By Max Sherman

In a recent The New England Journal of Medicine review of the past 200 years of surgery, author Atul Gawande, MD, MPH, mentioned that Joseph Lister’s seminal work on antisepsis was regarded with overwhelming skepticism by the medical profession. This was despite the fact Lister’s work was heralded in a series of articles he wrote for The Lancet. However, this same journal found the alleged breakthrough as a method neither original nor beneficial.

Ignac Semmelweis suffered a similar fate. Even though years earlier he had identified the means by which childbed fever could be spread from one patient to another by the very doctors trying to cure it, his work was unpublished, suppressed and hidden by resentful colleagues.

Childbed fever is a bacterial infection contracted by women during delivery or miscarriage. Both Semmelweis and Lister dealt with the problem of postpartum or postoperative infections that became increasingly troublesome with each passing decade of the 19th century.

Semmelweis was one of first physicians to use logic to confirm his clinical observations before anyone had shown germs cause disease. Lister may have been the first physician to relate Pasteur’s bacteriological principles to the operating theaters and surgical wards of the hospitals of Europe.

Both gentlemen are legendary figures in the history of medicine. This article briefly describes their histories, trials and tribulations, and ultimate historical achievements.

Ignac Semmelweis

In 1847, Ignac Semmelweis, a Hungarian physician, was likely the first to recognize how infection is spread from the hands of a surgeon to the patient and that this was the cause of the lethal disease, “childbed” or puerperal fever. He was also among the first physicians to adopt a strategy for characterizing diseases.
He has been described as a failed genius who, unfortunately, never published a respectable article explaining his theory using a scientific rationale. Instead, he lashed out at his critics and found little support for his discovery. His genius led him to a discovery for which the world was not yet prepared.6

The disease concept he presented was based on the spread of bacterial contamination, but he did it nine years before Louis Pasteur’s demonstration that bacteria were the cause of putrefaction.

Semmelweis (1818–65) was born in Taban, the oldest part of what is now Budapest, on 1 July 1818. He was the fifth of 10 children of Jozsef and Terezia Muller Semmelweis. Ignac began studying law at the University of Vienna in 1837. A legal degree was the choice of many bourgeois families for their sons, because it opened the door to a variety of opportunities in the civil service and other areas of public life.7 After accompanying a medical student friend to an anatomy lecture, Ignac resolved to change the direction of his career. The following year, he switched to medicine.

After a year of studying in Vienna, he transferred to the University of Pest, where he stayed for two years before returning to the University of Vienna to complete the qualifications for his degree. He was awarded his doctorate in 1844. When he failed to obtain an appointment in a clinic for internal medicine, Semmelweis decided to specialize in obstetrics.8

In the early decades of the 19th century, the Viennese maternity hospital system consisted of a private ward for women sufficiently affluent to pay their own medical expenses, and free clinics. Obstetricians were trained in the first ward and midwives in the clinic. For several years, the incidence of childbed fever in the private ward averaged between three and five times that found in the clinic.

Shortly after being appointed as an assistant in the private ward, Semmelweis began looking for the cause or causes of the difference in mortality rates. He recognized that the two locations situated side by side, and even sharing certain rooms, were subject to the same atmospheric influences. Therefore, he deemed the disease was not epidemic.9

He decided overcrowding, rough handling, specific medical procedures, inadequate ventilation and dietary irregularities, as well as particular physiological or psychological conditions of the patients, could not explain the incidence of childbed fever, since all of these factors were either equally operative in both the clinic and the ward, or worse in the clinic.10

He looked at differential factors in the two locations. None were detected. But while the investigation was ongoing, one of Semmelweis’ instructors and his mentor, Jakob Kolletschka, died from a minor injury incurred while he was dissecting a corpse.

When Kolletschka’s body was examined, pathological remains were found that were similar to those obtained in dissections of women who died from childbed fever.11 Considering the year of Semmellweis’ discovery (1847), this was indeed perceptive and insightful.

From this discovery, it became obvious the source of an infectious process was being transmitted by the hands of students and attending surgeons in the ward. Because there seemed to be no reason for them to wash their hands or change clothing, they decided not to do so.12

Greater degrees of trauma during delivery resulted in an even greater chance of infection. Semmelweis reasoned a chloride solution (previously used to counteract the noxious odor of putrid materials) would be the ideal substance to cleanse the hands of every medical attendant touching patients in labor. Mortality rates in the ward decreased remarkably.13

Having discovered the nature of childbed fever and a way to prevent it, Semmelweis might have been expected to provide a full description in the medical literature. He might also have been expected to conduct controlled experiments to confirm in the laboratory the theory he had devised in the ward. Unfortunately, he did neither.14

Nothing could persuade him to write and much of his work appeared only as abstracts in medical society minutes. As a result, his ideas were rejected by the medical community as he could offer no acceptable explanation for his findings.

Finally, after spending more than 14 years developing his ideas, he did write a book, published in 1861.15 It was hastily arranged, repetitious, reader unfriendly and received poor reviews.
By 1862, Semmelweis began having bouts of depression alternating with periods of elation. He also suffered from memory lapses and fits of bizarre behavior.

In 1865, Semmelweis suffered a nervous breakdown, was uncontrollably psychotic and was committed to an insane asylum. He died that same year from the same disease he had been fighting in mothers all of his professional life. A laceration sustained while examining one of his last patients is said to have become gangrenous, resulting in massive infection like those of countless dead mothers and his mentor, Kolletschka.16

His early death was indeed unfortunate. It took a number of years before his ideas were verified by Joseph Lister and others.

Joseph Lister

Joseph Lister (1827–1912) was born in Upton, Essex, England, on 5 April 1827, the fourth of Joseph Jackson Lister and Isabella Harris Lister’s seven children.

His father was a wealthy wine merchant and student of Latin and mathematics with an interest in microscopy. Unlike Semmelweis, young Joseph knew he wanted to become a surgeon. In 1844, he entered University College in London to study medicine. After graduating in 1852, he began a surgical career in Edinburgh, Scotland, and, in 1860, became a professor of surgery at the Royal Infirmary in Glasgow.17

Because surgery was more commonly practiced following the introduction of anesthesia in the late 1840s, the incidence of infection increased. Inflammation and suppuration occurred in almost all accidental wounds, and more so when patients were treated at a hospital rather than at home by a visiting surgeon.

Lister began his research on microscopic changes in tissues resulting in inflammation. When he read Pasteur’s work on microbes in 1864, Lister applied Pasteur’s research to the problem he was investigating. He concluded inflammation was the result of bacteria entering and developing in the wound. His solution was to try to use a substance to destroy the organisms.18

That same year, there were reports the treatment of sewage with carbolic acid led to a reduction of diseases among individuals in Carlisle, England. Using that knowledge the following year, Lister began applying carbolic acid directly to wound dressings on compound fractures and began using sterile sutures for closing wounds.19 He published his successful results in 1867.20 Amputations became less frequent, as did death from infections.

Lister, however, did not invent antiseptic practices. Ancient Greeks used vinegar on wounds, French surgeons preferred iodine and, as mentioned above, Ignac Semmelweis all but eliminated deaths from childbed fever in his obstetric clinic by introducing hand washing with a chloride solution.

Lister was not even the first to voice the implications of Pasteur’s discoveries for surgery. A year earlier, in 1864, Queen Victoria’s surgeon, Thomas Spencer Wells, argued Pasteur’s theory meant antiseptic agents should be applied to wounds.21

Although surgeons on the European continent eagerly embraced Lister’s ideas, his methods were met with apathy, doubt and hostility in England. Sanitary reformers like Florence Nightingale dismissed germ theory and argued ward hygiene and hospital design were more important than wound antisepsis.

Others insisted meticulous cleanliness was more successful than antisepsis. Some surgeons favored other antiseptics over carbolic acid, which induced vomiting and damaged tissue.22

Ultimately, nobody knows whether Lister’s efforts or better hospital hygiene, nursing and diet caused a huge downturn in hospital mortality in the 1870s. Lister, Semmelweis and others deserve credit for their lifelong campaigns to make surgery safe and effective.

Lister became professor of surgery at King’s college London in 1877, and devoted the rest of his life to testing, revising and improving his antiseptic technique.23 Strangely, he continued to stubbornly operate without a mask or gloves until the end of his life.24

Final Thoughts

While teaching a graduate course at a small college, I was amazed at how little many of the students knew about the history of medicine, and the physicians and scientists whose discoveries led to its progress.
Certainly, Ignac Semmelweis and Joseph Lister belong to that list. Both were pioneers in antiseptic surgery and clinical research. Their observations were in direct contrast to their contemporaries, and each faced ridicule, resistance and skepticism. Fortunately, they were prescient and resolute. Hand washing, however, is still a health concern and its lack is a major cause of nosocomial infections.

As a result, the Centers for Disease Control and Prevention has published comprehensive guidelines on hand hygiene in health settings. The recommendations provide an in-depth review, levels of adherence of personnel to recommended hand washing practices and factors adversely affecting adherence.25

References
9. Ibid.
11. Ibid.
22. Ibid.

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