Medicine in Stamps

David Bruce (1855–1931): discoverer of brucellosis

Tan S Y, MD, JD and Davis C*

Director of Medical Education, Hawaii Medical Centre East, Honolulu, Hawaii

* Research carried out during senior year at the John A Burns School of Medicine, University of Hawaii.

Brucellosis, formerly known as Mediterranean fever, Malta fever or undulant fever, is a bacterial infection characterised by wave-like variations in the body temperature of afflicted victims. It presents with migratory myalgia and arthralgia, diaphoresis and headaches, with late complications of granulomatous hepatitis, endocarditis, blood dyscrasias, and neuro-ophthalmologic sequelae. Its modern name bears tribute to Sir David Bruce, the military physician who discovered the aetiologic agent, *Brucella melitensis*.

Born to Scottish parents in Melbourne on May 29, 1855, Bruce returned to Scotland when he was five. As an athletic youth, he yearned to be a professional athlete, but his plans were derailed after he came down with pneumonia. He later considered becoming a zoologist, but chose medicine upon the advice of a physician friend. Upon graduation from medical school in 1881, he initially worked as an assistant to a general practitioner in Surrey, England, and there, met and married Mary Elizabeth Steele, the daughter of a doctor, in 1883. Mary was an accomplished researcher in her own right, and the Bruces, who had no children, devoted their entire life to science, working side and side and dying within four days of each other.

THE DISCOVERY OF BRUCELLOSIS After his brief stint in Surrey, Bruce joined the Army Medical Services, where his talents and high test marks immediately propelled him to the rank of Surgeon Captain. In 1884, the island of Malta greeted the arrival of its new captain, whose role at Valetta Hospital was to safeguard the health of British soldiers who were stationed there. Malta is a tiny southern European island resort, its name derived from the Greek word *Melitē*, meaning honey-sweet for the island's unique brand of honey derived from endemic island bees. In the annals of medical history, Malta is remembered as the place where David Bruce discovered the cause of the mysterious febrile illness that debilitated so many British soldiers.

In Malta, Bruce saw first-hand an illness that caused the sufferers' temperatures to soar to 41 degrees Celsius at night, only to normalise during the day. This febrile course did not subside for weeks on end, sometimes for several months and occasionally, with a fatal outcome. Autopsy specimens from spleens, livers and kidneys yielded an organism that Bruce termed a 'micrococcus', being about 3 micrometres in length, singled or paired and staining Gram-negative. To test if this was the causative agent of Malta fever, he infected monkeys with the organism grown in culture. Seven monkeys were infected and four died, while the remaining three survived but had undulating fever that mimicked their human counterparts. Bruce then studied tissue samples from the monkeys that died and successfully grew out the same micrococcus from their organs. Koch's postulates having been fulfilled, Bruce then sent his findings to the Pasteur Institute in Paris, identifying the causative organism as *Micrococcus melitensis*, now renamed *Brucella melitensis*. Other *Brucella* species that can infect animals, such as those that cause abortions in cattle, have since been identified. In 1905, Themistocles Zammit, a scientific member of the Bruce-led Mediterranean Fever Commission, proved that the reservoir for the organism was goat's milk. It was the final link that permitted the public health measure of eliminating goat's milk from the British soldier's diet,

and in the process, removed the scourge of Brucellosis in this land of honey. Zammit, a Maltese citizen, was subsequently knighted for his important contribution.

AWAKENING TO TRYPANOSOMIASIS Shortly after his return to England in 1889, Bruce was named an assistant professor of pathology at the Royal Army Medical College at Netley. It was there that he introduced the scientific methods and the bacteriological theories of Pasteur, Koch and Lister. Several years later, he arrived in Natal, South Africa, to investigate an animal disease known as 'nagana', which killed cattle in the Zulu region. Similar outbreaks in West Africa and India suggested a common aetiology. In the town of Umbumbo in Zululand, the Bruces stayed for two months, the only white people in the area who were living in a traditional mud hut. Bruce identified motile, vibrating 'haematozoa' upon microscopic examination of the blood of infected cattle. Based on work previously done by Timothy Lewis in India for the Royal Army Medical Corp, he concluded that this pathogen was a trypanosome and the likely causative agent. To test his theory, he inoculated healthy horses and dogs with blood of infected cattle. These experiments were similar to what he did with monkeys in Malta. The newly infected animals became acutely ill, and their blood was subsequently found to contain the same kind of haematozoa seen in the nagana cattle. The vector was then unknown, but a flying biting insect was suspected, since otherwise healthy oxen and dogs sent into a fly-infested area for two weeks came down with nagana. The pathogenic protozoan was eventually named *Trypanosoma brucei*, and the vector was shown to be the tsetse fly.

After the Boer War, Bruce returned to Africa, this time to Uganda, where he studied a human illness known simply as sleeping sickness. The symptoms included long-lasting fevers leading to confusion and stupor, and the patients usually had enlarged lymph nodes and spleens. Many would eventually lapse into a coma and die, and autopsy revealed pericardial and peritoneal effusions and evidence of meningitis. His predecessor, an Italian doctor and pathologist named Aldo Castellani, had discovered evidence of *Trypanosomas* in the cerebral spinal fluid of ill patients, but did not recognise its significance. With his wife Mary at the microscope and tending the media culture, Bruce used his familiar methods to prove that, as with nagana, trypanosomes were responsible. Sleeping sickness is now called trypanosomiasis, the aetiologic agent is *Trypanosoma gambiense*, and the sole vector the tsetse fly or *Glossina palpalis*.

TETANUS ON THE BATTLEFIELD Among Bruce's other contributions was his work on tetanus. Soldiers who were injured in the muddy trenches of the battlefield died not only from their injuries but from supervening tetanus. He headed a commission to study the effectiveness and optimal administration of tetanus vaccine. His regimen for immediate tetanus shots as soon as a soldier was injured decreased the rate of tetanus and almost halved the mortality from 58% to 31%.

HONOURS AND LEGACY David Bruce's achievements won recognition from both the medical community and the British government. In 1905, he was named CB, or Companion of the Order of Bath, a high military service or civilian merit honour. He won knighthood in 1908, and in 1912, rose to Major-General in the Royal Army and shortly thereafter, was named Commandant of the Royal Army Medical College. In 1918, he was awarded the KCB, the Knight of the Companion of the Order of the Bath. Since 1982, Millbank has memorialised his accomplishments with an annual David Bruce Lecture.

But Bruce was not the nicest of men. He had few friends and came across as brusque, abrupt and haughty. The famous American neurosurgeon Harvey Cushing once had this to say: "*General Sir David Bruce sank into a divan, stretched out his highly polished boots into the middle of the room, inserted his spurs into the rug, drew his John Bull visage deep into his clothes, turtle fashion, and slept profoundly which was good for the general and also helped the meeting.*"

David Bruce officially retired from medicine and army duty in 1919, and plagued with recurrent lung infections, took to spending his winters in Madeira, Portugal, to escape the cold, wet English winters. He succumbed to cancer in 1931 at age 76, just four days after Mary, his beloved wife and dedicated coworker, had died. As Mary was being laid to rest in a nearby church, his last words were that "*should any notice appear about myself, you must see that my wife gets credit for all the work she has done.*" For her scientific contributions, Mary Bruce was awarded the Order of the British Empire.

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