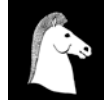




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Arabic Treatises on Environmental Pollution up to the End of the Thirteenth Century

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ABSTRACT

Ever since the earliest Arabic writings on medicine we meet treatises on widespread illnesses or crowd diseases, including epidemics. Some of those works discuss the causes and treatment; others deal with the treatment only. This paper is limited to the works that deal with environmental pollution as a cause of such illnesses. They cover subjects like air and water contamination, solid waste mishandling and environmental assessments of certain localities. The treatises reviewed are those written by (1) al-Kindi, (2) Qusta b. Luqa, (3) al-Razi, (4) Ibn al-Jazzar, (5) al-Tamimi, (6) Abu Sahl al-Masihi, (7) Ibn Sina, (8) Ali b. Ridwan, (9) Ibn Jumay', (10) Ya'qub al-Isra'ili, (11) Abdullatif al-Baghdadi, (12) Ibn al-Quff and (13) Ibn al-Nafis. Studying the contents of each work shows which authors were merely copying the Greek theory of humours and miasma, and which made genuine contributions to the field.

The period covered in the paper is up to the end of the thirteenth century A.D. This is because the Black Death took place in the fourteenth century, and encouraged several authors of that time to write about epidemics and plagues. Other contemporary researchers have studied these later works.

KEY WORDS

Arabic medicine, Islamic medicine, environmental protection history, epidemics treatment history, hygiene history, history of medical geography

INTRODUCTION

Physicians have studied the causes and treatment of widespread illnesses or crowd diseases, both endemics and epidemics, as part of medicine. A handful of books in this field was translated into Arabic during the 'Translation Period' of

Arab/Islamic intellectual history (eighth to ninth centuries A.D.). Among these were the works of Hippocrates and Galen. Two of Hippocrates' works, namely *Airs, Waters and Places* and *Epidemics*, were among the most influential works used later by the Arab physicians.

This paper is a sort of a handlist, limited in scope to a brief review of Arabic works that studied environmental pollution as a cause of various illnesses, endemic and epidemic. It reviews only the treatises written solely on this subject, unless the issue was treated in depth within some compendium. In addition to the contents, we mention any original and important ideas in the treatise. Other researchers have treated this subject briefly, and their works are mentioned in the references. But several of the treatises mentioned in this paper were not known when those works were published, and this led to some erroneous assumptions, which are corrected below.

This paper deals only with the genre of treatises mentioned above. The subject of protection of public health against the effects of pollution was also treated in other non-medical books. Among these are the 'market and industry inspection manuals' (*Hisba* books in Arabic) and the books of 'jurisprudence of civil works', i.e. regulations for civil works and buildings (*Ahkām al-Bunyān* in Arabic).

Table 1 gives the titles and bibliographical data of the treatises reviewed in this article. The table also shows the year when the author died. Two dates are given: the *hegira* (Arabic lunar) year (A.H.) and the Gregorian year (A.D.). The period covered in the paper is up to the end of the seventh century A.H./thirteenth century A.D. This is because the Black Death took place in the fourteenth century A.D. and encouraged several authors of that time to write about epidemics and plagues. These later works have been studied before.¹

Al- Kindī (ninth century)

Until the 1970s it was generally assumed that the latter medieval physicians who wrote on plague did not cite the works of al-Kindī.² This is no longer true because al-Tamīmī, whose book was discovered later, cites the treatise on *Incenses Purging the Atmosphere against Epidemics* on seven pages. He says:³

"These are recipes of incenses which I extracted from a treatise by Ya'qūb ibn Is'hāq al-Kindī to Ahmed ibn al-Mu'tasim (the Abbāsīd prince) on making incenses which purge air spoilage."

"وهذه صفات دخن استخرجتها من رسالة ليعقوب بن

إسحق الكندي إلى أحمد بن المعتصم في أعمال الأبخرة

المصلحة لفساد الهواء."

From these extracts it appears that the sources used by al-Kindī were firstly, books of the Sabian or Mandaean sect, descended from the Babylonian star worshippers, and secondly, Indian books. Hence, the treatise of al-Kindī is about incenses that combat air pollution according to the available knowledge from his sources and experience.

Qustā ibn Lūqā (ninth and tenth centuries)

Qustā wrote and translated many books. His works on environmental issues are given in Table 1. One of these is a small treatise *On Contagion*. He defines contagion as a transmission from an ill body to a healthy one. He then describes the means of contagion and gives examples of transferrable diseases. He assigns two causes to widespread illnesses: firstly the surrounding air and secondly contagion/infection.⁴ He relates contagion to environmental pollution by saying⁵:

‘Surrounding air differs greatly according to different effects on it. These are either from the earth or from the sky. Factors relating to the earth include: (i) vapours ascending from forests and swamps; (ii) other ground humidities, such as the smoke ascending from mountains and furnaces; (iii) corpses and other dry bodies which emit smoke when they are burned; and (iv) other decayed things which emit bad fumes and stinky odours when heated by the sun and nature. Heavenly factors include extreme heat in summer and extreme cold in winter. These factors cause the common illnesses that overwhelm most people. The most obvious cause is air spoilage which results from these factors’

“الهواء المحيط يختلف اختلافا كبيرا، على قدر اختلاف التأثيرات التي تحدث فيه: إما من الأسباب الأرضية كالبخارات التي ترتفع من السباح والغياض وسائر الرطوبات الأرضية كالأدخنة التي ترتفع من الجبال والأتاتين وغيرها من الأجرام اليابسة التي إذا عملت فيها النار انقادت منها دخانها، وكجثث القتلى وغيرها من الأشياء العفنة التي إذا فعلت فيها الحرارة الشمسية والطبيعية أحدثت منها بخارات رديئة وروائح منتنة. وإما من أسباب سمائية، كالحر المفرط في الصيف والبرد المفرط في الشتاء، كان كثيرا ما يعرض للناس أمراض مشتركة تعم أكثرهم، يكون أظهر حدوثها عن فساد الهواء بما يعرض فيه من هذه الأحداث”

His *Medical Regime for the Pilgrims to Mecca* is a traveller's health guide especially written for a pilgrim to Mecca. The following 'chapters' of the treatise are related to environmental pollution and how to cope with various natural resources. Each 'chapter' is one page long on the average.

- Chapter 4: On the diseases that arise from the blowing of the different kinds of winds.
- Chapter 6: On rheum, defluctions and cough, which are caused by changes of weather, and their treatment.
- Chapter 7: On eye diseases which are caused by change of weather, by dust or winds, and their treatment.
- Chapter 8: On the examination of different waters in order to find out which is the best.
- Chapter 9: On the improvement of contaminated water.
- Chapter 10: On lack of water and ingenuity in finding means of quenching one's thirst.
- Chapter 12: On the treatment of stings and bites of all kinds of vermin.⁶

Qustā was a translator who lived during the aforementioned 'Translation Period'. The influence of Galen's ideas can be traced in his works.⁷ A treatise entitled *On Epidemics and their Causes* was ascribed to Qustā,^{8,9} but a study of its content, made by the author of this paper, showed that it is the work of Abū Sahl al-Masīhī, which will be reviewed below.

Al-Rāzī (Rhazes) (ninth and tenth centuries)

Here we meet another prolific author, especially in medicine. His extant works in the subject of our study are given on Table 1. In his work *On Types of Water* the subject is treated from the medical, geological and physical points of view. He cites Hippocrates, Dioskurides, Rufus, Galen, Alexander of Tralles, Ibn Māsawaih, Alī ibn Raban at-Tabarī and Hunain.¹⁰

In his short *Epistle on Chronic Coryza at the Bloom of the Roses* he describes the effect of pollen dust on the respiratory system.¹¹

Al-Rāzī is well known as the most freethinking of the major philosophers of Islam. His medical works are typically free of dogmatism, following the Hippocratic reliance on clinical observations. His criticism of Galen had the potential, in time, to bring down the whole theory of humours and the scheme of the four elements, on which ancient medicine was grounded.¹² Among his ideas appearing for the first time in a book is the positioning of dwelling units uphill and upwind from infected areas.¹³

Ibn al-Jazzār (tenth century)

Ibn al-Jazzār did not travel outside the region of 'Ifriqiya' (today's Tunisia); yet he was the author of a book on epidemics in Egypt (Table 1). This made him the subject of bitter criticism by the Egyptian physician Alī ibn Ridwān, whose book is reviewed below. Ibn al-Jazzār's work is not extant, except for small extracts by al-Tamīmī and ibn Ridwān. Al-Tamīmī quotes the compositions of three syrups that were composed by Ibn al-Jazzār. These syrups were made as health protectors when crowd diseases attack the community. Ibn Ridwān accuses Ibn al-Jazzār of being weak in Greek philosophy, besides writing about an environment that he did not see. He quotes the erroneous statements of Ibn al-Jazzār and then comments on them, one by one.

Nevertheless, Ibn al-Jazzār deserves credit for being the first author in the genre of medical geography books, the books that study the environmental conditions of a specific town. This genre includes the works of Alī ibn Ridwān, Ibn Jumay', Ya'qūb al-Isra'īlī, and 'Abdallatīf al-Baghdādī (Table 1). Some researchers have claimed that Ibn Butlān (d. A.H. 458/A.D. 1066) gave a brief description of Baghdad.¹⁴ However, this 'description' is very brief, and does not give any valuable information.¹⁵

Al-Tamīmī (tenth century)

Compared to other treatises, al-Tamīmī's book is voluminous (Table 1). Its contents are broadly classified as follows:

1. Views of Hippocrates, Aristotle and Aharun on the subject. The author devotes special sections to each of these scholars. In addition, he quotes other non-Arab scientists throughout the book.
2. Description of polluted air types in the Islamic states, and their relations to weather and geographical conditions.
3. Diseases resulting from air pollution and their infectious nature.
4. Hygienic procedures for protection against contagion when epidemics occur.
5. Types of incense that treat/combat air pollution. Many of these were developed by the author himself.
6. Treatment of stagnant water, which produces various types of pollution.
7. Drugs that strengthen the immune system. Here he cites Indian sources, among others.
8. Usage of perfumes, music and psychotherapy to strengthen the body against infection.
9. Descriptions of smallpox and measles, together with their remedies.

10. Drugs for healing those who caught airborne diseases. Many of these were prepared by al-Tamīmī himself.¹⁶

This work of al-Tamīmī was listed as lost until the late 1970s,¹⁷ or even the 1980s.¹⁸ Because it was only discovered recently, a number of important ideas in it have been ascribed to later authors. Examples are: (i) preventive measures that include sour juices and pickles, ascribed to Tashkupruzāde (d. A.H. 968/A.D. 1561),¹⁹ (ii) methods for improving air quality and increasing body resistance to diseases, ascribed to Ibn Khātimah (d. ca. A.H. 775/A.D. 1373)²⁰. These subjects were discussed in detail by al-Tamīmī.

Abū Sahl al-Masīhī (tenth and eleventh centuries)

If al-Tamīmī's work is important in its details and pioneering, al-Masīhī is outstanding in being organised and clear. In nineteen manuscript pages he presents an 'engineered report', classifying crowd diseases in terms of their causes, and specifying a certain remedy for each type of disease.

Al-Tamīmī, in comparison, lists many recipes without specifying when and why they are used. Therefore, al-Masīhī's work is a key to many other works like that of al-Tamīmī.

The treatise is divided into four sections, each one called *jumlah* (group or bunch), as follows: (1) The necessity of air to life; (2) Changes in air contents and the effects of these changes on health; (3) The ways by which epidemics harm the body; (4) Prevention and treatment according to the type of epidemic.

In the second section or *jumlah* we see a clear distinction between endemic illnesses (*al-amrādh al-bilādiyyah* in Arabic), epidemics (*al-wabā'*) and calamities (*al-muwatān*). Also in this section the author gives three causes of epidemics: (i) excessive humidity and warmth in the air, compared to usual conditions at that time of the year; (ii) excessive dryness in the air; (iii) air being changed into an abnormal condition, or when abnormal detrimental fumes are mixed with it. This last condition particularly causes calamity.

In section 4 the epidemics are classified according to the causes given in section 2, then al-Masīhī specifies the remedies for each type.²¹

Ibn Sīnā (Avicenna) (tenth and eleventh centuries)

Ibn Sīnā's *Qanun* is very important in this subject. Chapters in it were devoted to: (i) mouldiness; (ii) types of water, their quality and treatment; (iii) illnesses caused by impurity in water; (iv) air spoilage and its effect; (v) designing houses and selecting their location according to health considerations; (vi) food quality and its effects; and (vii) animals transmitting pollution or observed at the time of plague. He mentions as a sign of an approaching plague that rats and subterranean animals flee to the surface of the earth, behave as if they were

intoxicated, and die. This important phenomenon was mentioned by Ibn Sīnā for the first time.²²

Some of these ideas are treated in depth in another work of Ibn Sīnā entitled *Repelling General Harm from the Human Body* (See Table 1). It discusses types of harmful air: hot, cold, coal smoke, perfumes, northerly wind, southerly wind, moving from one air to another, epidemics caused by air putrescence, stagnant and moving air. It also describes water-borne harms and treatment by different types of water: forest water, sulphur water, alum water, sulfate water, arsenic water, verdigris water, ammonia water, copper water, tar water, saline water, bitter water, sour water, beer, strong black liquor, light transparent liquor and stored liquor.²³

Alī ibn Ridwān (eleventh century)

As we saw earlier, Ibn Ridwān wrote his work to rebut Ibn al-Jazzār. According to Ibn Ridwān, Ibn al-Jazzār was not only a foreigner to Egypt; he also lacked knowledge of Greek medical theory. Ibn Ridwān was a strong exponent of the thought of Hippocrates and Galen.²⁴ His treatise covers the following issues: (1) specific causes of pollution in Egypt (more exactly Metropolitan Cairo); (2) the temperament of Egypt; (3) the necessity to adapt to the local environment; (4) disturbances and corruption of air there; (5) causes of epidemics; (6) geographical comparison between various parts of Metropolitan Cairo; (7) geographical comparison between Metropolitan Cairo and rural areas; (8) methods of improving the quality of air, water and food in Egypt; (9) appropriate medical remedies for ill bodies; (10) advantages of living in Metropolitan Cairo; (11) emphasis on proper regime and prophylaxis rather than remedial treatment.²⁵

Ibn Jumayʿ (twelfth century)

Here we meet another study of the specific environment of a city. Ibn Jumayʿ wrote about Alexandria, where he examines the various parts of the city, conducts field reviews of drinking water sources and how they are polluted, and studies the types of food and drink. After demonstrating the city's shortcomings, he gives appropriate advice to eliminate pollution and avoid illnesses. He also gives special advice to the physicians who work in the city.²⁶

Ibn Jumayʿ was influenced by Ibn Ridwān, not only in the overall subject, but also in repeating some of his predecessor's ideas. For example, Ibn Ridwān mentioned that 'Burqa rams are imported to Egypt. Their transportation creates aridity in their bodies, dryness and humours that are unlike the temperament of the Egyptians. For this reason most of the rams get sick when they enter Egypt. After settling down in Egypt for a suitable length of time, their temperament changes and agrees with that of the Egyptians'.²⁷ Ibn Jumayʿ repeats the same thing about Burqa rams, but without giving any credit to Ibn Ridwān.²⁸

Ya'qūb al-Isrā'īlī or Al-As'ad al-Mahallī (twelfth century)

Ya'qūb states, in the introduction, that when he visited Damascus in A.H. 598/A.D. 1202 he was asked several questions. His treatise on *The Temperament of Damascus* is composed of the answers to those questions, one of which was about the temperament of Damascus, its location, and differences from Egypt. It is composed of four 'articles' (*maqālāt* in Arabic) in 31 pages (see Table 1). Only the first article (in 10 pages) is devoted to the question of Damascus and Egypt, although the whole treatise is named after that article. That 'article' is divided into three sections: (i) presenting the seven climates, and proving that the equator is not a temperate zone; (ii) Egypt's temperament; and (iii) the temperament of Damascus.^{29,30}

In his opinion Egypt is healthier than Damascus, because of the differences in weather and terrain. He therefore gives several pieces of advice regarding suitable diet in Damascus to avoid the common illnesses there.³¹

'Abdallatīf al-Baghdādī (twelfth and thirteenth centuries)

'Abdallatīf was a Baghdād physician who was in Cairo when a great famine and spread of illness occurred in A.H. 597–8 (A.D. 1201–2). In his book we have a graphic and detailed eye-witness account of this occurrence, as well as other chapters dealing with ancient monuments of Egypt at that time, plants, animals, exotic foods, buildings (including public baths) and ships. It contains also a progressive study of the River Nile and its floods, so vital to the life and economy of Egypt at that time. This is a famous and important work, which has been studied by several researchers. It contains valuable information concerning environmental pollution. Examples are:

1. The effect of weather conditions and the rise of the Nile river on the health of people. Here he follows Ibn Ridwān in saying that the people of Upper Egypt are healthier than those of Lower Egypt.^{32,33}
2. The social effects and the behaviour of people at times of crisis. Some researchers thought that he was talking about an epidemic,^{34,35} while actually he was describing a calamity that resulted from drought and famine.^{36,37}
3. The proper design of houses and city planning. He observed the use of wind catchers, the towers containing ventilation shafts in houses. The Egyptians had firm sewage channels; their streets, markets and houses were wide and comfortable.³⁸
4. The bath houses were designed with proper ventilation, enough lighting and elevated vaults.³⁹

Ibn al-Quff (thirteenth century)

Ibn al-Quff's work (Table 1) belongs to the literary genre of preventive medicine, as did Ibn Sīnā's work. Other works of this genre⁴⁰ showed less concern about environmental issues. Ibn al-Quff's book is considered outstanding among all the others, being the most comprehensive, finest and most original. It was not surpassed until the time of the European Renaissance in its precision, scope, contents and objectivity.⁴¹ Among the subjects of the book are: (1) water quality and treatment; (2) causes of epidemics; and (3) diet and health protection of people according to the terrain and weather in their areas.⁴²

Ibn al-Nafīs (thirteenth century)

Ibn al-Nafīs wrote a voluminous commentary on Hippocrates' *Epidemics I and III*. But this commentary does not add much new to the field. In his introduction, Ibn al-Nafīs mentions that his task is limited to explaining the statements of 'the Leader Hippocrates' (*al-Imām Abuqrāt* in his Arabic wording) and justifying his claims. He decided to avoid any side issues and arguments against the opponents of Hippocrates, because these controversies were mentioned in other works written by the commentator.⁴³

The latter authors who cited Ibn al-Nafīs were not influenced by this commentary. They referred to another book of his, namely the *Summary of Qanun (mūjaz al-Qānūn)* which has a commentary on the important plague description of Ibn Sīnā.⁴⁴

CLASSIFICATION OF THE TREATISES

Table 1 lists twenty books related to the field of environmental pollution. Most of them have been mentioned in this article; a few are not extant. The areas covered by these books are:

- Pollution and contagion (numbers 1, 4, and 9 in the table)
- Medical geography: the environmental conditions of specific cities – Alexandria, Cairo and Damascus (10, 14, 15, 16, 17)
- Remedies, treatments and combating illness (2, 3, 11, 12)
- Prevention of air and water pollution (8, 13, 18)
- Clinical observations (19)
- Conservation of health for travellers (5)
- Effects of weather (6, 7, 20)

TABLE 1. List of Arabic treatises dealing with environmental pollution, up to the end of the thirteenth century A.D.

#	English Title	Arabic Title	Author	Condition (Manuscript or Printed)	Folios or Pages
1	<i>Causes of Heavenly Fatal Toxicants, Named Epidemics</i>	رسالة في إيضاح العلة في السمائم القاتلة السمائية، وهو على القول المطلق الوباء	Al- Kindī (d. ca. A.H.200/ A.D.873)	Not extant ⁴⁵	Not extant
2	<i>Drugs Curing Detrimental Odours</i>	رسالة في الأدوية المشفية من الروائح المؤذية	—	Not extant ⁴⁶	—
3	<i>Incenses Purging the Atmosphere against Epidemics</i>	رسالة في الأبخرة المصلحة للجو من الأوباء	—	Not extant, but al-Tamīmī (see below) cites it. ⁴⁷	7 printed pages are extant
4	<i>On Contagion</i>	كتاب في الإعداداء	Qustā ibn Lūqā (d. ca. A.H.300/ A.D.912)	Printed in Stuttgart, 1987	9 printed pages
5	<i>Medical Regime for the Pilgrims</i>	رسالة في تدبير سفر الحج	—	Printed in Leiden, 1992	34 printed pages
6	<i>Epistle on Chronic Coryza at the Bloom of Roses</i>	مقالة في العلة التي من أجلها يعرض الزكام لأبي زيد البلخي في فصل الربيع عند شمه الورد	al-Rāzā (Rhazes) (d. A.H.313/ A.D.925)	Printed in Aleppo, 1977 ⁴⁸	3 printed pages
7	<i>The Reason that Simoom [Hot Wind] Kills Most Animals</i>	السبب في قتل ريح السموم أكثر الحيوانات	—	Manuscript in Tehran ⁴⁹	fol. 90a-91a (3 ms. pages)
8	<i>On Types of Waters</i>	رسالة في المياه	—	Manuscript in Tehran ⁵⁰	fol. 224b-242a (36 ms. pages)
9	<i>On Epidemics</i>	الرسالة الوبائية	—	Manuscript in Istanbul ⁵¹	fol. 493b-502a (18 ms. pages)

ARABIC TREATISES ON ENVIRONMENTAL POLLUTION

10	<i>Causes Generating Epidemics in Egypt, Methods of Prevention and Treatment</i>	نعت الأسباب المولدة للوباء في مصر وطريق الحيلة في ذلك وعلاج ما يتخوف منه	Ibn al- Jazzār (d. A.H.369/ A.D.980)	Not extant; but small extracts are given by al-Tamīmī and Ali ibn Ridwān	Small extracts
11	Surviving material about treating air spoilage and avoiding epidemics	مادة البقاء بإصلاح فساد الهواء والتحرز من ضرر الوباء	al- Tamīmī (d. ca. A.H.390/ A.D.1000)	Printed in Cairo, 1999	700 printed pages
12	<i>Investigation on the Nature of Epidemics, their Prevention and Cure</i>	رسالة في تحقيق أمر الوباء والاحتراز منه وإصلاحه إذا وقع	Abū Sahl al-Masīhī (d. A.H.401/ A.D.1010)	Manuscript in Istanbul	fols. 73a- 82a (19 ms. pages)
13	<i>Repelling General Harm from the Human Body</i>	دفع المضار الكلية عن الأبدان الإنسانية	Ibn Sīnā (Avicenna) (d. A.H.428/ A.D.1037)	Printed in Aleppo, 1984	63 printed pages
14	<i>On the Prevention of Bodily Ills in Egypt</i>	دفع مضار الأبدان بأرض مصر	Alī ibn Ridwān (d. A.H.460/ A.D.1068)	Printed in 3 different editions: Berkeley, Baghdad and Cairo	63 printed pages (U.S. edition)
15	<i>The Nature of Alexandria</i>	طبع الإسكندرية	Ibn Jumay ^l (d. A.H.594/ A.D.1198)	Printed in Mecca, 1997	74 printed pages
16	<i>The Temperament of Damascus: Its Location and Difference from Egypt</i>	مزاج دمشق ووضعها وتفاوتها من مصر	Ya'qūb al- Isra'īlī (d. ca. A.H.600/ A.D.1204)	Manuscript in Istanbul	Fols. 34a- 49a (31 ms. pages)
17	<i>Instruction and Admonition on the Things Seen and Events Observed in the Land of Egypt</i>	الإفادة والاعتبار في الأمر المشاهدة والحوادث المعانية بأرض مصر	Abdal-latif al-Bagh- dādī (d. A.H.629/ A.D.1231)	Printed in several editions, e.g.: Paris 1810 London 1964 Damascus 1982 Baghdad 1987	96 printed pages
18	<i>Prevention of Health and Avoiding Ills</i>	جامع الغرض في حفظ الصحة ودفع المرض	Ibn al-Quff (d. A.H.685/ A.D.1286)	Printed in Amman, 1989	363 printed pages
19	<i>Commentary on 'Epidemics'</i>	كتاب شرح أبيذيميا	Ibn al-Nafis (d. A.H.687/ A.D.1288)	Manuscript in Istanbul and Cairo	Cairo copy is in 193 folios (386 pages)
20	<i>Commentary on 'Airs, Waters and Places'</i>	كتاب شرح الاهوية والمياه والبلدان	—	Not extant ⁵²	Not extant

Some of the authors made genuine contributions to the field. For example we have mentioned those who studied specific localities. Others did no more than rely on the Greek theory of humours and miasma. For example, Ibn al-Nafīs, known in the history of medicine as being the discoverer of the lesser circulation of the blood, wrote two lengthy commentaries on Hippocrates; but reviewing the extant one of those commentaries we do not find anything new. The common factor linking all the aforementioned authors is that they were all concerned with environmental pollution and how to protect human health from its effects.

NOTES

¹ M.W. Dols, *The Black Death in the Middle East* (New Jersey: Princeton University Press, 1977).

² Dols, *The Black Death in the Middle East*, 29n.

³ Yahya Sh'ār (editor), *Māddat al-Baqā'* [Surviving Material] by Attamīmī al-Maqdisī (Cairo: The Institute of Arabic Manuscripts, 1999), pp. 177–83.

⁴ G. Bos (editor), *Qusta Ibn Luqa's Medical Regime for the Pilgrims to Mecca* (Leiden: E.J. Brill, 1992), p. 5.

⁵ H. Fahndrich (editor), *Abhandlung uber die Ansteckung von Qusta Ibn Luqa* (Stuttgart: Franz Steiner Verlag Wiesbaden GMBH, 1987), pp. 22–4 .

⁶ Bos, *Qusta's Medical Regime*, pp. 21–3.

⁷ Dols, *The Black Death in the Middle East*, p. 87.

⁸ Dols, *The Black Death in the Middle East*, p. 29.

⁹ Fuat Sezgin, *Geschichte des Arabischen Schrifttums, vol.3 (Medicine)* (Leiden: E.J.Brill, 1970), pp. 271 & 327.

Sezgin noted that the treatise cannot be Qustā's, because it was written upon the request of Khwarizm-Shah (the King of Khwarizm) *Ma'mūn* who died in A.H. 407/A.D. 1016, while Qustā died around A.H. 300/A.D. 912.

¹⁰ Sezgin, *Geschichte des Arabischen Schrifttums*, 3, p. 290.

¹¹ Friedrun Hau, 'Summary of .. Rāzī's Epistle on Chronic Coryza at the Bloom of the Roses', *Journal for the History of Arabic Science* 1-1 (Aleppo: Aleppo University 1977), p. 123.

¹² L.E. Goodman, 'al-Razi', in *Encyclopaedia of Islam* (new edition, EI²), (Leiden: E.J. Brill) volume 8 (1995): p. 474 .

¹³ Hazim al-Bakri (editor), *al-Mansūrī fī 't-Tibb* [*The Mansūrean Book on Medicine*] by al-Razi (Kuwait: Institute of Arab Manuscripts, 1987), p. 225.

¹⁴ M.W.Dols and A.S. Gamal, *Medieval Islamic Medicine, Ibn Ridwan's Treatise 'On the Prevention of Bodily Ills in Egypt'* (Berkeley: University of California Press, 1984), p. 53.

¹⁵ J. Schacht and M. Meyerhof (ed. & trans.), *The Medico-Philosophical Controversy Between Ibn Butlan of Baghdad and Ibn Ridwan of Cairo* (Cairo: The Egyptian University, Faculty of Arts, 1937), p. 89 .

¹⁶ Yahya Sh'ār, *Māddat al-Baqā'* .

¹⁷ Dols, *The Black Death in the Middle East*, p. 29.

¹⁸ S. K. Hamarneh, *Background of History of Arabic Medicine* (Amman: Yarmouk University, 1986), (in Arabic), p. 280.

- ¹⁹ Dols, *The Black Death in the Middle East*, pp. 99 & 333.
- ²⁰ Dols, *The Black Death in the Middle East*, pp. 99 & 100.
- ²¹ Abū Sahl al-Masīhī, *Fī Tahqīq Amr al-Wabā' wa-l-Ihtirāz Minhu Idha Waqa'* [Investigation on the Nature of Epidemics, their Prevention and Cure] (Istanbul: Shehid Ali Library MS. 2095). This treatise has been edited by the author of this paper. It is being printed in volume 13 of the *Journal for the History of Arabic Science*.
- ²² Dols, *The Black Death in the Middle East*, p. 89.
- ²³ Zuhair al-Baba (editor), *Min Mu'allafāt Ibn Sīnā at-Tibbiyya, K. Daf' al-Madhār al-Kullīyyah A'n al-Abdān al-Insāniyya* [Selected Medical Works of Avicenna: Repelling General Harm from the Human Body] (Aleppo: Aleppo University, Institute for the History of Arabic Science, 1984).
- ²⁴ Dols and Gamal, *Ibn Ridwan's Treatise*, pp. 19 & 65 .
- ²⁵ Dols and Gamal, *Ibn Ridwan's Treatise*, pp. 69–72 .
- ²⁶ Muraizen (Aseeri and Sa'd al-Bishri (editors), *Tab' al-Iskanderiyya* [The Nature of Alexandria] by Ibn Jumay^l, (Mecca: Umm al-Qura University, 1997).
- ²⁷ Dols and Gamal, *Ibn Ridwan's Treatise*, pp. 90–1 .
- ²⁸ (Aseeri and al-Bishri, *The Nature of Alexandria*, pp. 69 & 70.
- ²⁹ R. Şeşen et al., *Islamic Medical Manuscripts in the Libraries of Turkey* (Istanbul: Research Centre for Islamic History, Art and Culture, 1984), p. 390.
- ³⁰ Ya'qūb al-Isra'īlī, *Mizāj Dimashq wa Wadh'ihā wa Tafāwutihā min Misr* [The Temperament of Damascus: Its Location and Difference from Egypt] (Istanbul: Nur Osmaniyya Library MS. 3589/3), folios 34A-49A.
- ³¹ Ibid.
- ³² Dols and Gamal, *Ibn Ridwan's Treatise*, pp. 92 & 193 .
- ³³ K. Hafuz Zand, and John and Ivy Videan, *The Eastern Key: Kitāb al-Ifādah wa'l-Itibār of 'Abdallatīf al-Baghdādī* (London: George Allen & Unwin Ltd., 1965), p. 27.
- ³⁴ Zand and Videan, *The Eastern Key*, p. 7.
- ³⁵ Dols, *The Black Death in the Middle East*, p. 33 .
- ³⁶ Ibn Hajar al-ʿAsqalānī, *Badhl al-Mā'ūn fī fadhl aṭ-Ṭā'ūn* [About the Religious Virtue of Plague], edited by Ahmed I.A. al-Kātib (Riyadh: al-ʿĀsimah publisher, 1999), p. 368.
- ³⁷ an-Nuwairī, *Nihāyat al-Arab f Funūn al-Adab* [On Varieties of Literature] (Cairo: General Egyptian Book Organization, 1992) 29: 12.
- ³⁸ Zand and Videan, *The Eastern Key*, p. 179.
- ³⁹ Zand and Videan, *The Eastern Key*, p. 183.
- ⁴⁰ Hamarneh, S.K. (ed.) *Ibn al-Quff al-Karaki's Book On Preventive Medicine and the Prevention of Health* (Amman: University of Jordan, 1989) pp. 12 & 13.
- ⁴¹ Ibid.
- ⁴² Op. cit., pp. 176, 180–92, 216, 217 .
- ⁴³ Ibn al-Nafīs, *Sharh Kitāb Apidhīmīyā* [Commentary on 'Epidemics'] (Cairo: National Egyptian Library MS. 583 Tibb/Tal'at) folios 1a & 1b.
- ⁴⁴ Dols, *The Black Death in the Middle East*, pp. 29, 88, 89 .
- ⁴⁵ ʿAmer an-Naggār (editor), *Uyūn al-Anbā' fī Tabaqāt al-Atibbā'* [Best Selected Items of Information about the Classes of Physicians] by Ibn Abī Usayb'ī'a (Cairo: National Book Organization, 2001) 2: p. 185.
- ⁴⁶ an-Naggār, *Uyūn al-Anbā'*, 2: p. 184.
- ⁴⁷ Sh'āar, *Māddat al-Baqā'*, pp. 177–83.
- ⁴⁸ Hau, 'Razi's Epistle', p. 123.

⁴⁹ Sezgin, *Geschichte des Arabischen Schrifttums*, 3: 289.

⁵⁰ Sezgin, *Geschichte des Arabischen Schrifttums*, 3: 290.

⁵¹ Şeşen et al., *Islamic Medical Manuscripts*, p. 115

⁵² Yousef Zeedan, *Al-Mukhtasar fi'l Hadīth [A Compendium in Hadīth] with a bibliography of the works of Ibn an-Nafīs* (Cairo: Al-Dar al-Misriyah al-Lubnaniah, 1991), pp. 62–3.