

A review on medicine in medieval times and the multicultural origin and development of the Salerno Medical School

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Abstract. The principality of Salerno, bordering with the Roman Catholic ‘Church State’ and the Byzantine ‘Catepanate of Italy’, with a Jewish population that dated back to antiquity and the Muslims of Sicily and North Africa in the immediate vicinity, flourished economically and culturally until the end of the 10th century, when it became, in 851, the capital of an independent state of ‘Longobard’ (Lombard) origin. Thanks to its development, Benedictine monks from the neighboring Monte Cassino Abbey opened convents in town, taking care of the poor and practicing herbal medicine. A multicultural medical activity developed, to which female medical practitioners and scholars, as Trota of Salerno, took part. An official acknowledgement of the existence of the Salerno Medical School took place in the 11th century, when the Longobard state was replaced by the Norman ‘Kingdom of Sicily’ and the archbishop of Salerno, Alphanus, a physician himself, invited an Arab medical scholar, Constantine the African, to teach there. Constantine later became a Benedictine monk in Monte Cassino, where he exerted an intense translational activity, from Arabic in Latin, of the major medical treatises being produced in the Islamic World. The scholars from the Salerno Medical School transmitted to Carolingian Europe and to England those works, thus contributing to the advancement of medical knowledge in Western Europe.

Key words: Religion and Medicine, Medieval History, Christianity, Islam, Judaism, Buddhism.

Introduction

Before examining the origin and the development of the Salerno Medical School in medieval times, it is worth mentioning that, at a short distance from Salerno, in the ancient city of *Elea*, in Cilento, flourished in the 6th century B.C. the pre-Socratic ‘*Eleatic philosophical school*’, established there by Parmenides, Zenon and other Greek philosophers. Medical practice was an integral part of their philosophical teaching, performed under the auspices of Apollo and Asclepius, the Greek god of medicine. This is evidenced by the name of *Oulis* (healer) attributed to Parmenides and to other members of that School, and by the inscriptions carved on stone or casted on coins, found in that site during archeological excavations. That medical

activity continued in the same place, but under another name, that of the Roman city of *Velia*, where medical treatments were successfully performed until Caesar Augustus times, when the Greek-Roman physician Antonius Musa healed the emperor in Velia with cold baths (1).

Coming to the Salerno Medical School, the scholar Lola Ferre (2), from the University of Granada (Spain), in a recent paper brought up to date a debate concerning its origins. She took a strong position against the thesis of an exclusively autochthonous origin of that School, first advanced by Salvatore De Renzi (3), the author of *Collectio Salernitana*, supporting on the contrary the thesis of its multicultural origin. As a matter of fact, the origin of that School before the 11th century is not supported by any available document.

The same can be said of the intercultural exchanges between the School of Salerno and the Islamic world before that date (4).

Things changed in 1058 with the appointment of the Benedictine monk Alphanus (5) (1015/20-1085), a physician himself, as archbishop of Salerno. He invited the Arab scholar Constantine the African (6), then teaching medical sciences at the Great Mosque of al 'Uqba, in Kairouan (Tunisia), to do the same in Salerno, bringing with him a copy of the major medical treatises of the Islamic medicine, what he did between 1085 and 1087. The Benedictine Monte Cassino's Abbot Desiderius (later Pope Victor III) invited him to move to his Abbey to translate from Arabic in Latin those treatises, written by Jewish and Muslim scholars in the Islamic Caliphate. Of those translations were subsequently spread from Monte Cassino throughout the abbeys and monasteries of Carolingian Europe and the Kingdom of England (7).

The aim of the present paper is to illustrate the multicultural origins and development of the Salerno Medical School, focusing on the contributions offered by Muslim and Jewish scholars to the development of one of the most relevant centers of medical studies in the Western World, before and during the first years of life of European universities.

Southern Italy and its fate from the 9th to the 14th century A.D.

During the 5th and 6th century A.D. massive invasions of the various provinces of the Western Roman Empire took place, leading to the creation of barbaric kingdoms. As for Italy, in 568 A.D. the last invasion by Germanic tribes took place, that of *Longobards* (also known as Lombards in English literature). In Northern Italy the Longobards created the *Kingdom of Longobardia*, and in Central Italy the independent duchies of Tuscany and Spoleto. A strip of land around Rome was granted to the head of the Roman Catholic Church, the Pope. This territory was known as '*Patrimonium Petri*' or simply as the Church State. The southern part of the Italian peninsula was split among the Duchy of '*Longobardia Minor*' (Little Longobardia), centered in Benevento, and the Byzantine '*Catepanate of Italy*,

which extended over the heel and toe of the peninsula (Apulia and Calabria). The Island of Sicily was invaded in 827 by Arab armies coming from the '*Emirate of Ifriqiya*' (the former Roman Province of *Africa*, centered in Carthage), who established there the Aghlabite *Emirate of Sicily*. The Island of Sardinia was an independent territory, subdivided into four autochthonous kingdoms, the '*Judgedoms*' (*Giudicati*). Flourishing trade exchanges took place between the merchants of the southern Italian city states of Salerno and Amalfi and the Arabic emirates of Sicily and North Africa (8).

In 999 an expedition of mercenary forces, coming from the Duchy of Normandy, arrived in Southern Italy at the service of the Principality of Salerno, while other Norman mercenaries were called by the Byzantine rulers of the '*Catepanate of Italy*' (*Military Province of Italy*), to protect their territories from Arab invaders, known as '*Saracens*'. Those Nordic mercenaries, guided by Robert the Guiscard, rebelled, and eventually expelled the Byzantines and the *Longobard* rulers from Southern Italy, establishing in their place, in 1071, the Duchy of Apulia and Calabria. Successively, guided by Robert of Hauteville, they invaded Sicily and in 1130 completely disbanded the Arabs from the island, establishing the *Kingdom of Sicily*, centered in Palermo, which extended over Sicily and the Duchy of Apulia and Calabria as well. In 1139 they also annexed the Duchy of Naples, with a feudal investiture by the Pope over the entire territory. The last recognized King of Sicily was Frederick II (1194-1250), whose mother was the Norman Constance of Hauteville and his father the German Emperor Henry VI Hohenstaufen, from the Duchy of Swabia (9).

At his death, Pope Innocent IV, fearing that the heirs of the Hohenstaufen Dynasty could eventually unify the whole of Italy under their rule, thus annexing the Church State, disowned Frederick's heirs and gave the investiture of the Kingdom of Sicily to the French prince Charles I of Anjou (1226/27-1285). The latter waged war on the Hohenstaufen heirs, Conradin and Manfred, and defeated both, initiating in 1266 the Angevin dynasty. Charles I of Anjou's Sicilian domains didn't last long: in 1280 Sicily passed to the Spanish Crown of Aragon (thus becoming the Vice-Kingdom of Sicily), while the Angevins ruled over the Kingdom of Naples.

As for Salerno, a city of pre-Roman origin, it had been for a few centuries a minor port city of the Duchy of Longobardia Minor. In 774 the capital of the duchy, Benevento, fell to Charlemagne, king of the Franks. The Lombard ruler Arechis II (734-787) then moved the capital of the Duchy from Benevento to Salerno and in 851 *Longobardia Minor* was split into the Principality of Benevento and the Principality of Salerno.

Thanks to Arechis II and to Guaimar IV (983-1027), who made the maritime city-states of Amalfi, Gaeta, and Sorrento his vassals (annexing also parts of the Byzantine '*Catepanate of Italy*'), the city entered an era of great splendor, attracting communities of Jewish and Arab traders, who settled in its territory. '*Opulenta Salernum*' (*Wealthy Salernum*) was the inscription on its coins. In 999 Guaimar IV's son, also named Guaimar, who shared the power with his father, invited the *Norsemen* to Salerno as mercenary soldiers. That was the end of the duchy (10).

Medical knowledge in Western Europe and in the Near East in Medieval times

Ancient Greek and Roman Medical Tradition

The healers of Roman Catholic and Christian Orthodox faiths based their medical knowledge on the teaching of the Greek scholars Hippocrates, Dioscorides and Galen (11). The Greek-Roman cultural heritage of Italy had not been completely lost with the collapse of the Western Roman Empire and the de-urbanization of Western Europe. The great schools of Roman times had collapsed but their place was assumed by the '*Benedictine*' abbeys and convents. Their religious order had been founded in 529 by St Benedict of Norcia and their members were celibate monks and nuns, following the rule '*Ora et labora*' (*Pray and work*). Among their daily activities they were busy with the cultivation of medicinal plants, the cure of sick people, the teaching of agriculture and the hand-copying, in the '*scriptoria*' of their abbeys, of classical Greek and Roman works.

- Hippocrates of Kos (460-380 B.C.) was born in the age of classical Greece and is considered

'*the father of Western medicine*'. Famous is the '*Hippocratic Oath*', addressed to the Greek healing gods, which was required by a new physician to swear upon. The '*Hippocratic Corpus*', a collection of around 60 early medical works, is attributed to him. According to Hippocrates, the human body contains four humors, represented by fire, air, earth, and water, responsible for the properties of hot, cold, dry, and moist respectively. Health in the human body relies on keeping these humors in balance. After the examination of the patient, the physician determines which humor is unbalanced in his body and prescribes a diet to restore the balance, including not only food but also physical exercises and medication. Hippocrates categorized illnesses as acute, chronic, endemic, and epidemic.

- Pedanius Dioscorides (40-90 A.D.), born in Cilicia, in the Anatolian Peninsula, was a physician, pharmacologist, and botanist. He wrote a five-volume work entitled "*De Materia Medica* (*About Medicine*)", where he described 600 plants utilized in medical practice. His work circulated in Greek, Latin, and Arabic editions until the 19th century, being at the base of European Pharmacopeia, but some of the plants that he described could not be identified (12).
- Galen (Claudius Galenus) (130-210 A.D.) was born in the ancient Greek city of Pergamon, in the Anatolian Peninsula, studied at the '*Medical School of Alexandria*', in Egypt, and later settled in Rome, where he became the personal physician of several emperors. During his life he wrote over a hundred medical works in Greek on Physiology, Etiology, Semeiotics, Pharmacy.

His works were translated into Arabic at the time of the Arab expansion, in the 9th century A.D., and several of them were re-translated from Arabic into Latin in later Medieval times. He shared Hippocrates' theory of bodily humors. In his view, an imbalance of four fluids (blood, yellow bile, black bile, and phlegm) was at the base of different human temperaments: '*sanguine*' (with prevalence of blood), '*melancholic*' (with prevalence of black bile), '*choleric*' (with prevalence of yellow bile) and '*phlegmatic*' (with prevalence

of phlegm). Individuals with a *sanguine* temperament were considered extroverted and social; *choleric* people were assumed to have energy, passion, and charisma; *melancholic* people creativity and kindness; *phlegmatic* people were characterized by dependability and affection. Galen's principal interest was in human anatomy, but Roman law prohibited the dissection of human cadavers, so he performed anatomical dissections on living and dead animals, mostly focusing on pigs and monkeys (primates). Galen also studied the difference between motor and sensory nerves and formulated the concept of muscle tone, explaining the difference between *agonistic* and *antagonistic* muscles, but Galen's major contributions to medicine is considered his work on blood's circulatory system: as the first medical scholar he recognized the difference between *venous* (dark) and *arterial* (bright) blood, but the Arab physician Ibn al-Nafis (1213-1288) found that his work contained scientific errors, believing that the circulatory system consists of two separate one-way systems of distribution, rather than a single one.

Islamic and Jewish Medical Knowledge

Medicine was a central part of medieval Jewish and Islamic culture in the Arab Caliphate (13). The Abbasid Caliph al-Mamun created in Baghdad, in 825, the 'House of Wisdom' (*Bayt al-Hikmah*), also known as the 'Grand Library of Baghdad', where the texts of the main sources of medical knowledge were saved and copied. An important 'translation movement', aiming at translating classical treatises from ancient Greek, Persian, and Sanskrit into Arabic, started there soon after, and lasted for over two centuries (14). A great stimulus was given to this activity by the initiative of the fifth Abbasid Caliph Harun al-Rashid (763-809).

Islamic and Jewish medical knowledge developed from three main sources. The first one was the Classical Greek and Roman medical tradition, which arrived to Islam through the manuscripts contained in the libraries of the conquered Byzantine territories of Egypt, Syria, and Mesopotamia, and were translated by Syrian scholars into Arabic, the lingua franca of Islam. That medical knowledge was mainly based on the

teaching of the Greek scholars Hippocrates, Dioscorides, and Galen.

The second source came from the Persian 'Academy of Gondishapur', established in South-Western Iran, near Susa, by the Sassanid emperor Khosrau I (531-579 A.D.). The oldest written sources of Iranian medicine were the 'Avesta' and other religious Zoroastrian texts. The Zoroastrian beliefs focused on personal hygiene, to prevent contagious diseases (15). This academy received cultural contributions from Syriac speaking scholars of Nestorian Christian belief, fleeing to the Sassanid Kingdom to avoid religious persecution by the Orthodox Christian rulers of the Byzantine empire.

A third source was the 'Ayurveda' alternative medicine, derived from the classical Sanskrit "Sushruta Samhita" (*Sushruta's Compendium*), containing accounts of the transmission of medical knowledge from the Gods to sages and from them to physicians: it was based on complex herbal compounds, minerals, and metal substances and on surgical techniques, including rhinoplasty, kidney stone extractions, sutures (16).

Among the Muslim scholars from the 'Islamic Golden Age', let us recall (17):

- Ali ibn Mousa al-Ridha (765-818), Persian, who published a medical treatise entitled "*Al-Risalah al-Dhababiab*" (*The Golden Treatise*) which deals with Anatomy, Physiology, Chemistry, and Pathology. According to the treatise, one's health is determined (in agreement with Galen's teaching) by the four humors of blood, yellow bile, black bile, and phlegm, the suitable proportion of which maintains health.
- Ali ibn Sahl Rabban al-Tabari (838-870), Persian, who wrote the "*Firdous al-Hikmah*" (*Paradise of Wisdom*), the first encyclopedia of medicine in the Arabic language. Al-Tabari emphasized the strong ties existing between Psychology and Medicine, and the need for psychotherapy and counseling in the treatment of patients.
- Muhammad ibn Sa'id al-Tamimi (also known as '*Al-Tamimi, the physician*'), who was born in Jerusalem (date unknown) and died in Egypt

in 990. Al-Tamimi expanded the knowledge of the properties of plants and minerals of classical Greek scholars.

- Ali ibn al Abbas al-Majusi (also known as *Haly Abbas*), Persian, who was born in 930 in Ahvaz, Iran, and died in Shiraz in 994. He became famous for his work '*Kitab al-Maliki*' (*Complete Book of the Medical Art*), also called '*The Royal Book*', which was later translated at the Monte Cassino Abbey by Constantine the African, to be used as a textbook of surgery in medical schools across Europe until Renaissance times. One of the greatest contributions of *Haly Abbas* to medical science was his description of the capillary circulation. He founded a hospital at Shiraz, in Persia, and the '*Al-Adudi Hospital*' in Baghdad.
- Muhammad ibn Zakariya al-Razi (854-925), Persian, who was the author of several medical treatises, among which "*Kitab-al Hawi fi al-tibb*" (*Comprehensive Book of Medicine*), translated into Latin as "*Liber Continens*". The book is a comprehensive encyclopedia of medicine, subdivided in ten sections. Another work of al-Razi was a treatise about smallpox and measles, which is considered the earliest monograph on these infectious diseases.
- Abu-Ali al-Husayn ibn Abdullah ibn-Sina (known in the West as '*Avicenna*') (980-1037 A.D.), Persian, a great philosopher (commentator of Aristotle) and medical scholar, author of "*Al-Qanun fi't-Tibb*" (*The Canon of Medicine*) and "*Kitāb al-Šifā*" (*Book of Healing*). The '*Canon*' was highly influential on later medical writers. In the "*Book of Healing*" Avicenna discussed the existence of the mind and its relationship with the body; he was the first to divide human's senses into the five '*external senses*' (hearing, sight, smell, taste, and touch) and '*internal senses*': the '*sensus communis*' (common sense), the '*sense of imagination*', the '*instinct*' and the '*intentions*'.

As for Jewish contribution to medicine, the oldest work in medieval times is considered the "*Sefer Refuot*" (*Book of remedies*), possibly written by the Byzantine

Jew Asaph ben Berechiah between the 3rd and 6th centuries A.D. (18,19).

During the 9th century, the most influential Jewish medical scholar was Yitzhak ben Shlomo ha-Yisraeli, born about 832 in Egypt, who taught at Kairouan's Mosque of Uqba. He was a follower of *Galenic* medicine and wrote in Arabic the treatise "*Kitab al-hummayat*" (*Book on fevers*) translated into Latin by Constantine the African in 1087), "*Fi al-baww*" (*On urine*) and, in Hebrew, "*Sefer ha-yesodot*" (*Book of elements*), inspired by Galen's theories. Yitzhak ben Shlomo ha-Yisraeli died in Kairouan.

Among Cordoba's medical scholars, let us recall:

- Abū Marwān 'Abd al-Malik ibn Zuhr (*Avenzoar*) (1091-1161), born in Sevilla (Spain) and best known for his treatise "*Al-Taysir fi l-mudāwāt wa l-tadbīr*" (*Book of Simplification on Therapies and Diet*), which greatly influenced medical studies in Islamic countries and Europe. He believed in prophylaxis against urinary stone disease and reported the importance of dietary management. Furthermore, Ibn Zuhr enriched surgical and medical knowledge by describing many diseases and treatment innovations not ever described before him. He was the teacher of *Averroes*.
- Abū l-Walīd Muḥammad Ibn 'Aḥmad Ibn Rušd (*Averroes*) (1126-1198), philosopher and physician, born in Cordoba, where he wrote the treatise "*Kitāb al-Kulliyāt fi al-Ṭibb*" (*General medicine*). He faced several important medical issues, such as dissection and autopsy, but his fame in the Western World is related to his commentaries on Aristotle's philosophical works, as did, before him, *Avicenna*.
- The most famous Cordoba's Jewish physician and philosopher was Moses ben Maimon (*Maimonides*) (1135-1204). He wrote in Arabic ten medical works: "*The Art of Cure – Extracts from Galen*", "*Commentary on the Aphorisms of Hippocrates*", "*Medical Aphorisms of Moses*", "*Treatise on Hemorrhoids*", "*Treatise on Asthma*", "*Treatise on Poisons and their Antidotes*", the "*Regimen of Health*" and the "*Treatise on Cohabitation*".

Contacts of the Islamic World with China in pre-modern times

The first contact between the Islamic world and China is due to *Umayyad* Caliph, Uthman, who in 650 sent a diplomatic mission to the court of the *Tang* emperor Gaozong. Within a hundred years, the westward expansion of the *Tang Empire* met the eastward expansion of the *Abbasid Caliphate* (750–1258) at the Talas River, in Central Asia, leading to a military engagement between the Chinese and Islamic Empires in the *Battle of Artlakh* (July 751). The Arab forces won a decisive victory, securing Central Asia as a Muslim territory and the *Turkic* people of the region soon converted to Islam (20).

The knowledge of Chinese herbal medicine spread over the Islamic world, as it appears from the following text by the Iranian scholars Heyadri and colleagues (21).

‘Chinese herbal drugs have been described by medieval Persian medical scholars as Tabari [Abū Jaʿfar Muḥammad ibn Jarīr al-Ṭabarī] (870 AD), Rhazes (Muḥammad ibn Zakariya al-Rāzi) (925), Haly Abbas (ʿAlī ibn al-ʿAbbas al-Majusi) (982), Avicenna [Abu Ali Sina] (1037 AD), Jurjani (Abd al-Qabir al-Jurjani) (1137)]. In Avicenna’s “Canon of Medicine” the following herbs, imported from Al-Sin (China), are mentioned: Cinnamon (Dar Sini = Chinese Herb), Wild Ginger (Asaron), Rhubarb (Rivand-e Sini), Nutmeg (Basbasa), Incense Tree Wood (Ood), Kubeb (Kababe) and Sandalwood. It appears that Chinese herbal drugs were a major component in the exchange of goods and knowledge between China and the Islamic world and later to the Western world during this era.’

During the *Song* dynasty (960–1270 A.D.) there was the incorporation, into the *Buddhist* medical practice, of *opium therapy*, which utilized the oozing latex from the immature capsules of *Papaverum somniferum* (罂粟 *Yingsu*), cultivated in Afghanistan (22).

The Salerno Medical School

The Spanish scholar Lola Ferre, from the University of Granada, in her already quoted paper (2) cites a legend that hints to a multicultural origin of the Salerno Medical School, possibly in the second

half of the 10th century, namely the ‘*legend of the four scholars*’, to be found also in “*Historiarum epitome de rebus Salernitatis*” (*An epitome of the history of Salerno*) (23). According to that legend, ‘*the School was founded by four scholars: a Greek speaking Byzantine Christian, a Latin-speaking Roman Catholic one, an Arabic-speaking Muslim and a Hebrew-speaking Jew.*’

Ferre confirms that the first period of Salernitan literature is very obscure, adding that there is evidence of ‘*medical works written in Hebrew in Southern Italy in the tenth century*’.

No written document is available, testifying the existence of a Salernitan Medical School in the 9th century or earlier. From two German chronicles (one by Richer of Reims and the other by an anonymous chronicist of the Bishop of Verdun) both written toward the end of the 10th century, ‘*Salerno appears, from 985 on, as a renowned center of medicine, and we may reasonably suppose that it had taken about ten or twenty years to develop that reputation*’ (4) (pp.143–145).

It is reasonable to assume that the first teaching of medical science in Salerno came from Benedictine monks from Monte Cassino (24), as well from medical practitioners or scholars of the Jewish and Muslim communities established in the city, whose presence is well documented. The Benedictine medical practice was routinely performed inside the convents established in town with the support of the rulers of Salerno.

The earliest medical scholar active in Salerno, whose work is well documented, is Gariopontus, active between 1020 and 1050. He apparently compiled his work, “*Passionarius*”, ‘from writings of Galen and other ancient medical works’ (4) (p. 147).

Another historically well documented scholar is the physician Alphanus (1015–1085), who first became a Benedictine monk in Monte Cassino and later an Abbot in Benevento. He finally became, in 1058, the archbishop of his native city (5). Alphanus composed the medical text “*De Pulsibus*” (*About Pulsation*) and also translated in Latin several Greek medical treatises, among which “*De quattuor humoribus corporis humani*” (*About the four humors of human body*).

Archbishop Alphanus invited the Arab scholar Constantine the African, native of Carthage and teacher at the Great Kairouan Al-Uqba Mosque, to teach Medicine in Salerno, where he landed in 1077,

carrying several, precious medical manuscripts, written by Jewish and Muslim scholar from the Arab Caliphate. Constantine possessed an excellent knowledge of Greek, Latin, Arabic and had undertaken extensive travels to Syria, Egypt, Persia, India, Ethiopia, before coming to Italy (25).

Constantine eventually became a Benedictine monk and Desiderius, the Abbott of Monte Cassino, who later became Pope Victor III, invited him to his abbey, where he translated for the abbey's library 37 medical works that he had brought with himself from Kairouan, including two treatises by the Jewish scholar Yitzhak ben Shlomo ha-Yisraeli, one of the greatest physicians of the *Ifriqyia's Emirate*. While in Monte Cassino, Constantine also composed a treatise on Andrology, entitled "*Viaticum*", and a work entitled "*De Genecia*", a name which he had interpreted as meaning '*On the body and organs of women*'. Constantine's most important accomplishment was his introduction in the West of the "*Kitāb al-maliki*" (*The Royal Book*), written by the Persian physician Alī ibn al-Abbās al-Majusi. He also translated in Latin several works written by Hippocrates and Galen, whose copies could be found in the Caliphate. Those translations exerted a great influence in Europe until the 16th century. Constantine died in Monte Cassino in 1098/1099. The monk Peter the Deacon (1115-1159), librarian at the Abbey of Monte Cassino and the continuator of "*Chronicon monasterii Casinensis*" (*Monte Cassino Chronicle*) was the first historian to write a biography of Constantine (26).

The historian Carmen Caballero-Navas, also from the University of Granada (Spain), observes the following (27):

'The climate of tolerance [existing in Salerno] extended itself to women practitioners, as well as Jews and Arabs, and during most of his lifetime Salerno was the only medical school in Europe that opened its doors to women.'

That presence in Salerno of several female medical practitioners and teachers contributed to the advancement of medical science, especially in surgery and cosmetics. The reason of their presence in Salerno is easily explained by the existence of strict Islamic and Jewish religious norms that prohibited the intervention of male hands in assisting women in childbirth

or in treating female pathologies, not to mention the domain of cosmetics, which was considered part of medical practice.

Among them, during the early 12th century, there was '*Magistra Trocta*' or Trota de Ruggiero. Even though there is no direct biographic information about her, the 'Trota' name is related to the treatise "*De curis mulierum*" (*On medical treatments for women*), which is part of a compendium of three texts collected under the title "*Trotula*", circulating throughout Western Europe from the 12th to the 15th century. That work had been considered for a long time the work of a male scholar which bore the same name. Master/Magistra Trota was also the confirmed author of a text, entitled "*Practica secundum Trotam*" (*Medical practice according to Trota*), a compendium on infertility, menstrual disorders, cosmetics, and others. The medical historian John F. Benton, from the California Institute of Technology, discovered in 1985 in Madrid a manuscript entitled "*Practica secundum Trotam*", explicitly attributed by the scribe to '*Magistra Trota*' (*Lady teacher Trota*) (28). Trota benefited from the studies of Galen and Hippocrates, whom she quotes in her texts, as well from the numerous Arab authors, such as Avicenna and al-Majusi, who were translated into Latin during her lifetime (29).

Concerning the contributions to surgery by Trota and other female medical practitioners active in Salerno at that time, it is worth citing the following text from the "*Annals of Thoracic Surgery*" (30):

'Early medieval surgery was most concerned with the lack of sufficient methods for managing serious pain, bleeding, and infection. Hence, medieval surgeons can best be attributed with innovation in what concerns wound management and pain control. In this fields, the women of Salerno played a vital role. The frequency with which a midwife encounters common wounds, like perineal tearing and uterine ruptures, lent Trotula [read Trota] and her pupils ample occasion for the development of new techniques and remedies for wound management. She developed and documented a wide variety of herbal and animal remedies for the prevention and care of infectious wounds. Against labor pains, she also developed a variety of opiates, which were extended to deal with general post-operative pain as well.'

Other details on the subject can be found in Della Monica et al. (31).

According to the German scholar A. Kristeller (4) (p. 164), the first official acknowledgement of the existence of the *Salerno Medical School* could have been done by the Norman Duke of Apulien and future King of Sicily Roger II Hauteville, in 1127, when he promised that no other ‘*Medical Collegium*’ (*Medical Faculty*) conferring medical titles should exist in the Duchy, but the authenticity of that document is controversial (4).

Toward the end of the 11th century the first medieval universities (*Studium*) were established, but only in the 13th century they obtained a legal status. The university teaching in Europe was based on the *Seven Liberal Arts*, divided into the *Trivium* (Grammar, Rhetoric, and Logic), and the *Quadrivium* (Arithmetic, Astronomy, Geometry, and Music). Once completed those basic studies, post-graduate studies could be undertaken, to become a Magister in Theology or Jurisprudence, a title conferred by the ‘*Collegium*’ of Professor after examination. Medicine was not a formal area of study in early medieval universities, but it grew in response to the proliferation of translated Greek and Arabic medical texts in the 11th century. The University of Paris in 1150, Bologna in 1158, Oxford in 1167, Montpellier in 1181 and Padua in 1222, conferred Magister titles in Medicine (32).

The Salerno Medical School adopted a similar rule: first the studies in Logics and Philosophy, thereafter the medical studies. The Salerno School assumed a legal status in 1224 by initiative of the King of Sicily and Holy Roman Emperor Frederick II Hohenstaufen, through an edict contained in his ‘*Liber Augustalis*’, also known as “*Melfi Constitutions*”. The edict required that candidates for the license to practice medicine must be examined in public by the ‘*Collegium*’ of professors, in the presence of a royal representative, who would report to the king, the only dispenser of the license, ‘*confirming the loyalty and the scientific adequacy of the candidate. The right to grant the license remains with the king*’ (4) (pp. 176-177). The edict prescribed that only the Salerno Medical School was allowed to teach Medicine or Surgery. In 1241 a further edict was issued, prescribing three years of Logics as a pre-requisite, and five years of medical study on the standard medical textbooks (Latin

translations of Hippocrates, Galen and Avicenna) and one year of practical training under the guidance of an expert physician. An additional year of anatomical study was required for those who would perform Surgery. Human dissection was not allowed: animal bodies (especially pigs) were utilized instead.

King Conrad, Frederick’s first successor, tried to transfer to Salerno the University of Naples, declaring the first, for the first time, as *Studium*, but his half-brother and successor, King Manfred, restored Naples University in 1258. Under Charles I, the Angevin King of Naples, both *Studia* (Salerno Medical School and the University of Naples) were granted privileges. The Salerno Medical School was recognized, in 1280, as ‘*Studium Generale*’ for the teaching of Medicinal Sciences (4), (pp.178-179).

Three famous medical scholars active in Salerno between the second half of the 12th and the early 13th century were *Magister Maurus*, author of “*Tractatus de Urinis*” (*Treatise about Urins*), *Johannes Platearius Junior*, author of “*Practica*”, a medical handbook which described diseases, their origin and therapy, and *Magister Urso from Calabria*, author (among others) of “*De commixtionibus elementorum*”, essay on the nature and properties of things, having as a theoretical background the physics of the four elements (Earth, Air, Water and Fire), their qualities, and the way in which they interacted in natural bodies.

Toward the middle of the 13th century a medical poem, written in Latin hexameters, was composed in Salerno and spread, with teaching purposes, throughout European universities. Its title was: “*Regimen Sanitatis Salernitanum*” (*The Salernitan Rule of Health*). Translated in several languages, it had an extraordinary success in Europe. The poem, subject to manipulations in the following centuries, concerned domestic medical practice, based on Galen’s precepts. The following are two verses from that poem (33):

*‘Si tibi deficient medici, medici tibi fiant
Haec tria: mens laeta, requies, moderata diaeta’*

(If your doctors fail you, let then these three things become your doctors: a happy mind, rest and a moderate diet).

Under the *Angevins*, the Medical School played a minor role, progressively overtaken, as regards medical studies, by the recently established universities. The Medical School of Salerno remained active until 1811, when it was closed by royal decree under the Napoleonic government of Murat.

Conclusions

Based on what has been illustrated so far, we can conclude this review on medicine in medieval times with the words of the historian Aurelio Musi (34), who wrote that '*the Salerno Medical School is a wonderful example of Mediterranean cultural syncretism*'.

The encounter of the Islamic world with Southern Italy during the 10th-13th centuries greatly contributed to the rebirth and the advancement of medical sciences in Western Europe, opening the way to the scientific revolution, which took place inside the European universities during the 15th-17th centuries. The manuscripts of classical Graeco-Roman antiquity, together with the modern medical treatises from the Islamic world, once translated from Arabic into Latin and copied in the *scriptoria* of Monte Cassino and other Benedictine abbeys, were in turn widespread in Carolingian Europe through the network of abbeys and universities established all over Europe in medieval times. The simultaneous existence of two *Norman* dynasties, one in the Kingdom of Sicily and the other in the Kingdom of England during the second half of the 12th century, and of two *Angevin* dynasties in the same two countries from the second half of the 13th century to the 14th century included, facilitated the intercultural communication from the Mediterranean Basin to the Rhine Valley and the British Islands. The Salerno Medical School greatly contributed to that rebirth.

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