Discovery of *Yersinia pestis*

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The understanding of plague really began during the Chinese and Indian epidemics in the latter decade of the nineteenth century. During the Chinese epidemic, Shibasaburo Kitasato (1852-1931) and Andre Yersin (1863-1943), independently identified the cause of the plague, but not without controversy.

In 1894, the bubonic plague had already spread through southern China and then to Hong Kong. On May 8, 1894, James Lowson (1866-1935), a 28-year-old Scottish physician, was sent to investigate the Hong Kong outbreak. Upon his arrival, he diagnosed the first cases of the bubonic plague. Two days later, Lowson found 20 more deaths from the plague at a Hong Kong Hospital. Lowson blamed the hospital for failing to diagnose the disease earlier and the authorities and the governor of Hong Kong for not following Lowson's recommendation to examine all the river boats from Canton. On May 10, the health authorities recommended house-to-house searches for cases, disinfection of affected dwellings, rapid disposal of corpses, and isolation of patients on a hospital ship.

Kitasato arrived from Tokyo on June 12, 1894 after achieving distinction with the discovery of the role of *Clostridium tetani* in lockjaw. Almost immediately he discovered a bacillus growing from post-mortem specimens. Although he was skeptical about the significance of this finding because the specimens were taken 11 hours after the patient's death, he inoculated a mouse and at autopsy, he visualized a bacillus similar to that seen in the blood of another patient. Although Kitasato may have been unsure of his results, Lowson had no doubt that Kitasato had discovered the plague bacillus. On June 15 he wired *The Lancet* and reported that Kitasato had discovered the plague bacillus.

A young Swiss physician, Alexandre Yersin, arrived in Hong Kong 3 days after Kitasato to study the epidemic. He had worked under Pasteur and had isolated the diphtheria exotoxin with Roux. Nevertheless, Yersin arrived to a cool reception and found that all the cadavers for research were reserved for Kitasato. Yersin was introduced to Kitasato while Kitasato's team was completing a post-mortem examination. Yersin was surprised to find that while they examined the blood and the internal organs, they ignored the buboes.

After spending 5 frustrating days examining the blood of patients with plague, Yersin bribed 2 English sailors who were assisting in the morgue to be allowed into the morgue. With a sterile pipette he punctured a swollen lymph node from a patient who had just died from the plague. Using a microscope, he was able to see small faintly staining gram-negative bacilli with rounded ends. He then inoculated the aspirate into mice and guinea pigs. The animals died quickly of sepsis and the same bacilli were isolated from their lymph nodes. Two days later he informed the British authorities of his findings and was finally given access to the cadavers after complaining to the governor.

On August 4, 1894, *The Lancet* published Kitasato's discovery. Slides that Kitasato and Lowson had sent to Britain were reproduced in the *Lancet* and a week later in the *British Medical Journal*. The slides showed small bacilli of diverse morphology as well as some encapsulated diplococci. On August 18 the journals printed Yersin's letter to the French Academie de Sciences claiming he had discovered the bacillus that was causing the Chinese plague. However, the *Lancet* stated "there must be some misapprehension here, as Professor Kitasato is such an accurate and reliable observer that we cannot conceive that he has rushed into print without having first satisfied himself as to the accuracy of his observation and experiments." However, Kitasato apparently did exactly that. He had identified the bacillus 6 days before Yersin and he had published the discovery first. Unfortunately, his description was imprecise because his cultures were contaminated by pneumococci; for example, in a report in the August 25 issue of the *Lancet*, he was unable to confirm whether the bacillus stained Gram positive or negative. As a result, Yersin would ultimately be credited as the first to link the bacillus to the plague.

Yersin named the bacillus *Pasteurella pestis*, after his mentor, Louis Pasteur. In 1944, the organism was reassigned to a newly defined genus, *Yersinia*.

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