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Ignaz Semmelweis - Saviour of mothers

In 1847, a doctor from one of the maternity wards of the General Hospital in Vienna cut his finger with a scalpel during a post-mortem examination. He had been trying to work out why so many women were dying, but he himself became ill and later died. The doctor was Jakob Kolletschka and his death became a turning point marking the beginning of the systematic use of antiseptics in medicine. The story that follows is an example of how scientists use observations and theories to make practical changes that can improve our lives.

A death and a new beginning

Ignaz Semmelweis, a great admirer of Dr Kolletschka, was distraught at the news of his death but also took careful note of the symptoms that had killed his friend. He wrote: "Day and night I was haunted by the image of Kolletschka's disease and was forced to recognize ... that the disease from which Kolletschka died was identical to that from which so many maternity patients died."

Semmelweis didn't let the problem go. He was determined to reduce the number of deaths in the wards and he used his observations to make lasting improvements to cleanliness and hygiene in hospitals.

Follow the numbers

Semmelweis made a series of observations and then developed a hypothesis that he could test. In the hospital where he worked, there were two maternity wards. From 1839 onwards, male medical students were responsible for delivering the babies in Ward 1, while in Ward 2 female midwives performed the deliveries. Semmelweis made the key observation that since the wards had been divided in this way, the death rate in Ward 1 had increased, whilst the death rate in Ward 2 had gone down. He produced detailed charts to summarise this information (Table 1 and Figure 1).

He also observed that the medical students spent their mornings in the autopsy rooms, where they dissected the bodies of women who had died of child bed fever. They then moved into the maternity ward, often without washing their hands. The midwives did not carry out autopsies. He found a clear correlation between deaths and autopsies. Finally, he noted that women who didn't make it to the maternity hospital in time very rarely contracted childbed fever. He was left staring at a body of facts for which he had no explanation.

Year span	Hospital ward	Number of deaths	Number of patients	% deaths
1833-1838 (same number of doctors and midwives in each ward)	Ward 1	1505	23509	6.4
	Ward 2	731	13097	5.81
1839-1847 (medical students and doctors in Ward 1; midwives in Ward 2)	Ward 1	1989	20204	9.84
	Ward 2	691	17791	2.18
1848-1859 (chlorinated hand wash used)	Ward 1	1712	47938	3.57
	Ward 2	1248	40770	3.06

Table 1 Semmelweis's original data

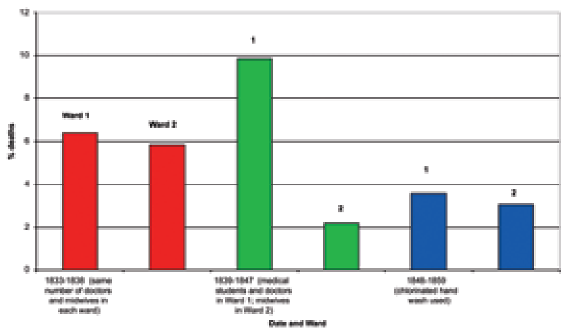


Figure 1 *The fraction of patients who died on the maternity wards of Vienna General Hospital. The difference in death rates between Wards 1 and 2 before handwashing was introduced is clear.*

Problem solving

Semmelweis, though, was a good scientist and kept following the well-defined series of steps to develop his work (Figure 2). He proposed a hypothesis that could explain his observations.

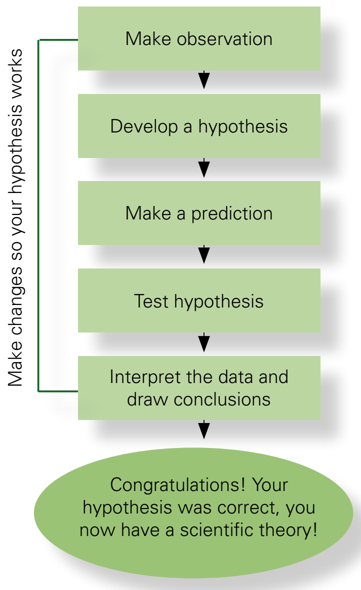
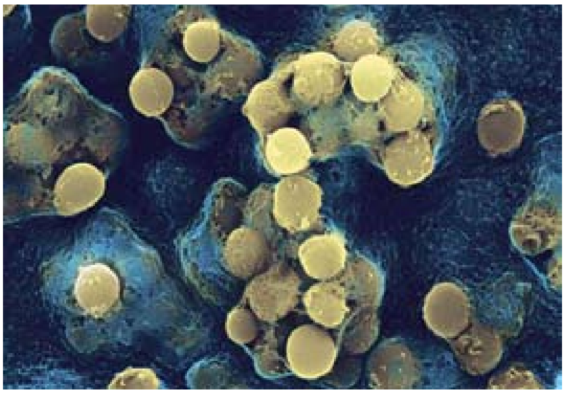


Figure 2

Although nowadays we know that childbed or puerperal fever is caused by a bacterial infection, in those days, there was no explanation for the disease. Semmelweis therefore suggested that the dead bodies contained 'cadaverous particles', literally dead-body particles. He said that the medical students touched the cadaverous particles during the autopsy and the particles were then transferred from the hands of the students to the uterus of the women in the maternity ward as the students examined them. The particles then entered the bloodstream of the women and this was what caused childbed fever. In many respects, his idea was not too far from the truth, and it was certainly accurate enough for him to devise a method of prevention.



Streptococcus pyogenes*, the bacteria responsible for puerperal fever.*

Having proposed a hypothesis, Semmelweis then went about testing it and making predictions based on his observations. He proposed that the cadaverous particles would be destroyed by chemicals such as chlorinated lime (an early antiseptic) and he ordered all of the medical students to wash their hands in chlorinated lime after they had performed autopsies. The data that he collected following this step (Figure 1) showed clearly that death rates in Ward 1 dropped to levels similar to those found in Ward 2, where only the mid-wives worked. His predictions were correct.

Semmelweis was convinced that he had found the answer to the problem of childbed fever. Not only this, but he found that his theory could explain another observation. The Viennese women who gave birth without ever reaching the maternity hospital did not come into contact with doctors. They were not examined during the process of giving birth so there was no opportunity for them to become infected with cadaverous particles. It made sense that they did not become ill with childbed fever.

The maternity ward in Vienna University Children's Hospital in 1921 – the lessons of Semmelweis's work were well-established by this time.

The Semmelweis Museum in Budapest recreates a medical lab of his time.

The long road to acceptance

Despite his conviction that his ideas were correct, Semmelweis did not immediately publish them in order to share them with other scientists and doctors. We do not really know why this was the case, although some of his writings may give us a clue. He wrote: 'God knows the number of patients who went prematurely to their graves because of me,' adding that before he had realised how to prevent childbed fever, he too had moved from autopsy room to maternity ward without washing his hands. He was proud to have found a method of prevention, but also deeply aware of the offence that he might cause to other doctors if he pointed out that they had caused the deaths of patients they were trying to help. Eventually, he did publish his work and it began to be slowly accepted by other doctors. Today, he is affectionately remembered as the 'saviour of mothers'.

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