

INTERNATIONAL JOURNAL OF LEPROSY and Other Mycobacterial Diseases

OFFICIAL ORGAN OF THE INTERNATIONAL LEPROSY ASSOCIATION

EDITORIAL OFFICE

Gillis W. Long Hansen's Disease Center
at Louisiana State University
Baton Rouge, Louisiana 70894, U.S.A.

VOLUME 61, NUMBER 2

JUNE 1993

EDITORIAL

Editorial opinions expressed are those of the writers.

Leprosy and the Case of King Baldwin IV of Jerusalem: Mycobacterial Disease in the Crusader States of the 12th and 13th Centuries

The case of King Baldwin IV (died 1185 A.D.) has received little critical attention since the 1930s and 1940s,^{1,2} and reference in the English language is extremely brief.² This is clearly inadequate, especially bearing in mind the modified archeological hypotheses concerning both the timing of the introduction of leprosy into the Middle East³ and the new ideas on the immunological resistance to leprosy in cases from ancient times.⁴ In addition there have also been considerable advances in the classification and knowledge of the variations among the different manifestations of infection with

Mycobacterium leprae since that time.^{5,6} Using this information it is interesting to look at the case of Baldwin IV from a modern perspective and also to consider the suggestion that he might, in fact, have been suffering from a form of treponematoses found in the Middle East⁷ known as "endemic syphilis," "treponarid" or "bejel." Following on is a discussion of the effects of diseases diagnosed by medieval physicians in the Middle East as "leprosy"* and how society coped with them. Finally, the topic of tuberculosis and leprosy crossimmunity is studied, since paucity of evidence is one of the major handicaps experienced by those studying disease relationships in the past and, with the exception of Egypt,

* When the word leprosy is used in quotes, the word refers to those diseases categorized as such by medieval diagnosis, namely, Hansen's disease and, almost certainly, endemic syphilis as well.

¹ Jeanselme, E. *La Lèpre*. Paris: G. Dovin & Co., 1934.

² Lowe, J. Comments on the history of leprosy. *Indian Med. Gaz.* 77 (1942) 680.

³ Dols, M. Leprosy in medieval Arabic medicine. *J. Hist. Med.* 34 (1979) 314-333.

⁴ Andersen, J. G. Studies in the medieval diagnosis of leprosy in Denmark. *Dan. Med. Bull.* 16 Suppl. 9 (1969) 1-142.

⁵ Ridley, D. A. and Jopling, W. H. Classification of leprosy according to immunity; a five-group system. *Int. J. Lepr.* 34 (1966) 255-273.

⁶ Job, C. K. and Chacko, C. J. G. A simplified 6 group classification of leprosy. *Lepr. India* 54 (1982) 26-32.

⁷ Brothwell, D. R. Comments on Baker and Armelagos' The origin and antiquity of syphilis. *Curr. Anthropol.* 29 (1988) 721.

the medieval eastern Mediterranean is one area where very little work has been undertaken.

Presence of leprosy in the Middle East prior to Baldwin

Romantic notions have associated the introduction of leprosy into the Middle East with the Indian Campaign of Alexander the Great in 327–326 B.C.³ We do know that leprosy was present in India at least as early as 600 B.C.,⁸ and a condition extremely suggestive of lepromatous leprosy had been described by 300 B.C. in the works of physicians at the prestigious School of Alexandria in Egypt, terming the disease “elephas” or “elephantiasis.”³ We have no references to leprosy in the Middle East before 300 B.C. However, continuous trade had plied along such trade routes as the Silk Road from China (also known to have had leprosy by that time⁹) and from southern Asia. Trade is a well known source for the spread of many transmissible diseases, and should always be kept in mind as a possible mode of transfer from one area to another. Regardless of the source of origin or manner of introduction of the disease to the area, we can be sure that by the 11th century leprosy was an endemic disease in the Mediterranean. From its characteristic skeletal pathology four cases of leprosy have been described¹⁰ from a grave dated to 492 A.D. in the Byzantine Monastery of Martillous in the Judean Desert, and there are further examples from the Monastery of St. John the Baptist, near the River Jordan, dated to around 600 A.D. The disease is also known to have been present in Egypt by the medieval period shown, for example, by the advanced postcranial and rhinomaxillary changes of a mummy from El-Bigha dated to around 500 A.D.¹¹ Since we know the

disease was present in and around the area of the Crusader States before the time of Baldwin, leprosy would not be too surprising a diagnosis of his condition.

The case of King Baldwin IV

Baldwin IV of Jerusalem is perhaps the most famous leprosy patient of the Crusader States. William of Tyre,¹² responsible for Baldwin's education, wrote an excellent account of the early symptoms. “It so happened that once when he was playing with some other noble boys who were with him, they began pinching one another with their fingernails on the palms and arms, as playful boys do. The others evinced their pain with yells, but, although his playmates did not spare him, Baldwin bore the pain, altogether too patiently, as if he did not feel it. When this had happened several times, it was reported to me. At first I thought this had happened because of his endurance, not because of insensitivity. Then I called him and began to ask him what was happening. At last I discovered that about half of his right hand and arm were numb, so that he did not feel pinches or even bites there.

“I reported all this to his father. Physicians were consulted and prescribed repeated formentations, anointings and even poisonous drugs to improve his condition, but in vain. For as we later understood more fully as time passed and as we made more comprehensive observations, this was the beginning of an incurable disease For as he began to reach the age of puberty it became apparent that he was suffering from that most terrible disease. Each day he grew more and more ill. The extremities and the face were most affected” Later, with Baldwin now ascended to the throne, it was written, “They grew fearful especially as the king, whose illness grew daily worse, was becoming less and less fit to handle the affairs of the kingdom. Indeed, he was scarcely able to stand up and he might collapse altogether He had lost his sight and his extremities were covered with ulcerations so that he was unable to use either his hands or his feet.” Baldwin died on 16 March 1185, aged 24.

⁸ Dharmendra. Leprosy in ancient Indian medicine. *Int. J. Lepr.* 15 (1947) 424–430.

⁹ Skinsnes, O. K. Leprosy in archeologically recovered Bamboo Book in China. *Int. J. Lepr.* 43 (1980) 333.

¹⁰ Zias, J. Leprosy in the Byzantine monasteries of the Judean Desert. *Koroth* 9 (1985) 242–248.

¹¹ Möller-Christensen, V. Evidence of leprosy in earlier peoples. In: *Disease in Antiquity*. Brothwell, D. R. and Sandison, A. T., eds. Springfield: Charles C. Thomas, 1967, pp. 295–307.

¹² William of Tyre. *Chronique*. Huygens, R. B. C., ed. Turnhout, Belgium: Brepols, 1986.

The idea that much of what was termed "leprosy" in the Middle Ages, especially in the Middle East, could actually have been cases of endemic syphilis is a much discussed one.^{13, 14} It has been suggested that the case of Baldwin IV is one such example, since some feel that his condition progressed too fast to have been leprosy.⁷ However, there are a number of reasons to suggest that the diagnosis of Baldwin IV's affliction as leprosy is the correct one.

Firstly, Baldwin's father, King Amalric, brought in a respected physician from Egypt to treat his son, but the condition did not improve.¹⁵ It is known that Islamic physicians, practicing the most advanced medical techniques in the world at that time, used an ointment made from cinnabar (mercury sulfide) and fat which was named "Saracen Ointment" by pilgrims returning to Europe. This was used to treat certain disfiguring skin diseases, and would be expected to improve symptoms of endemic syphilis infection.¹⁴

Indeed, mercury compounds have been used as the mainstay of treatment for the treponematoses for hundreds of years, such as John of Vigo (1517 A.D.)¹⁶ and Carmichael (1817 A.D.) in Dublin.¹⁷ It would be anticipated that the standard of drugs and general expertise of such a physician, whose reputation would result in his treating the heir to a throne, would have been particularly high for the period. It seems likely that if Baldwin was suffering from endemic syphilis, use of the mercury-containing ointment would have had a beneficial effect upon the condition, at least in the short term, but this was not the case.

Secondly, the distribution of lesions on Baldwin is characteristic of leprosy rather

than endemic syphilis. William of Tyre specifically notes that they were worse on the extremities as well as the face. While endemic syphilis lesions tend to present in warm moist areas (such as around the mouth and nose, armpits and groin), lepromatous leprosy, the form Baldwin appears to have developed as he grew older, is characterized by lesions on the face, hands and feet.

Thirdly, the nature of the lesions is more suggestive of lepromatous leprosy than of endemic syphilis. While both conditions share some symptoms, such as ulceration, lepromatous leprosy is associated with the anesthesia and destruction of the hands and feet, which Baldwin had, while endemic syphilis invariably is not.¹⁸

Immunological resistance to leprosy in antiquity

It has been suggested that in early times leprosy manifested itself in the lepromatous form, which is associated with an ineffective, antibody-related, immune response. It is thought that only after many centuries did effective immunity develop in humans so that the tuberculoid form, with the more effective cell-mediated immune response, became a common occurrence.⁴ This is substantiated by textual descriptions of cases in the Sushruta Samhita of 600 B.C. India⁸ and a 3rd century B.C. bamboo book from China,⁹ as well as by the pattern of lesions seen in early leprosy archaeological skeletal material which regularly demonstrates bilateral involvement of the peripheral skeleton coupled with rhinomaxillary change. Examples of such pathology from Egypt include Ptolemaic skeletal remains from 2nd century B.C.¹⁹ and a mummy dating from 500 A.D.¹¹ There are also cases from northern Europe, dating to the Dark Ages and the early medieval period, such as skeletal remains from 6th century Anglosaxon Beckford in Britain,²⁰ 7th century Tean in the

¹³ Baker, B. J. and Armelagos, G. J. The origin and antiquity of syphilis. *Curr. Anthropol.* **29** (1988) 703–737.

¹⁴ Hudson, E. H. Treponematoses and pilgrimage. *Am. J. Med. Sci.* **246** (1963) 645–656.

¹⁵ Hallam, E., ed. *Chronicles of the Crusades*. London: Guild Publishing, 1989, p. 86.

¹⁶ Hudson, E. H. Historical approach to the terminology of syphilis. *Arch. Dermatol.* **84** (1961) 545–562.

¹⁷ Carmichael, R. *An Essay on the Venereal Diseases which Have Been Confounded with Syphilis, and the Symptoms which Exclusively Arise from that Poison*. Philadelphia: T. Dobson & Son, 1817.

¹⁸ Manson-Bahr, P. E. C. and Apter, F. I. C., eds. *Manson's Tropical Diseases*. 18th edn. London: Baillière Tindall, 1982, pp. 298–322, 406–407.

¹⁹ Dzierzykraj-Rogalski, T. Paleopathology of the Ptolemaic inhabitants of the Dakhleh Oasis (Egypt). *J. Hum. Evol.* **9** (1980) 71–74.

²⁰ Wells, C. A possible case of leprosy from a Saxon cemetery at Beckford. *Med. Hist.* **6** (1962) 318–344.

Scilly Isles,²¹ and from the Merovingian Period (500–752 A.D.) in France at Neuville-sur-Escaut.²² From the preceding discussion it is evident that the distribution of lesions and the effect of the disease upon Baldwin is extremely suggestive of lepromatous leprosy, and this fits well with the hypothesis⁴ concerning the gradual development of resistance to leprosy bacillus.

Contemporary medieval diagnosis of leprosy

The degree to which leprosy was prevalent in the Crusader States is very hard to assess. Very few documented accounts of disease classed as "leprosy" by physicians in the Crusader States exist, and it is thought highly likely that at least some of those so classified were, in fact, suffering from endemic syphilis.¹⁴ In the past it has been suggested that anyone suffering from a number of skin-disfiguring diseases from smallpox to elephantiasis might have been diagnosed as having leprosy.²³ The facial sores of leishmaniasis also might be expected to have caused confusion, while psoriasis may not only cause skin lesions but also abnormalities to the bones of the digits if manifested as psoriatic arthropathy.²⁴

Before all credibility of medieval leprosy diagnosis is shattered, it should be acknowledged that the standard of medicine in the Middle East at the time was particularly high, even if many Frankish doctors who had studied in Europe and migrated to the Crusader States left a little to be desired.²⁵ By the time of the Crusades it seems that medicine in the area did recognize leprosy as distinct from most of these conditions.³ Very early writers sometimes did become confused between such similar

diseases, for instance, At-Tabari (died c. 850 A.D.) who confused leprosy with elephantiasis, but the distinction was soon made. Rhazes (865–925 A.D.) described the general symptoms well, noting the changes to the voice, the skin, the eyes, the loss of hair, and hand deformity. The physician al-Majusi in his work *As-sina' ah at-tibbiya* gives an account of what he says are two forms of leprosy; the first would not lead to falling away of the limbs and treatment might succeed, while the second caused eating away of the extremities. It has been suggested that he was describing the two extremes of the leprosy spectrum, tuberculoid and lepromatous.³ However, the coupling of the beneficial effect of treatment (possibly referring to "Saracen Ointment") with the preservation of the fingers and toes does suggest that a rudimentary knowledge of the difference between Hansen's disease and endemic syphilis was known. Avicenna gives further detail to the record of leprosy symptoms, and in his classification of leprosy into four types describes one as the "serpentine disease" which, it has been suggested, may have been referring to some of the spiralling skin lesions of endemic syphilis.²⁶ Abu I-Quasim az Zahrawi (died 1009 A.D.) discussed the neurological symptoms. This suggests that by the time the Crusaders arrived medical practitioners of the Middle East were well acquainted with leprosy, were aware that leprosy was distinct from most other diseases with roughly similar symptoms, and actually may have differentiated between leprosy and endemic syphilis, even though they still classified them both as different forms of "leprosy."

Legislation introduced to cope with "leprosy"

The Moslem empire had legislation concerning "leprosy," part of which involved the issue of certificates to those diagnosed as having the disease. One such certificate comes from the Geniza writings of Cairo, and is dated 23 February 1262,²⁷ during the

²¹ Brothwell, D. R. The palaeopathology of early British man. *J. R. Anthropol. Inst.* **91** (1961) 318–344.

²² Blondiaux, J. *Le Cimetiere Merovingien de Neuville-sur-Escaut*. Denain: Musee Municipal de Denain, 1989.

²³ MacArthur, W. Medieval leprosy in the British Isles. *Lepr. Rev.* **24** (1953) 8–19.

²⁴ Ortner, D. J. and Putschar, W. G. *J. Identification of Pathological Conditions in Human Skeletal Remains*. Washington, D.C.: Smithsonian Institution Press, 1981, p. 405.

²⁵ Woodlings, A. F. The medical practice of the Crusader States in Syria and Palestine 1096–1193. *Med. Hist.* **14** (1971) 268–277.

²⁶ Holcombe, R. C. Christopher Columbus and the American origin of syphilis. *U.S. Nav. Med. Bull.* **32** (1934) 401–430.

²⁷ Isaacs, H. D. A medieval Arab medical certificate. *Med. Hist.* **35** (1991) 250–257.

Crusader period. The document certifies Abraham a leprosy patient and not fit to mix freely with the Moslem community.

It is well known that leprosy patients, as well as others with skin complaints, travelling vast distances to bathe in sulfurous pools, such as those at Tiberias which lay to the west of the Sea of Galilee and, at the time of writing Abraham's certificate, lay within the boundaries of the Crusader States, although it was soon to be overrun by the Islamic Mamluks. We have a fragment of a letter (fragment T-S 13J 19.19) from the mid-11th century which was written by Jews from Cairo who were bathing at Tiberias for health reasons, and sent to their community back in Cairo. This mentions some of their symptoms including blindness, mutilation and deafness,²⁷ and many of these cases must surely have been true leprosy.

There was legislation referring to "leprosy" in the Crusader States also, most notably in the *Livre au Roi* which was the Kingdom's first comprehensive, documented legal code and which was drawn up some time between 1196 and 1205. The very fact that the condition warranted special legislation shows that a significant proportion of the population had "leprosy" and that, to a degree, it was an accepted hazard of the times. The relevant clauses provide for difficulties likely to arise from affliction in the nobility, for example, if a knight contracted leprosy he had to join the Order of St. Lazarus and continue to provide the military service to the king required from his fief using a substitute liege.²⁸ Ideas have been put forth concerning the relationship between leprosy prevalence in medieval times and social class²⁹ since some nobles are said to have gone out of their way to increase their exposure to the disease, although the degree to which this occurred and any impact this may have had on the distribution of leprosy cases throughout the social strata is debatable. The origins of the brothers of St. Lazarus may date back to the 4th century, when Pope Damas approved the founda-

tion of a leprosy hospital in Byzantine Caesarea.²⁵ This is particularly interesting since this foundation is in stark contrast to the situation in northern Europe, where such institutions were only found much later. In Britain the earliest known leprosarium was established by Archbishop Lanfranc (died 1089 A.D.) at Harbledown, Canterbury, roughly 700 years later, although some have proposed that less formal foundations may have existed during the Viking era, such as at Loppergarth on the Furness Peninsular.³⁰ This might have been due to either a lower prevalence of leprosy in northern Europe compared with the Middle East at that time or to differing social attitudes toward the disease in the two communities. It seems most likely that both factors would have been contributory. It could also have been that leprosy, with its biblical connotations, would have been close to the hearts of many of the Christian pilgrims traveling to the Holy Land. Likewise the association of Saint George, patron saint of leprosy sufferers and adopted as a symbol by several European countries, may have played a role since he was born in Cappadocia (during the 3rd century) and originally buried at Lydda,³¹ which is between Jericho and Joppa. In this way a Levantine leprosarium might have been sustained by donations of the pious, while funds for a similar establishment in northern Europe might have been harder to acquire since religious zeal often wore off once the pilgrim returned home.

In fact, this hospital at Caesarea was one of the first hospitals, in the modern sense of the word, to be founded in the Western world. In Greek and Roman times, physicians tended either to visit their clients or to receive a visit themselves, and establishments where members of the general population could go for nursing and medical care with food and a bed did not exist, although comparable arrangements were made for particular groups, such as military legionaries in their "valetudinaria." In the Eastern Roman (Byzantine) Empire, these hospitals began to appear during the second

²⁸ Grousset, R. *Histoire des Croisades et des Royaumes Franc de Jerusalem*. Vol. 3. Paris: Plon, 1936, pp. 90, 109.

²⁹ Ell, S. R. Leprosy and social class in the Middle Ages. *Int. J. Lepr.* 54 (1986) 300-305.

³⁰ Richards, P. Leprosy in Scandinavia. *Centaureus* 7 (1960) 101-133.

³¹ Huizenga, L. S. St. George, the patron saint of lepers. *Int. J. Lepr.* 3 (1935) 337-338.

half of the 4th century, and included foundations in such cities as Antioch and Constantinople and also Caesarea, where Basil founded the famous "ptocheion" complex around 370 A.D. which included a hospital, a hostel for the poor, and also a monastery.³² By Crusader times, the best known leprosy hospital was to be found in Jerusalem, although others existed in Bethlehem (later evacuated to Acre) and one in Beirut, dedicated to St. Bartholemew.³³ The earliest record we have of the order's privileges was the donation of a cistern, confirmed by William the Patriarch of Jerusalem.³⁴ The order's central establishment was the "house of leprosy patients" in Jerusalem, about which Theoderich³⁵ wrote in his work *Description of the Holy Places*. He recounts that "whosoever makes the circuit of the city walls, beginning his journey at the Tower of David, will find at the western angle of the city the church and dwellings of the . . . [leprosy patients] which are handsome and kept in good order . . . At the gate [of St. Lazarus] . . . itself stands a venerable hospice." The chronicler Gerard of Nazareth, Bishop of Laodicea, wrote in his work *De Conversatione Servorum Dei* about many of the religious and hermits of the Crusader States in the mid-12th century. Several sought spiritual purification by serving the leprosy patients who lived in the leprosarium outside the walls of Jerusalem. One, named Alberic, took care of their daily needs, kissed each of them every day after mass, and carried the feeble among them on his shoulders. Another was Bartholemew who came to Jerusalem as a pilgrim. He first became a Knight Templar but then imitated Alberic in serving the leprosy patients.³⁶ In Acre, the order's base was at the northern

tip of the city and a leprosy nunnery is marked, near the cathedral, on a contemporary map.³⁴

The leprosy brothers also became a military order, with the master of the order and the "brethren-at-arms" originally having to be leprosy patients themselves, until heavy losses later necessitated the assistance of healthy knights in the ranks. One of the factors maintaining the order's strength was the decree recorded in the *Livre au Roi*, whereby a knight contracting leprosy had to join the order.²⁸

There is some debate over the proportion of sick in these leprosaria who actually had leprosy as opposed to diseases with similar symptoms. Whatever disfiguring diseases the occupants did have, the leprosy hospitals provided a double service to the population, in spite of the fact that the Middle Ages had no cure for leprosy. To a degree they protected society from the contagious diseases, and from the other view they gave support to severely afflicted men and women who were shunned by society, unable to work and support themselves, and who certainly would have died before their time as a result of malnourishment, exposure or secondary infection of unnoticed, and so untreated, minor wounds. A seal of the establishment vividly portrays the lot of the leprosy patient. It shows a man wearing a garment with an open neck, with his head covered, holding a clapper in one hand and with the other concealed under his clothes.³⁴ Whenever such a person left a leprosarium he was obliged to make healthy people with whom he came into contact aware of his affliction by rattling the clappers, giving them a chance to get out of the way.

There were slave markets in the larger towns, at Acre for instance, and again the prevalence of the condition was such that provision was made for the sale to be cancelled if the captive turned out to have leprosy.³⁷

Tuberculosis in the Crusader States

It is known that there is considerable crossreactivity between leprosy antigens and

³² Miller, T. S. *The Birth of the Hospital in the Byzantine Empire*. Baltimore: The Johns Hopkins University Press, 1985, p. 85.

³³ Mayer, H. E. *The Crusades*. 2nd edn. Gillingham, J., trans. Oxford: Oxford University Press, 1990, p. 163.

³⁴ Prawer, J. *The Latin Kingdom of Jerusalem*. London: Wiedenfeld and Nicholson, 1972, p. 276.

³⁵ Theoderich. *Description of the holy places*. In: *The Palestine Pilgrim Text Society*. Vol. 5. New York: AMS Press, 1971, p. 34.

³⁶ Kedar, B. Z. Gerard of Nazareth, a neglected twelfth century writer in the Latin East. *Dumbarton Oaks Papers* 37 (1983) 55-78.

³⁷ Richard, J. *The Latin Kingdom of Jerusalem*. Shirley, J., trans. Amsterdam: North Holland Publishing Co., 1979, p. 132.

those of other mycobacteria,³⁸ for example, the MLW1 leprosy antigen shows cross-reactivity with the BCG60 antigen of *M. bovis* BCG. Many researchers feel that this cross-reactivity may have been partially responsible, along with factors such as changes in attitudes to segregation, increased socioeconomic standards and minor climatic alterations, for the demise of leprosy in Europe.³⁹ Crossimmunity between leprosy and other diseases has been proposed before, such as with the Black Death for which it was not so much immunological as social and environmental factors which were thought to be involved.⁴⁰ Leprosy prevalence in Europe peaked in the 12th and 13th centuries, but became relatively rare in Britain by the 15th and 16th centuries. It was during this period that pulmonary tuberculosis was increasing greatly in prevalence and, as a result, is thought to have conveyed some immunity to leprosy in those who had recovered from tuberculosis. It is, therefore, interesting to very crudely assess the degree to which tuberculosis occurred in the Crusader States in order to add information to the data already published on the relationship in Europe.

It appears that tuberculosis was not an uncommon disease in the Middle East in past ages, as shown by the considerable number of examples of human remains exhibiting pathological signs of tuberculosis, such as the distinctive destructive cavitation of consecutive lower thoracic or lumbar vertebral bodies causing Pott's disease. A number of cases have been found dating back several thousand years, such as a Twentieth Dynasty Egyptian mummy dated to roughly 1000 B.C.⁴¹ There are also skeletal remains of cases from areas once covered by the Crusader States, such as two

Early Bronze Age skeletons from Bab edh-Dhra in Jordan,⁴² and from the medieval Byzantine monasteries of the Judaean Desert.¹⁰ Further cases have been found in Constantinople dating to the 12th century,⁴³ exactly the time when thousands of Crusaders passed through there on the way to the Levant.

The Islamic physician Usamah gives an interesting account of how he was introduced to an effective remedy for scrofula.⁴⁴ "In Shayzar [which lay between Tripoli and Antioch] we had an artisan named abu-al-Fath, who had a boy whose neck was afflicted with scrofula. Every time a part of it would close, another part would open. This man happened to go to Antioch on business of his, accompanied by his son. A Frank noticed the boy and asked his father about him. The Frank said to him, 'wilt thou swear by thy religion that if I prescribe thee a medicine which will cure the boy, thou wilt charge nobody fees for prescribing it thyself? In that case, I shall prescribe to thee a medicine which will cure the boy.' The man took the oath and the Frank said, 'Take the uncrushed leaves of glasswort, burn them, then soak the ashes in olive oil and sharp vinegar. Treat the scrofula with them until the spot on which it is growing is eaten up. Then take burnt lead, soak it in ghee butter and treat him with it. That will cure him.' The father treated the boy accordingly and the boy was cured. The sores closed and the boy returned to his normal condition of health. I have myself treated with this medicine many who were afflicted with such disease and the treatment was successful in removing the cause of the complaint." This is particularly interesting since vinegar has been shown to have effective bacteriocidal components⁴⁵ and lead, although having

³⁸ Kaplan, G. and Cohn, Z. A. The immunology of leprosy. *Rev. Exp. Pathol.* **28** (1986) 45–78.

³⁹ Manchester, K. *Tuberculosis and Leprosy: Evidence for the Interaction of Disease*. Washington, D. C.: Smithsonian Institution Press, 1988.

⁴⁰ Ell, S. R. Plague and leprosy in the Middle Ages; a paradoxical cross-immunity? *Int. J. Lepr.* **55** (1987) 345–350.

⁴¹ Elliot-Smith, G. and Ruffer, M. A. Pottsche Krankheit An Einer Agyptischen Mumie Aus Der Zeit Der 21 Dynastie (um 1000 v. Chr.). *Hist. Biol. Krankheit.* **2** (1910) 9–16.

⁴² Ortner, D. J. Disease and mortality in the early Bronze Age people of Bab edh-Dhra, Jordan. *Am. J. Phys. Anthropol.* **51** (1979) 589–598.

⁴³ Brothwell, D. R. The human bones. In: *Excavations at Sarachane in Istanbul*. Vol. 1. Harrison, R. M. ed. Princeton: Princeton University Press, 1986, p. 395.

⁴⁴ Usamah Ibn Munqidh. *Autobiography: An Arab Syrian Gentleman and Warrior in the Crusades*. Hitti, P., ed. and trans. New York: Columbia University Press, 1929, p. 163.

⁴⁵ Phillips, I., Fernandez, R. and Gundara, N. S. Acetic acid in the treatment of superficial wounds infected by *Pseudomonas aeruginosa*. *Lancet* **1** (1963) 11–13.

unpleasant side effects upon the body, is known to be pathogenic to a considerable number of microorganisms.⁴⁶⁻⁴⁸ Usamah's choice of words, "I have treated many who were afflicted with such disease," does imply that he saw a considerable number of cases of scrofula in his career, which indicates that tuberculosis was not a rare affliction in the eastern Mediterranean at that time.

Another textural example of tuberculosis is recorded by Ibn Wasil in his work *The Dissipator of Anxieties Concerning the History of the Ayyubids*⁴⁹ when he writes about the ill health of the Moslem leader during the Fifth Crusade in Egypt (led by Louis IX of France in August 1249). "Meanwhile, al-Malik as-Salih was weakening, his strength wasting away . . . two grave diseases combined to overcome him: an ulcer in the groin and pthisis." Pthisis is a word which was often used to refer specifically to pulmonary tuberculosis, although occasionally to a more general wasting of the tissues.

Cases such as these give the impression that tuberculosis was not an uncommon affliction in the eastern Mediterranean at the time of the Crusades. The proposed cross-immunity given by a previous tuberculosis infection against leprosy³⁹ would be expected to have had an effect on the prevalence of leprosy in certain populations during the Medieval Period. Whether the dynamic process of increasing TB levels, with a corresponding decrease in leprosy, had already begun on a scale capable of significantly altering disease patterns in the area by the time the Crusaders began to settle, is a question textual examples alone are unable to answer. Nor is this an area for which archeological excavation can contribute

positively to the problem at present due to the near-complete absence of interest in the excavation of human remains from the Crusader States. Even if there had been such studies, the fundamental association of leprosy with segregation into leprosaria with their own cemeteries rather than the burial of cases with the rest of the population makes disease epidemiology using human remains extremely difficult in this case.

Conclusion

It seems that leprosy was responsible for the affliction suffered by King Baldwin IV, and that he suffered from the lepromatous form of the disease, in common with the vast majority, if not all of those suffering from the disease in antiquity. Although the standard of medicine practiced by Frankish physicians was relatively poor, most physicians of the Medieval Middle East were able to differentiate a case of leprosy from many diseases with similar symptoms. Baldwin was not alone among the inhabitants of the Crusader States in having the disease, and a significant amount of legislation was introduced in an attempt to minimize the disruption to society which leprosy, and the superficially similar endemic syphilis, would cause. The archeological and literary evidence also suggests that another mycobacterial disease, tuberculosis, was not particularly rare in the Crusader States, and this may have resulted in a relative decrease in the prevalence of leprosy in the population by a process of crossimmunity. However, the debates over the role of crossimmunity between tuberculosis and leprosy causing the decline of the latter in Europe, and also the diagnostic confusion between leprosy and endemic syphilis, are more than likely going to persist for as long as new historical information is studied and discussed. It is only by finding pieces of the puzzle, such as this one, that some time in the future we might be able to put together a sufficient number to obtain a reasonable view.

—Piers D. Mitchell, M.Sc.

Charing Cross and Westminster Medical School
The Reynolds Building
St. Dunstan's Road
London W6 8RP, England

⁴⁶ Avakian, Z. A. [Comparative toxicity of heavy metal ions for some microorganisms.] *Mikrobiologiya* 36 (1967) 446-450.

⁴⁷ Babich, H. and Stotzy, G. Abiotic factors affecting the toxicity of lead to fungi. *Appl. Environ. Microbiol.* 38 (1979) 506-513.

⁴⁸ Gibson, J. F., Hadfield, S. G., Hughes, M. N. and Poole, R. K. Effects of trialkyllead compounds on growth, respiration and ion transport in *Escherichia coli* K12. *J. Gen. Microbiol.* 116 (1980) 99-110.

⁴⁹ Ibn Wasil. *The dissipator of anxieties concerning the history of the Ayyubids*. In: *Arab Historians of the Crusades*. Gabrielli, F. London: Routledge and Kegan Paul Plc., 1969, p. 287.

Acknowledgment. I would like to thank Dr. Don Brothwell of the Institute of Archeology, University College, University of London, and Dr. Tony Waldron, St. Mary's Hospital, University of London, for their helpful comments concerning this topic. I also thank the Wellcome Foundation for funding my M.Sc. course, when my preliminary work on the Crusades began. I

am also very grateful to Jonathan Pink for his assistance in the translation of a number of texts. A proportion of the research contained in this paper was carried out as part of the requirements for the M.Sc. in Archeology and Ancient History of Disease at the Institute of Archeology, UCL, in 1991–1992.