3, 4]. One of the great Moslem scholars who shared in illuminating the path of medical human knowledge is "Al-zahrawi" who is considered as the father of modern surgery[6]. Added to being a physician and a surgeon, he was also a pharmacist and an oculist [7]. He developed a lot of contributions to pharmacy, some of which are mentioned in this article.

Outline Biography

Abu Al-Qasim Khalaf Ibn Abbas Al-Zahrawi, known in the West as Albucasis or Zahravius, was born in 936 AD in Al-Zahra', a suburb, six miles northwest of Cordoba, the capital of Muslim Spain (Al-Andalus)[2]. His ancestors were from the Al Ansar tribes of Al Madina Al Munawwarah who had settled earlier in Spain. He traveled rarely, and spent most of his life in his hometown as a practicing physician-pharmacist-surgeon[8]. Al-Zahrawi became one of the most famous surgeons of the Muslim era and was a physician to Abd al-Rahman III (912–961) and his son Al-Hakam II (915–976) of Spain, the Umayyad Caliphs of Córdoba [9]. After nearly five decades of medical career full with great original contributions particularly in the court of Caliph, Al-Zahrawi died in 1013 AD[10, 11]. A very few details remain about his life. He was mentioned for the first time by the Andalusian scholar, Abu Muhammad ibn Hazm (993–1064), as one of the great physician surgeons of the Moorish Spain. The first known biography of Al-Zahrawi was demonstrated in Al-Humaydi's Jadhwat al-Muqtabis fi Dhikri Volat al-Andalus (On Andalusian Savants) compiled six decades after Al-Zahrawi's death[12].

Al-Tasrif and *Liber Servitoris*

Al-Zahrawi wrote his famous book "*Al Tasreef Liman 'Ajaz 'Aan Al-Taleef*", (The Clearance of Medical Science for Those Who Can Not Compile It). This masterpiece recorded the state of medical and pharmaceutical knowledge 1000 years ago, but unfortunately only parts were ever translated. It included thirty volumes which covered various aspects of medical knowledge. In addition to sections on medicine and surgery, there were sections on midwifery, pharmacology, therapeutics, dietitics, psychotherapy, weights and measures, and medical chemistry[8]. The 28th volume of this great encyclopedia contains a vast amount of chemical, pharmaceutical and therapeutic information, and was translated into Latin in 1288 by Simon of Genoa and printed in Venice in 1471, becoming known as *Liber Servitorisde Praeparatione Medicinarum Simplicium*, or simply *Liber Servitoris*.

It represented a very important source of information on pharmaceutical processes, which several generations of European apothecaries depended on. Unlike Bahgdad, Spain did not adopt apothecary as an independent profession, therefore, physicians there had to compound their own medications. Owing to the absence of a consistent source of written information about such matters, al-Zahrawi wrote the 28th volume of *Al-Tasrif*. Through the years, a lot of people believed that the *Liber Servitoris* represented the complete pharmaceutical writings of al-Zahrawi, which is not true. Other volumes of *Al-Tasrif* gave detailed accounts on a lot of herbal preparations, chemical processes and various dosage forms[13].

Pharmacology

Pharmacology includes an area which is concerned with recognizing and accurate naming of drugs through correct knowledge of Arabic and Greek languages. Volumes of Abulcasis were dedicated to providing synonyms and elucidations for the names of drugs in severallanguages (e.g. Arabic and Spanish)[14]. Drugs and treatment with drugs held an important place in his work where he listed a great number of prescriptions for various diseases. Each prescription gives the weight or volume of the ingredients, the method of preparation and compounding, the dose and the method of administration. The drugs are administered in various dosage

forms (decoctions, potions, syrups, pills, etc). Practical pharmacology, *materia medica*, and the preparation of drugs were widely discussed. He listed Greek and Egyptian weights and measures as well as those used in the eastern caliphate[1]. For epilepsy and seizures, he developed medications called *Ghawali* and *Lafayef*. For the relief and treatment of common colds, he invented *Muthallaathat*, which was prepared from camphor, musk, and honey similar to Vick vapor rub, a modern topical cream. He also invented nasal sprays and hand creams, and developed effective mouth washes. Therapeutics chapters in *Al-Tasrif* discussed emetics, laxatives, dietetics, cardiac drugs, *Materia medica*, cosmetology, and the substitution of drugs for other invasive techniques, among other topics[15]. Duration of the potency of drugs was a problem with obvious importance to pharmacists and their customer. Al-Kuhin Al-Attar said in his book (Minhaj al-dukkan) that one should pay attention to what al-Zahrawi has to say about this subject [16]. The 4th chapter of the 25th volume of *Al-Tasrif* is about the durations of the effectiveness of simple drugs and compound medicines. Greater attention was devoted by AL-Zahrawi to mineral drugs noting that gold and rubies are less corruptible than silver, copper, and iron [17]. The 29th volume included multilingual lists of drug names and synonyms that appeared in it, accompanied by details of their stability, and therefore it represented a great value to apothecaries and pharmacists [13].

Pharmaceutical Chemistry

Liber Servitoris comprised three parts, the first of which dealt with chemistry and processing of various minerals used in medicine including alum (aluminum sulfate), copper, galena (lead sulfide), iron, stibnite (antimony sulfide) and vitriols (natural sulfates). Preparation of verdigis (basic copper acetate) from copper, preparation of sal ammoniac (ammonium chloride) from igneous rocks, preparation of the oxide and carbonates of lead, and purification of ceruse- a white lead carbonate found near Cordoba and was used as a cosmetic- were also discussed in this part. Furthermore, this part included detailed explanation of roasting (calcination) of mercury and arsenic in furnaces to form their oxides, and various chemical processes such as the purification of tutty, a sublimate of zinc oxide that adhered to the flues of furnaces in which zinc ores were smelted [13]. Despite the fact that Arab physicians were strongly influenced by Galen, they paid a great attention to the preparation and uses of minerals, about which he was undoubtedly far from enthusiastic. This unexpected attention was one of the results of the robust link between Arab and Indian medicine as a lot of Indian physicians lived in late eighth century in Baghdad [18]. Association between medicine and alchemy had been developed in India in the fourth and fifth centuries. Accordingly many Arab physicians dug in it, and henceforth guaranteeing a continuing supply of minerals for medicinal purposes. Their patients suffered recurrently from eye and skin diseases resulting from the dry climate and frequent sandstorms, and the application of soothing ointments containing sulfur and mercury became the routine treatment. Although the internal administration of minerals was considered, restrictions seemed to have been implemented [13].Distillation and sublimation are the most important processes described by Abulcasis in his encyclopedia *Al-Tasrif*. Abulcasis described different methods of distillation, e.g with a wood or a coal fire, with or without a water bath[19]. He also explained the distillation of vinegar for whitening in an apparatus similar to that used for rose-water was distilled [20]. After the publication of this part in Venice in 1471 by the Venetian printer Nicolas Jensen (d.1480), Al-Zahrawi's techniques of chemical preparations, tablet making, filtering of extracts, and related pharmaceutical techniques were extensively implemented in the West [15].

Pharmacognosy

Albucasishas dedicated much of his work in *Al-Tasrif*to Pharmacognosy. The 3rd volume provided a comprehensive account of the compounding and storage of concoctions, the 10th volume discussed preparations of seeds and nuts for treatment of gastrointestinal disorders, and the 15th volume covered the production of conserves prepared from fresh or dried herbs, providing details about aromatic spices combined to improve their acceptance. Attention was given in the 16th volume to the preparation and storage of powders, whereas a more diverse range of products was considered in the 18th volume comprising astringent and dusting powders for application to wounds, fumigations, gargles, incenses ear drops, and effervescent powders. Preparations for the eye, including compresses, drops, washes, lotions and ointments were covered in the 20th volume, while the 21st described applications for the mouth and throat, such as lozenges and dentifrices. The 22nd volume included cough remedies, whereas the 24th volume covered ointments prepared from animal fats. The 25th volume discussed the manufacture of fats and oils extracted from plants, he insisted that these products were of a great importance. Among the sources of what he called "adhan" are peach, poppy seeds, castor seeds, hazelnuts, apricot, henbane, linseed, walnut, wheat, sesame nuts, and

sweet almonds[13]. Most importantly is *Liber Servitoris* (28th volume); it's second partrepresented a pharmacognosy reference as it included the description of the plant, the accurate manner of handling its products for medicinal application, and the optimal season for collecting it. It also highlighted the importance of drying and storage techniques, and introduced some information about collection of gums, expression of juices, and preparing aromatic waters, amber, turpentine, coral, vinegar, and oils. A lot of plants were studied and their natural habitats were described; examples included liquorice root, lycium, mandrake, opium, scammony, sandalwood, acacia, aloes, cardamom, colocynth, fleawort, fumitory, galbanum, lily, spurge, squill and wormwood [21]. The third part of the 28th volume dealt with products obtained from animal sources. In this part, instructions were provided on the collection of shells, bones, fat, blood, milk, urine, nails, hooves, snake skins, scorpions and other similar necessities of mediaeval pharmacy[13].

Toxicology

In the 4th volume, Albucasis explained the seven-stage preparation and the 84 ingredients of the "Great Theriac"- a famous antidote. Among its ingredients were: honey, mushroom, opium, ginger, glycyrrhiza, psyllium, cinnamon, rhubarb, balm, black pepper, saffron, and viper flesh. In addition, Albucasis described other products that resembled theriacs in the 5th volume. They are bitter medicines called "hieras" formerly introduced by the Greeks and used in their temples. Hiera picra (the sacred bitters) was the most popular of these. Hieras included various bitter herbs such as colocynth, cinnamon, and aloes [13].

Cosmetology

Albucasis devoted a chapter of *Al-Tasrif*exclusively to cosmetics, he believed that cosmetics comprised a real branch of medicine which he called the medicine of beauty- a perception that has been adopted by the twentieth century cosmetics industry with the onset of alleged anti-aging products. His contributions in medicated cosmetics included under-arm deodorants, solid lipsticks, and hand lotions. He also mentioned hair care products including hair dyes and preparations for correcting kinky or curly hair. Moreover, he stated the benefits of suntan lotions, describing their ingredients in detail. Albucasis recommended cinnamon, nutmeg, cardamom and chewing on coriander leaves to get rid of bad breath resulting from eating onions and garlic. He dealt with perfumes and scented aromatics. Also, he employed "Adhan" for beautification in addition to medication, and developed recipes for hair removal. Albucasis introduced a method of tooth bleaching using tooth whiteners. For a dentifrice, he recommended brushing with a well ground mixture of natural sodium carbonate, hydrosilicate of magnesium, and common salt [2].

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