Medicine in Stamps

Joseph Lister (1827-1912): father of antisepsis

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"Lister created anew the ancient art of healing; he made a reality of the hope which had for all time sustained the surgeon's endeavors; he removed the impenetrable cloud which had stood for centuries between great principles and successful practice; and he rendered possible a treatment which had hitherto been but the vision of the dreamer." —Sir Frederick Treves, famous 19th century English surgeon.

In the 19th century, wound suppuration was considered part of normal healing, and the absence of pus was cause for alarm. Scientists had yet to ascertain the origin of infection, which was widespread in hospital wards. Surgical patients were particularly susceptible, until Joseph Lister, a British surgeon, introduced the concept of antisepsis. Together with Pasteur and Koch, he helped formulate the germ theory of disease, and in the process, catapulted the progress of Medicine into the modern era.

RELIGIOUS CALLING Joseph Lister was born on April 5, 1827, at Upton, Essex, England. His father, Joseph Jackson Lister, was a wine merchant, an amateur microscopist, and a devout member of the Religious Society of Friends, also known as the Quakers. The stated mission of this religious group was "to wait upon the Lord," by performing God's work on earth through helping people. At an early age, Lister made the same commitment to alleviate the world of its pain and suffering by becoming a surgeon. However, as a Friend, Lister encountered much opposition. At that time, members of the Society of Friends were prohibited from attending many universities, but Lister was finally able to enrol in the University College in London in 1847. Shortly after beginning his medical studies, Lister suffered a nervous breakdown and had to drop out of school for a while. He returned later in the year, and successfully graduated from medical school with honours in 1852, and eventually became a Fellow of the Royal College of Surgeons of England.

Shortly after graduation, Lister travelled to the Medical School of the University of Edinburgh in Scotland where he met James Syme, Professor of Clinical Surgery. Syme immediately liked the enthusiastic young surgeon, and employed him first as a clerk and shortly thereafter, as the resident house surgeon in his own wards in the Old Royal Infirmary. Less than two years later, Lister became an Assistant Surgeon and Lecturer in Surgery at the Royal College of Surgeons of Edinburgh. Meanwhile, he married Agnes Syme, Professor Syme's eldest daughter. Because Agnes belonged to the Church of England, Lister was forced to resign from the Society of Friends. However, despite his new affiliation with the Church, Lister maintained his Quaker beliefs and continued his mission to aid mankind.

ANTISEPSIS With the help of his wife and knowledge of microscopy he had learned from his father, Lister initially investigated the structure and function of nerve and muscle fibres, blood coagulation, lymph flow and inflammation. His comprehensive studies of blood clotting and inflammation gave him special insight into the microscopic changes that accompanied infection, and the alterations in physiology consequent upon tissue contact with foreign substances.

On March 9, 1860, Lister assumed the position of Professor of Surgery at the University of Glasgow. At that time, putrefaction was thought to result from the entry of oxygen from the air into surgical wounds, causing the breakdown of unstable organic molecules, thus destroying the tissue and turning it into pus. Since there was no way to prevent oxygen from entering the wound, it was inevitable that infection would ensue. Lister, however, refused to accept this theory. He believed that there must be something invisible and foreign that fell from the air to contaminate the wound, and he found support for this hypothesis in Louis Pasteur's experiments on fermentation. Pasteur had reported that microscopic living organisms in the air caused the decomposition of organic material, and Lister reasoned that the entrance of

these same microorganisms into surgical wounds led to wound putrefaction.

But Lister went one step further. He proposed that: *"If the wound could be treated with some substance which without doing serious mischief to the human tissues, would kill the microbes already contained in it, and prevent the further access of others in the living state, putrefaction might be prevented however freely the air with its oxygen should enter."* He then experimented with several chemicals, finally deciding on a dilute form of carbolic acid based on his readings about its sterilising effects on sewage: *"The material which I have employed is carbolic or phenic acid, a volatile organic compound, which appears to exercise a peculiarly destructive influence upon low forms of life, and hence is the most powerful antiseptic with which we are at present acquainted."*

On August 12, 1865, Lister performed his first successful treatment using carbolic acid solution. James Greenlees, an eleven-year-old boy, had been run over by a horse-drawn cart and sustained a compound fracture of the left leg. At that time, compound fractures had a high rate of infection, most often requiring amputation. Lister dressed the wound with a lint bandage dipped in carbolic acid, and splinted the leg. Untouched for four days, the dressing was then changed periodically thereafter for six weeks. To his joy, the wound healed completely without putrefaction. In the ensuing months, Lister's carbolic-acid antisepsis resulted in many successes, and he began using his technique to treat other conditions, such as abscesses and amputations. He also incorporated the use of a spray to deliver the chemical directly to the injured site. In 1867, Lister reported this new antiseptic technique to the world in a series of five papers in the *Lancet*, entitled: "*The Antiseptic System: On a New Method of Treating Compound Fracture, Abscess, etc., with Observations on the Conditions of Suppuration.*"

As he gained experience, Lister began modifying his techniques. Not only did he routinely disinfect incisions with carbolic acid during surgery, he also applied the solution to surgical instruments and later, the hands of the surgical team.

CATGUT Around this time, Lister also invented the catgut suture. The common surgical practice then was to use non-absorbable threads or metal wires to tie off large blood vessels, leaving the ends long enough to extend out of the incision. When infection occurred and the tissues began to decompose, these ligatures could be easily pulled out. Unfortunately, haemorrhage would often supervene, sometimes resulting in death. With the introduction of Lister's antiseptic method and arrest of infection, the wound tended to close, and there was no easy way to remove the sutures. Catgut sutures solved this dilemma because they were absorbed by the body and did not require manual removal.

GLOBAL RECOGNITION When Lister was appointed Chair of Clinical Surgery at the University of Edinburgh in August 1869, news of his antiseptic method had yet to reach Edinburgh. Most British surgeons outside of Glasgow, as well as most American surgeons, opposed him and the germ theory. In 1877, Lister moved to chair the Department of Surgery at King's College, London. There, he was also greeted with disbelief, although he was luckier with physicians elsewhere. For example, at the International Congress of Medical Science in Amsterdam in 1879, surgeons from all over the world enthusiastically acclaimed his contribution. However, it would take another ten years before his peers in London would finally recognise his achievements.

Lister died at age 85 years on February 10, 1912 at the seaside town of Walmer in Kent, but his name lives on. He is familiar to the lay public through the popular mouthwash, Listerine. In his honour, microbiologists the world over have incorporated the genus *Listeria* in their bacteriological nomenclature. But Lister's most enduring legacy was life-saving antisepsis. His carbolic acid spray opened the door to infection-free surgery, a contribution that ranks with the discovery of anaesthesia as the most momentous in the history of surgery.

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