

## Story of Dr Ignaz Semmelweis

Dr Ignaz Semmelweis, who was also known as the father of infection control, was born in Hungary on July 1818. He first started as a low importance physician at the Vienna General Hospital in 1846. At that time, doctors and other medical practitioners didn't know much about germs and that diseases can be transmitted from one person to another. The issue that had everyone in the world of medicine on their toes was the childbed fever, which was creating "havoc" in the maternity ward 2 of the hospital. The thing that bothered Dr Semmelweis was the fact he could not create a correlation between why the maternity ward 1 had a low rate of mortality compared to ward 2. It was not adding up at all as the ward 2 had medical students conducting the deliveries and they were supposed to be more professional than the midwives. Thus in order to understand what was actually causing the death of those having their deliveries done in ward 2, Dr Semmelweis conducted a bunch of experiments until he actually found a theory that clarifies the whole cause of the problem. Firstly he tried to test the hypothesis that the priest would be related to the deaths because he had access to the pregnant women in ward 2. He tested his hypothesis, by asking the priest to also visit the pregnant women in ward 1 and unfortunately, it didn't change anything. After conducting other experiments, Dr Semmelweis noticed that the only difference between those two wards was those who were conducting the delivery. Therefore he decided to bring the medical students into ward 1 and vice versa and the outcome of that experiment was that the high death rate was following the medical students. Even after that he still couldn't figure out what the problem was. It all became clear in 1847, when his friend, Jacob Kolletschka cut his finger during an autopsy and soon after died of a disease having similar symptoms to those of childbed fever. This made Dr Semmelweis think and he eventually reached to the conclusion that medical practitioners often perform autopsies but midwives don't. The theory that he constructed based on his conclusion was that the diseases were caused by the particles from the dead bodies. Dr Semmelweis then proved his theory by implementing the washing of hands with soap and chlorine after each autopsy, which significantly decreased the rate of deaths, from 29% to 2% for medical students and from 3% to 1% for midwives. Unfortunately even after having proved his theory, the senior doctors didn't accept the fact that washing hands was the solution to the diseases because they believed that they were accused of being unhygienic as compared to the midwives who were women. It was only after two decades that his work was finally recognised by Louis Pasteur, Robert Koch and Joseph Lister who were the ones who provided more proof about the germ theory and the antiseptic methods. This whole story demonstrated whether the scientific attitude was correctly applied or not. The Scientific Attitude can be summed up in a commitment to two principles, which are; caring about empirical evidence and willingness to change theories in light of new evidence. Therefore considering the two above principles, Dr Semmelweis did apply the Scientific Attitude correctly. He did not just make his hypothesis become an actual theory without proving it first. He discovered his findings while analysing the differences and similarities between ward 1 and 2. Secondly he also made his experiment while taking in consideration conditions that could affect it. This proved that he valued empirical evidence and that he was also respecting the idea that the cause of childbed fever could not be figured out merely by reason. Another proof of whether the Scientific Attitude had been correctly applied was when Dr Semmelweis changed his theories multiple times, thus accepting the fact that they were not correlating to the cause of the deaths. For example when he first tested the theory that the priest might be related to the cause of the childbed fever and concluded that it was not the answer, he did not decide to stick to his theory and dig deeper in the "wrong way". Instead he moved on and tested other hypotheses until he got the correct solution. Not only did he change his hypothesis after each failure, but he also added the fact that both cadaveric matter and putrid

living cells could transmit diseases. At that time, it was hard to actually determine the mechanism through which the diseases were spreading from one patient to another, so Dr Semmelweis did not completely understand how it could happen; But the correlation that he had established between the medical students not washing their hands after an autopsy and the deaths of those pregnant women was undeniable due to it being accurately tested. An example similar to the one to Dr Semmelweis' situation was when Charles Darwin, also known as the Father of Evolution proposed his theory of evolution despite not knowing about genetics. He also did not lose faith in his research after so many incorrect theories but on the contrary, he persevered, and that demonstrates how he did fully apply the Scientific attitude in order to reach to his final conclusion. Dr Ignaz Semmelweis based his findings on the transfer of diseases from a dead body to a living person and due to not having advanced research equipment, he could not fully prove his theory. Then later during the mid-nineteenth century, Joseph Lister who was a British surgeon and the pioneer of antiseptic surgery and preventive medicine found a way to prevent infections in wounds during and after a surgery. Now due to the discoveries of these two great medical practitioners, handwashing between patients is recognised as the most efficient way to drastically reduce infections. But the man who made the discovery that helped Dr Semmelweis' work be recognised was the renowned French chemist, Louis Pasteur who created the germ theory of diseases. It was in 1845 that his research started, at the University of Lille where he was appointed as a chemistry professor and dean of the science faculty. While working at Lille, he was asked to help solve problems related to alcohol production at a local distillery, and thus he began a series of studies on alcohol fermentation. His work on these problems led to his involvement in tackling a variety of other practical and economic problems involving fermentation. His efforts proved successful in unravelling most of these problems, and new theoretical implications emerged from his work. Pasteur investigated a broad range of aspects of fermentation, including the production of compounds such as lactic acid that are responsible for the souring of milk. He also studied butyric acid fermentation, which is characteristic of several obligate anaerobic( **requiring an absence of oxygen**) bacteria that mainly belong to the genus Clostridium( **This genus includes several significant human pathogens, including the causative agents of botulism and tetanus**). In 1857 Pasteur left Lille and returned to Paris, having been appointed manager and director of scientific studies at the École Normale Supérieure. That same year he presented experimental evidence for the participation of living organisms in all fermentative processes and showed that a specific organism was associated with each particular fermentation. This evidence gave rise to the germ theory of fermentation. It was the work of Louis Pasteur and Joseph Lister which after two decades finally proved the theory of Dr Semmelweis, because due to the lack of the germ theory, the senior medical practitioners rejected his findings, on the basis that it could not compare to the theory that the disease was caused by spreading of miasma or due to an imbalance of humours, also known as dyscrasia and was thought to be the direct causes of all diseases by all ancient Greek and Roman physicians and philosophers. The most amazing part of the story about childbed fever is not why so many medical practitioners rejected controlled experiments and learning from empirical evidence, but that Dr Semmelweis ran so far ahead of the pack and embraced it.

## CONCISE WRITING

Dr Ignaz Semmelweis was born in Hungary on July 1818. He first started as a low importance physician at the Vienna General Hospital in 1846. The issue that had everyone in the world of medicine on their toes was the childbed fever who was creating “havoc” in the maternity ward 2 of the hospital. The thing that bothered Dr Semmelweis was the fact he could not create a correlation between why the maternity ward 1 had low rate of mortality compared to ward 2. It was not adding up, as the ward 2 had medical students conducting the deliveries and they were supposed to be more professional than the midwives. Thus in order to understand what was actually causing the death of those having their deliveries done in ward 2, Dr Semmelweis conducted a bunch of experiments until he found a theory that clarifies the whole cause of the problem. Firstly he tried to test the hypothesis that the priest could be related to the deaths because he had access to the pregnant women in ward 2. He tested it by asking the priest to also visit the pregnant women in ward 1 and unfortunately, it was in vain. After conducting other experiment, Dr Semmelweis noticed that the only difference between the two wards was those who were conducting the delivery. Therefore he decided to bring the medical students into ward 1 and vice versa, and the outcome of that experiment was that the high death rate was following the medical students. Even after that he still couldn't figure out what the problem was. It all became clear in 1847, when his friend, Jacob Kolletschka cut his finger during an autopsy and soon after died of a disease having similar symptoms to those of childbed fever. This made Dr Semmelweis think and he eventually reached to the conclusion that medical practitioners often perform autopsies but midwives don't. The theory that he constructed based on his conclusion was that the diseases were caused by the particles from the dead bodies. Dr Semmelweis then proved his theory by implementing handwashing with soap and chlorine after each autopsy, which significantly decreased the rate of deaths, from 29% to 2% for medical students and from 3% to 1% for midwives. Unfortunately even after having proved his theory, the senior doctors rejected the fact that washing hands was the solution to the diseases because they believed that they were accused of being unhygienic as compared to the midwives. This whole story demonstrated whether the scientific attitude was correctly applied or not. The Scientific Attitude can be summed up in a commitment to two principles, which are; caring bout empirical evidence and willingness to change theories in light of new evidence. Therefore considering the two above principles, Dr Semmelweis did apply the Scientific Attitude correctly. He did not just make his hypothesis become an actual theory without proving it first, he discovered his findings while analysing the differences and similarities between ward 1 and 2. Secondly he also made his experiment while taking in consideration conditions that could affect it. Another proof of whether the Scientific Attitude had been correctly applied was when Dr Semmelweis changed his theories multiple times, thus accepting that they were not correlating to the cause of the deaths. Not only did he change his hypothesis after each failure, but he also added the fact that both cadaveric matter and putrid living cells could transmit diseases. At that time, it was hard to actually determine the mechanism through which the diseases were spreading from one patient to another, so Dr Semmelweis did not completely understand how it could happen; But the correlation that he had established between the medical students not washing their hands after an autopsy and the deaths of those pregnant women was undeniable due to it being accurately tested. He also did not lose faith in his research after so many incorrect theories but on the contrary, he persevered and showed that he applied the Scientific Attitude correctly. Dr Ignaz Semmelweis based his findings on the transfer of diseases from a dead body to a living person and due to not having advanced research equipment, he could not fully prove his theory. Then later during the mid-nineteenth century, Joseph Lister who was a British surgeon and the pioneer of antiseptic surgery found

a way to prevent infections in wounds during and after a surgery. Now due to the discoveries of these two great medical practitioners, handwashing between patients is recognised as the most efficient way to drastically reduce infections. But the man who “helped” Dr Semmelweis’ work be recognised was the renowned French chemist, Louis Pasteur who created the germ theory of diseases. In 1845 his research started at the University of Lille where he was appointed as a chemistry professor and dean of the science faculty. While working at Lille, he was asked to help solve problems related to alcohol production at a local distillery, and thus he began a series of studies on alcohol fermentation. His work on these problems led to his involvement in tackling a variety of other practical and economic problems involving fermentation. His efforts proved successful in unravelling most of these problems, and new theoretical implications emerged from his work. Pasteur investigated a broad range of aspects of fermentation, including the production of compounds such as lactic acid that are responsible for the souring of milk.. In 1857 Pasteur left Lille and returned to Paris, having been appointed manager and director of scientific studies at the École Normale Supérieure. That same year he presented experimental evidence for the participation of living organisms in all fermentative processes and showed that a specific organism was associated with each particular fermentation. This evidence gave rise to the germ theory of fermentation. It was the work of Louis Pasteur and Joseph Lister which after two decades finally proved the theory of Dr Semmelweis, because due to the lack of the germ theory, the senior medical practitioners rejected his findings, on the basis that it could not compare to the theory that the disease was caused by spreading of miasma or due to an imbalance of humours. The most amazing part of the story about childbed fever is not why so many medical practitioners rejected controlled experiments and learning from empirical evidence, but that Dr Semmelweis ran so far ahead of the pack and embraced it.