

Sir Themistocles Zammit: his medical and scientific career

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Summary

Soon after graduation, Zammit and a colleague founded a review journal for which he prepared most of the abstracts, thus keeping up with recent literature of bacteriology. On appointment as Bacteriologist, he visited eminent practitioners in Paris and London. Based in Valletta, he became active in the local branch of the BMA, becoming Secretary and meeting senior British service doctors as well as young recent graduates. His first papers were based on his work and his early interest in brucellosis resulted in a slide test. Because of his interest in insects, he began corresponding with scientists in Britain. When the Mediterranean Fever Commission was formed, he was an obvious choice as his work was already known to Colonel Bruce FRS. At first he believed that transmission of brucellosis might be made by mosquitoes. However, he infected two goats and noted their continued inapparent infection and showed the presence of bacteria in their urine, blood and milk. Bruce and Horrocks did not wish him to continue with this experiment, but he persuaded them to allow him to buy a further six goats. He tested the goats and found that they were probably the source of infection through their milk. He devised a test for the bacteria in milk and continued research into the disease. He made significant contributions to other aspects of medicine in Malta. He was Professor of Chemistry, a lecturer to naval surgeons and a world renowned archaeologist. Later he was Rector of the University of Malta.

Keywords

Biography, brucellosis, goats, Zammit

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Introduction

“In the continual remembrance of a glorious past individuals and nations find their noblest inspiration.” (Sir William Osler) [Bean WB. Sir William Osler. *Aphorisms from his bedside teachings and writings*. Charles C Thomas 1968 (p 81).]

Dr. Paul Cassar wrote that Zammit was in his view ‘Malta’s most distinguished man’.¹ He was scientist, doctor, chemist, academic, archaeologist, writer and statesman yet there is no biography and few of his personal papers survive. It is difficult to trace his career and his contributions to brucellosis have been almost forgotten. I trace his career as doctor and scientist: an annotated bibliography has been published.² The discovery that apparently healthy goats could suffer infections of brucellosis³ and be carriers of the disease, was ‘one of the greatest advances ever made in the study of epidemiology’.⁴ This discovery led to the elimination of the disease among British soldiers and sailors within a year and revolutionised ideas about animal vectors of disease.

Early career

Sir Themistocles Zammit Kt. , CMG, MD, D Litt (Oxon) was born 30 September 1864 and died 2 November 1935 with obituary notices in Malta and England⁵. In 1898 he married the Noble Aloysia Barbara, dei, Marchesi di San Giorgio, widow of Mr. E Laferla. He graduated M. D. from the University of Malta in 1889 and with Dr Fabrizio Borg founded and edited *La Rivista Medica (The Medical Review)*. From 15 March 1890 to February 1891 to January 1892 there were 46 issues, all of 8 pages, mainly of abstracts and commentaries in Italian of contemporary medical papers, many signed ‘T Z’.

In its revival as *La Rivista Medica. Bollettino della Camera Medica di Malta 1922-1924*, Zammit wrote about the Medical School of Malta. The Malta and Mediterranean Branch of the British Medical Association was founded in May 1888. Zammit was the Honorary Secretary and Treasurer from 1904⁶ (the records disappeared in 1992).

On 24 December 1890 Zammit was appointed as Analytical Chemist to the Government with 2 assistants and a salary of £100 a year.⁷ He attended courses in analytical chemistry at the Ecole Superieure de Pharmacie in Paris ‘where he became a personal friend of Pasteur’,⁵ but there are no records of him at the Ecole. In June 1892 he attended King’s College, London.⁷ In September 1896 he made the earliest Xray photograph taken in Malta, of a human hand – probably his own. He gave a popular

lecture using an apparatus assembled by himself, in Italian in December 1908 and in English in January 1899.⁸ He was Director of the Public Health Laboratory from 1916 to 1920.

Brucellosis

His first recorded experiments with Mediterranean or Malta Fever (now Brucellosis) modified the Widal precipitation test where bacteria and sera are mixed in a tube: Zammit observed the mixture on a slide and used a microscope to see agglutination. He described this in an Annual Report⁹ and at a BMA meeting,¹⁰ mentioning it in his *BMJ* paper.¹¹ In another *BMJ* paper he wrote about episodes of milk poisoning.¹² In 1902 he made the first survey of brucellosis in civilians in Malta, comparing it with typhoid fever and concluding that it might be insect borne.¹³ In the same year the Secretary of the Royal Society suggested to the Under Secretary of State for the Colonies that Dr. Zammit should be given time for his studies on Malta Fever.

In 1903 he sent a letter and specimens to Sir Ronald Ross and wrote to David Bruce 'We have now a number of cases which tend to prove infection from patient to healthy. Major O'Connell, RAMC, has told me of a case of a man in hospital for over two months with a broken jaw: when convalescent he was placed close to a man with Mediterranean fever, and he picked up the disease in a very short time. Many similar cases are reported from other points'.¹⁴ He examined the viability of *Micrococcus melitensis* cultures to sunlight, diffused light and light of different colours, and on the effect of Maltese limestone on the survival of the bacteria which turned media alkaline. These experiments together with isolation of the bacteria from blood were published in the *MFC Reports*.¹⁵ Bruce wrote about these experiments and that Zammit had unsuccessfully fed cultures to monkeys.¹⁶

The Mediterranean Fever Commission

In February 1904, the Royal Society chose Colonel David Bruce RAMC as chairman of 'The Commission to investigate Mediterranean Fever', (MFC). Bruce visited Malta from 13 June to 14 July to see Major W. H. Horrocks RAMC from Gibraltar, Staff Surgeon E. A. Shaw RN, Dr. T. Zammit and Dr. R. W. Johnstone of the [UK] Local Government Board. Later Captain Kennedy RAMC in Malta joined them. The first monkeys arrived on 10 July: Zammit made his first experiment with mosquito transmission on 11 July.¹⁷

Horrocks, who was very friendly with Bruce, seems to have regarded Zammit more as a junior NCO than a colleague. He wrote to Bruce 'I have started Zammit feeding stegomyia [a mosquito] on this monkey [infected with M. M.] and after various intervals varying from one to twelve days he is to feed the stegomyia on healthy monkey. Zammit says he has recovered the M. M. from a drop of blood representing from 0.2 to 0.8.c.c. , taken from the ear of a patient'¹⁸ and 'I have put Zammit on to washing the walls and floors of infected houses. He is now doing a ward in the hospital'.¹⁹ Later he wrote 'Zammit, at my request, fed some *Stegomyia* on patients at the hospital, and then fed the mosquitoes, two days later, on monkeys. One of the monkeys

became infected, and Zammit has retrieved the *Micrococcus Melitensis* from its blood. I have taken some monkeys down to the Station Hospital in order to repeat the experiment under conditions free from Maltese influence!'.²⁰

Horrocks quickly confirmed Zammit's results: 'I believe Zammit's experiment was all right, but the conditions required for success, i. e. , many micrococci in the blood, and the bites of several mosquitoes, are rarely met with'¹⁹. Horrocks mentioned Zammit's experiments with feeding by two *Stegomyia* and his successful transfer from a monkey to a patient via the mosquito.¹⁷ However, he then went on 'The experiments made with *Stegomyia fasciata* do not support the results obtained by Dr. Zammit. This last comment must surely be the one about which Shaw wrote to Bruce.²¹ Horrocks and Kennedy later found four infected mosquitoes out of 450 collected in 'presumably infected places'.²²

From the beginning of the MFC, Zammit began a series of experiments with goats.³ Horrocks wrote to Bruce 'He is now continuing his mosquito experiments and attempting to infect goats by feeding'²³ and 'Zammit is also trying to infect a goat by feeding it on *Micrococcus Melitensis*, and if he succeeds we intend to *repeat* [my emphasis] the experiment of feeding a monkey its milk'.¹⁹ Zammit's first goat gave a positive reaction and he repeated the feeding of another in December. He wrote to Bruce 'I am conducting feeding experiments on goats so far with positive results'²⁴ but Bruce made no comment in his reply and later seems to have forgotten these experiments.²⁵

Zammit's discovery that goats were susceptible to inapparent infection was important, but he had already found the bacteria in milk, blood and urine from his experimental goats.³ In June 1905, Bruce was in Malta for a short time. Zammit said that he thought goats spread the disease to man. Bruce was unimpressed, but agreed to Zammit buying more goats. Bruce left Malta on 12 June and Zammit bought 6 goats from two different herds: five of these goats showed immediate agglutination.³

This suggested that Maltese goats were very frequently infected. In the excitement that followed, his experimental goats were overlooked until recorded by Dr. Eyre.³

On 16 June he took blood and a little milk to try to isolate the coccus. On 17 June he examined 2 spleens from an abattoir and found the blood negative from another 8 goats.²⁶ Zammit assisted Horrocks by analysing the chemical composition of 3 milk samples²⁸ and adapted his slide test for blood to test for milk (Zammit's Test). He recorded the number of reacting goats from 70 herds in 9 villages (the date of 1904 should be 1905 ?)²⁹ and was one author of a long paper describing experiments in 1906.³⁰ In 1908 he reported on infected goats and their kids since the end of the MFC.³¹ Zammit later published three papers on sub-cutaneous vaccination.³²⁻³⁴

His early work

In 1898 he reported two cases of poisoning by a local plant.³⁵ Later papers dealt with milk poisoning³⁶ and adulterations.^{37,38} In 1900 he presented a pioneering review of tuberculosis in the civilian population of Malta (as opposed to British service-men).

He pointed to the low incidence in the islands and suggested that Malta would be a good place for recovery and treatment of the disease.³⁹

In 1900 he was appointed to the Leprosy Board,⁷ and read a paper in 1902 on his treatment of a young woman: he 'had seen many cases of leprosy treated with ordinary drugs'.⁴⁰ He arrived at Naples on 17 Oct 1910 at the request of the Italian Government to advise on the cholera epidemic which was already subsiding.⁷ He investigated cholera⁴¹ and with Major W. B. Houghton examined 1500 rats of which 15 were infected with the plague bacillus.⁴² His experiments on the presence of coli-like bacteria in rain water were interesting and important for the testing of water in the tropics.⁴³

With Caruana Scicluna he wrote about several cases of malaria which occurred in 1904 when soldiers from malarious areas were sent to Malta.⁴⁴ In 1930 he returned to this outbreak and mentioned Crete as the previous station.⁴⁵ Curiously, he described the 1904 outbreak as the last in Malta, not mentioning the 20 cases around Salina Bay when Maltese soldiers returned from Macedonia in 1919.⁴⁶

Interest in mosquitoes

In 1899 he was made a member of a 'Commission for the purpose of assisting the Secretary for State for the Colonies and the Royal Society in conducting an investigation of Malaria'⁷ although he is not mentioned in the minutes or *Reports of the Malaria Committee 1900-1903*⁴⁷. Zammit, however, was not an entomologist and there was no malaria in Malta, although the mosquito *Acartomyia zammitii* (Theobald) now named *Aedes (Ochlerotatus) zammitii* was named after him⁴⁸. The description by Theobald as a n. sp. in 1903 consists of three pages of text and two of diagrams with: 'Habitat. - Malta (Dr. Zammit) Observations. - Described from a series sent by Dr. Zammit'

The specimens were probably sent to Sir Ronald Ross, a member of the Committee, and forwarded to the Museum. Zammit corresponded with Sir Ronald, sending him a reprint of his 1902 lecture and asking his help in identifying mosquitoes.⁴⁹

Zammit reviewed the incidence of Malta Fever among civilians in the towns of Malta and Gozo 1891-1901.¹³ His statistics showed that several of the suggested sources of infection were very unlikely, but he concluded that it might be insect borne.

Zammit and the British armed services

Captain Hughes thanked Zammit for his help with his book on Malta Fever, 1897. Eyre wrote that '[Hughes] had the advantage of Professor Zammit's assistance'⁵⁰. Zammit worked with other British Army officers on the MFC and later wrote a memo about Malta Fever with Colonel MacNeece and others⁷ Col. A. M. Davies wrote 'Zammit has been very good with some laboratory work for me'.⁵¹ In 1914, Dr. Zammit supplied Major Kennedy in London with a recently isolated strain of *M. melitensis* and milk from infected goats.⁵²

Fleet-Surgeon D. J. McNabb RN thanked him for the 'kind

help he has rendered me on many occasions'⁵³. Vice Admiral Sir Robert Hill, Director of Naval Medical Service wrote on 5 June 1919 on his appointment to Malta:

*My dear Zammit, how very kind of you to remember me after all these years and send such a cheery letter - Do you remember the old days when we tried to inoculate the rats and guinea pigs!*⁷

Hill, then a Fleet Surgeon, and Zammit were members of the Commission set up in May 1908 to 'suggest measures that would tend to suppress Mediterranean Fever in the Island'.⁷ A letter from the Secretary of the Mediterranean Fleet Medical Society records that Zammit was made an Honorary Member on 1 January 1907.⁷ In 1911 the Secretary of State for the Colonies 'sent an expression of appreciation of the Lords Commissioners of the Admiralty for [Zammit's] valuable services rendered to the Royal Navy as teacher of bacteriology to the Naval Medical Officers'.⁷

Surgeon E. H. Ross RN (brother of Major Ronald Ross), wrote to Zammit asking his advice. Ross and his colleague Surgeon G. Murray Levick wrote that:

'We wish to take this opportunity of thanking Dr. Them Zammit, Government Bacteriologist of Malta, for his help and suggestions. He has done much of the bacteriological work which we have purposely avoided.' [see ref 54]

At the first general meeting of the United Services Medical Society, Malta Branch, 1908 Zammit 'described the catchment area for the municipal water supply...' and 'spoke of the difficulty of obtaining reliable strains of paratyphoid'.⁵⁵

Malta University

As lecturer and then professor of chemistry he wrote two booklets in Maltese for practical classes. He applied for the Chemistry Chair at the University of West Australia, Perth on



A group of friends, surgeons and servicemen, to whom Zammit delivered a talk to discuss undulant fever. It includes Capt. Harvey, Surg. Knapp, Surg. Duddling and Surg. Moore. Courtesy of the Zammit Family

30 August 1912, but withdrew on finding that he would lose his pension rights under the Maltese Government regulations.⁷

He was appointed Rector of the University on 2 June 1920, retaining his post in charge of the National Museum as Curator.⁷ On 10 September 1920 the Governor appointed him an Official Member of the Executive Council of Malta.⁷ He resigned as Rector in 1926 to devote himself as Director of the National Museum, and his work as archaeologist and writer.⁵⁶

Travels and war

Zammit travelled to England on the Hospital Ship "Maine" in April 1907 and attended the seventh meeting of the Sub-Committee on Mediterranean Fever, of the Tropical Diseases Committee of the Royal Society. He met many doctors and scientists, visited many laboratories, hospitals and museums and made notes of several procedures eg opsonic index. He took back 24 bacterial cultures to Malta.⁵⁷

While serving in Malta during World War I, Sir Archibald Garrod of *Inborn errors of metabolism* fame, 'developed a friendship with a Maltese physician Professor (later Sir) Themistocles Zammit'⁵⁸ who showed him the archaeological sites of Malta. The University of Malta conferred the degree of MD, *honoris causa* on Garrod in 1916 and on '27 May 1920 Garrod's old friend from his Malta days, Sir Themistocles Zammit, received the degree of Doctor of Letters *honoris causa* from Oxford where Garrod was now Regius Professor of Medicine'.⁵⁸

He received the Mary Kingsley Medal of the Liverpool School of Tropical Medicine in 1920. In his address he returned to Brucellosis and to the possibility of immunisation of goats⁵⁹. He disagreed strongly with Professor Vincent of Paris who claimed to have a vaccine and quoted experiments under his supervision of unsuccessful immunisations. There were several photographs of goats and two have the captions 'Maltese goat, presented ... by Prof. T. Zammit.' He also gave three goat skins to the School [Dr HJ Power pers comm].

His obituary in the *Times of Malta* says that 'he rendered signal service throughout the war, serving in Hospital Ships and ashore in Malta'³. He continued to be in charge of the Analytical Laboratory during the war years and his 1916 and 1918 publications arose from those duties. In November 1915 he sailed to England on the Italian Hospital Ship "Regina d'Italia" with 600 convalescent patients. In London he stayed with Eyre and collected cultures from him, visiting the Municipal Laboratories in Naples on the way home. He made another trip to England in December.⁵⁷

In 1923 he attended the Imperial Education Conference in London and discussed brucellosis with Eyre, Kennedy, Bruce and others. In Paris he visited the Institut Pasteur and talked with Calmette about T. B. and brucellosis.⁶⁰

Conclusion

Zammit's knowledge of bacteriology was evident in his early editing of the review journal and his reading of the literature to write the reviews. In Paris and London he visited leading

laboratories and in Malta was very active in the local medical societies. By attending the meetings of the BMA local branch, of which he became secretary, he would have met the young service doctors posted to Malta, recently at British medical schools and the hospitals of the RAMC and RN. Later as lecturer to the RN officers, he would have continued to keep abreast of developments. His early researches closely mirrored those of Sir Almoth Wright's use of very small samples of blood for slide agglutination.

He is still vividly remembered in Malta. His stories in Maltese were written when Maltese was looked down upon by members of his class. He wrote to Shaw to complain of what he saw as a slight on the Maltese:

'... a very indignant letter - from Zammit, who is angry at Shaw's remarks about the Maltese'⁶¹.

Zammit has been remembered chiefly for his archaeology and literature, although there is no full appreciation of his work as an outstanding archaeologist. At his death, there were obituaries in *Nature*, *The Lancet* and the *British Medical Journal*⁵. Following the obituary in the *BMJ*, Lieut. -Colonel J. G. McNaught wrote that

'I should like to mention with gratitude the unselfish manner in which, without any trace of jealousy, he aided in every way the work of the Commission. His local knowledge and influence were invaluable, and always available to his colleagues. He put his private laboratory at their disposal, often I fear at the cost of much personal inconvenience.' and finished by saying he 'was not only a scientist but a man who, by his unselfish kindness, made a great contribution to the growth of better understanding and greater sympathy between Great Britain and Malta'.⁵

Eyre wrote that 'Zammit... had approached the subject of Melitensis infection in a purely scientific spirit on his appointment to the Commission'⁶². Kennedy recorded that 'Dr Zammit demonstrated agglutination in the tears of an infant who was crying and kicking and from whom he had not been able to extract sufficient blood'.⁶³ There could be no better tribute to his skills as caring doctor, skilful technician and careful medical scientist.

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