

## Semmelweis' discovery and its Finnish follow-up

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Professor Ignác Semmelweis (1818–1865) is one of the great personalities of medical history. He insisted on washing hands with chlorine water before any obstetrical intervention, he was the first to demonstrate its importance in preventing puerperal fever. Thus, the principle of asepsis was introduced prior to the discovery of bacteria and bacterial diseases. Semmelweis carefully documented his findings and in this way pioneered the scientific analysis of clinical data. Medical community of that time misinterpreted Semmelweis' great ideas, he died abandoned and forgotten. A Finnish doctor Josef Adam Joachim Pippingsköld was one of the first obstetricians who had realized the importance of Semmelweis' work. In 1861, in his letter to Semmelweis he reported about his own findings and favorable results in prevention of puerperal fever in Helsinki. Two decades earlier, Dr. Ehrström in the University of Helsinki had submitted his thesis on pathophysiology of puerperal fever that was similar to the ideas of Semmelweis. Long before modern times in Finland, mothers traditionally had their babies delivered in smoke saunas, where heating and smoke of bactericidal phenols created a clean, rather aseptic environment. Hand washing was self-evident necessity. However, the situation was quite different in the Central European universities and departments of obstetrics, where the medical training and clinical practice took place side by side. Semmelweis' life and his contribution to medicine was appreciated even in the theatrical circles of Finland. The piece "Semmelweis" of Norwegian playwright Jens Bjørneboe got its World Premier in the Swedish Theatre in Turku, former capital of Finland, in September 1969.

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### The short history of discovery made by Semmelweis

Ignác Semmelweis (1818–1865) (Fig. 1) was born in Ofen, now the Buda side of Budapest. He studied medicine alternatively in Vienna and Pest, than took his doctor's degree on May 21, 1844 in Vienna. He started his work as assistant physician at professor Johann Klein's obstetric clinic in the Viennese General Hospital (Allgemeines Krankenhaus) in 1846 (1, 6, 11, 20).

**SEMMEWEIS UNIVERSITY**  
**BUDAPEST, HUNGARY**  
**233rd Academic Year**  
**at the Faculty of Medicine**  
**2001/2002**



Fig. 1. The brochure cover page of Semmelweis University having Ignac Semmelweis' portrait

Semmelweis recognized a striking difference between the puerperal mortality rates in the two departments of the same hospital. In 1845 the maternal mortality rates in the First and the Second Clinic of Obstetrics were 11.5%, and 2.7%, respectively. A special commission established by the government studied the possible cause of the high mortality rate. Professor Klein explained it by poor facilities of his department. Both clinics, however, were quite similarly supplied. Results of careful statistical analysis performed by Semmelweis unambiguously proved that the year 1845 was not just an exception. Moreover, findings based on the autopsy of newborns showed that sepsis was the cause of both fetal and maternal deaths. In 1846, the director of the clinic unexpectedly fired Semmelweis. Returning back after a short stay in Venice, Semmelweis learned that his friend professor of forensic medicine Jakob K. Kolletschka

(1803–1847) had died from sepsis after a finger-cut, which he got during an autopsy. Semmelweis recognized from the documents that the signs of the mortal disease of his friend and of the mothers dying in puerperal fever were similar. Since same symptoms were observed in adults – both men and women, and in newborns –, Semmelweis concluded that mothers delivering at the First Clinic apparently died due to certain (then unknown) agents, transmitted by doctors and medical students from the autopsy unit of the teaching hospital. In the Second Clinic midwives took care of mothers, and they usually escaped this morbid disease, which was so common in the nearby clinic. Semmelweis also noticed that after autopsy normal hand-washing with soap failed to remove the odor, it did disappear only if chlorine water was used. Now professor Klein gave permission to Semmelweis – who again had got a job contract for two years – to introduce such hand-washing in patient examination and in attending deliveries. This procedure dramatically reduced the mortality rate to one fifth (1, 6, 11, 20).

In 1847, Semmelweis postulated that puerperal fever was due to particles from cadavers, pus and other putrefying organic materials. During patient examination or delivery the female genitals were exposed to these substances that could enter the blood stream of the unfortunate person (11).

Probably as the sign of a great respect for his professor, Semmelweis refrained from publishing anything about his discovery for several years. In 1847, however, a dermatologist Dr. Ferdinand von Hebra published a detailed editorial article in the Journal of the Viennese Medical Association. Professor of internal medicine Joseph Skoda proposed on his behalf that the Medical Faculty should establish a committee to carefully study Semmelweis' innovation. Professor Klein did not agree, and he himself got the responsibility. Semmelweis received an invitation to give a lecture at the meeting of the Pathological Subcommittee of the Viennese Medical Association on the 23rd of February 1849. A month later, in March 1849, Semmelweis' job contract at Professor Klein's Clinic expired. Professor Klein felt offended and did not prolong Semmelweis' contract. Neither did he continue hand-washing with – as we now know – sterilizing solution (11). Professor Skoda gave a lecture on Semmelweis' innovation at the Department of Natural Sciences of the Viennese Science Academy on 18th of October 1849, and Semmelweis himself gave a lecture on the etiology of puerperal fever in the Viennese Medical Association on 15th of May, 1850. Semmelweis applied and got a private-docentship in obstetrics – without any clinical facilities, and suddenly he left Vienna. This action was for a great disappointment to his supporters. Semmelweis returned back to Hungary, where he lived first in poverty. One must remember that Hungarians had difficult times after the Revolution and War for Independence of 1848/49. Finally he was invited to become the head of the Department of Obstetrics at the St. Roche's Hospital (Fig. 2). He got excellent results in applying his innovation. In 1855, by Emperor's letter Semmelweis became professor of obstetrics at the University of Pest, although first the faculty was against his nomination (11).



Fig. 2. St. Roche hospital in Budapest is still in operation in the very heart of the city

As a young assistant physician, at the age of 29, Semmelweis discovered and introduced into praxis the basic principles of etiological prevention and asepsis. His mental and physical health, however, was in a poor condition after the death of his close friend and supporter Dr. Kolletschka in 1847, and loss of his clinical job in Vienna in 1849. The position of a junior doctor was not easy at that time – neither now. Semmelweis got support and understanding from specialists of other fields of medicine: K. Rokitansky was professor of pathology, J. Skoda professor of internal medicine, and F. von Hebra was a dermatologist. However, Semmelweis' close colleagues became his opponents. Their opposition is easy to explain, since Semmelweis's discovery endangered their professional prestige. Ignorant in pathophysiology of the puerperal fever, obstetricians themselves had been transmitting this mortal disease to their patients. Bacteria had not yet been discovered.

Finally Semmelweis book "Die Aetiologie, der Begriff und die Prophylaxis des Kindbettfiebers" was published in 1861 (Fig. 3). The thorough treatise contained 543 pages.

Unfortunate in his private life, Semmelweis deeply suffered when his family not only abandoned him, but also refused the name Semmelweis. It was a tragedy – and in the same time also ironical – that Semmelweis himself died in Vienna due to sepsis and in a way due to the friends who tried to help him. They had paid no attention to the infected wound in his middle finger of the right hand (5).

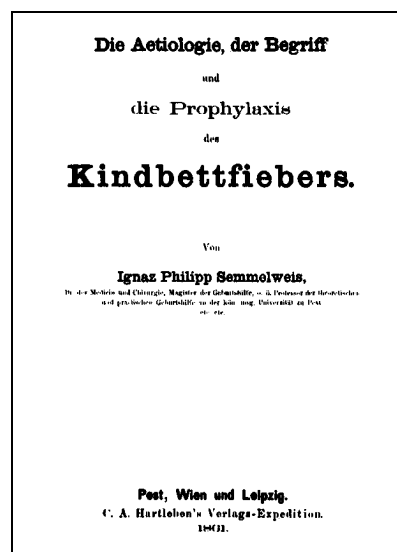


Fig. 3. The cover page of Semmelweis's book "Kindbettfiebers"

### Semmelweis, the Savior of Mothers

In 1885, about twenty years after Semmelweis' death his biography first appeared in Hungarian. In 1894, Jenő Rákosy wrote an article in Budapesti Hirlap entitled "Anyák megmentője" – "Savior of Mothers". This article initiated the rehabilitation of Semmelweis and appreciation of his work. His mortal remains were transferred to a new place of honor in Kerepes Cemetery, Budapest.

Forty years after Semmelweis' death, his complete works were published in German language and one year later they were also published in Hungarian. A monument designed by sculptor Alajos Strobl is still seen in a small park next to St. Roche's Hospital.

In 1965, one hundred years after Semmelweis' death Budapest Medical University adopted the name Semmelweis Medical University (since 2000 Semmelweis University). In 1965, the mortal remains of Semmelweis were transferred to the Buda Castle, to the garden of the house he was born. By the decision of UNESCO the year of 1965 was declared the year of Semmelweis.

On the Lake Shore Drive in Chicago, USA, the Museum of the International Academy of Surgeons is located. There, in the Hall of Fame, are the statues of twelve eminent masters of medical history. Together with Asclepius, Hippokrates, Galenos, Marie Curie and others there is a statue of Ignác Semmelweis.

### Semmelweis and Lister

Joseph Lister (1827–1912) was another prominent scientist whose works, similar to that of Semmelweis, were not understood by his contemporaries. Lister graduated in 1852. He became professor of surgery in the University of Glasgow in 1859 (14). In 1861–65, he had studied causes of extremely high incidents (45–50%) of septic mortality in male patients after amputation at the Department of Traumatology. In 1865, i.e. about two decades after Semmelweis' discovery, Louis Pasteur published that air can transmit organisms that cause destruction of tissues. Lister combined this piece of knowledge with his own experience in the field of wound fever. His main conclusion was that these organisms should be destroyed before they infected the wounds. In 1864, Lister had learned that people in Carlise used carbolic acid for treatment of wastewaters that reduced infectious diseases of the cattle. Lister started to clean the wounds with carbolic acid. He presented his ideas and results at the meeting of British Medical Association in 1867, i.e. a couple of years after the death of Semmelweis. Introducing the new technique he succeeded to markedly reduce septicemia in his hospital. Lister's results did not convince medical profession. His colleagues were as negative as those of Semmelweis in Vienna. The war between France and Germany, and the great success of German military surgeons promoted success of Lister's innovation. One can also speculate that Semmelweis's findings presented in his book in German language had paved the way in Germany for the adoption of Lister's methods. In fact Germans considered Semmelweis as their compatriot (11). When Lister visited Germany in 1875, he was celebrated as a great innovator in medicine. In England, however, Lister became really recognized in 1877 only, when he moved to London and worked as professor of surgery in Kings College. It was here, where his successful patella operation, on 26th October 1877, with his antiseptic method received a lot of publicity. Lister became Sir Joseph.

According to the Hungarian sources of information (1) Lister had no knowledge about Semmelweis when he visited Budapest in 1883. Apparently at that time scarcely any information was available in the United Kingdom about German scientific literature. Glasgow was a minor peripheral center and most probably the library of the medical school was quite modest. At that time (and now as well) most of British intellectuals did not read in German. One should also remember that the library services were poor in those days. On the other hand, according to Lister, nobody in Budapest mentioned Semmelweis' work to him during his visit to Budapest. In two decades after his death also Hungarians had completely forgotten Semmelweis and his work (11)?

Only in 1883, i.e. at the time of Lister's visit to Budapest, and perhaps having been inspired by Lister's work, Hungarian surgeon, Imre Réczey (1848–1913) at the St. Roche's Hospital was the first to mention Semmelweis as the apostle of aseptic medical praxis (1). Réczey worked later as professor of surgery at the same medical faculty in Budapest as Semmelweis in his last years.

### Pippingsköld and Semmelweis

Josef Adam Joachim Pippingsköld (1825–1892) (Fig. 4) in 1861 wrote to Semmelweis that he had received good results when applying his method in Helsinki Hospital of Obstetrics (9, 10). Already in 1860 Pippingsköld had found that the puerperal fever was transmitted from one patient to another (21). Semmelweis published an open letter in 1862, where he mentioned the names of those colleagues (also Pippingsköld's name) whose findings strongly supported his observations. In Finland it is known that Pippingsköld was corresponding with Semmelweis (21). Semmelweis asked more information from Pippingsköld, but his claim was not met (11). Perhaps some of the mail was lost as Pippingsköld traveled at that time in Central Europe.



Fig. 4. Josef Adam Joachim Pippingsköld (1825–1892) around the time when he wrote a supportive letter to Semmelweis. Pippingsköld wears the dress of Finnish university teachers of that time. The two buttons in sleeves indicate that he was a noble man. Photographer is not known (From the collection of National Museum of Finland)

Josef Adam Joachim Pippingsköld was an important promoter of several branches of medicine in Finland. His activities covered in addition to gynecology and obstetrics also pediatrics and childcare, surgery, physiotherapy and balneotherapy. He was an exceptionally active and talented man (17, 18). He defended his dissertation on the physiology of circulation and muscle function already in 1857 during his medical studies, before his graduation. In 1859–1861 he continued his studies in surgery and obstetrics in Berlin, Prague and Paris. He wrote another dissertation on the anatomy and

functions of pelvis in 1861 and became a docent of obstetrics in the University of Helsinki in 1861. He got professor's title in 1865. As ordinary professor of gynecology and obstetrics he started in 1869 and served the University for about twenty years. Pippingsköld made two other trips in Central Europe, and he worked in Strasburg and Paris (13, 21). It is rather obvious that he had learned about Semmelweis' discoveries and results via different routes.

Karl Robert Ehrström (1803–1881) was the first in Finland who studied puerperal fever in Helsinki in 1836–1837 (4). He submitted his thesis several years before Semmelweis and Pippingsköld. Ehrström concluded that an invisible and undetectable poison was transmitted during examination of patients. It caused puerperal fever even, if the best was done to avoid an exposition. Most probably, Pippingsköld knew well Ehrström's work, as only few dissertations were submitted in those days.

Professor Knut Samuel Sirelius (1827–1869, as professor 1861–1869) was Pippingsköld's predecessor in the University of Helsinki. He had studied medicine in Vienna and in Prague. Most probably, he also knew Semmelweis' experiments and results. However, despite being an open-minded scientist, Sirelius did not support Semmelweis' conclusions. Presumably he had also read Ehrström's thesis. Sirelius was very well aware of the poor situation in his clinic. In 1866 he even mentioned that his clinic was a deadly place for mothers and newborns (21).

Other Finns were also familiar with Semmelweis' work. In 1851 Knut Felix von Willebrand (later – in 1856–1874 – professor of internal medicine in the University of Helsinki) gave a lecture on Semmelweis' findings just after the very first reports. This knowledge, however, did not hinder the Medical Faculty to order a professor of pathology Otto Edvard August Hjelt (1823–1913) to serve as an acting professor of obstetrics (21).

Pippingsköld opened a new period in the obstetrics in Finland, when he became professor and chairman after Sirelius in 1870. He isolated the septic patients. Personnel had to wear clean clothing. Beds had to be clean. All instruments were heat treated before the use. Personnel had to wash their hands carefully. Hair should be clean and no full beards were permitted. In his inaugural lecture in 1871 he said that the puerperal fever would soon be overcome. Pippingsköld worked hard to get a new obstetrical hospital (Fig. 5), and he was successful. It was opened in 1878 (7). In 1861–1869, during professor Sirelius' time the sepsis-induced mortality among obstetric patients was 7.4%. In a few years, mortality rate was reduced to 3.3% (in 1871), and in 1888–1889 it had dropped to 0.45% (21). Thus, Pippingsköld was one of the first in Europe who introduced the ideas of Semmelweis in medical praxis with very good results.



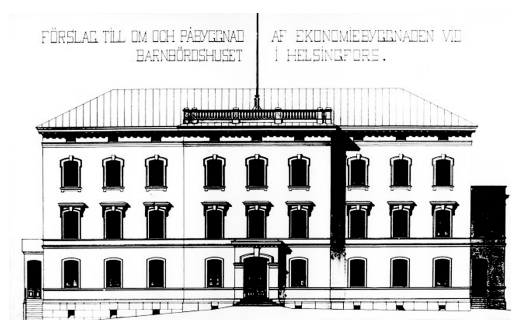


Fig. 5. The drawing of Pippingsköld's new obstetric hospital in Helsinki. It was inaugurated in 1878 and there Semmelweis' innovations were strictly observed. The Embassy of Russia is now located in the same area near to the South Harbour

### **During Semmelweis' time Finns were usually born in sauna**

Semmelweis' innovation on hand washing and aseptics was probably less important in rural Finland, its practical impact was limited to city hospitals. Great majority of Finnish mothers gave birth in saunas in those days. The saunas were quite clean due to very hot air temperature and the use of boiled water. It is also noteworthy that smoke, although the farmers were unaware of it, contains phenols and in that time most of the saunas were traditional smoke saunas (later Lister used carbolic acid!). Midwives obviously washed their hands and the water contained some smoke-derived phenols. A direct transfer of infections from one mother to another was rare, as there were seldom more than one delivery in the family. Jutikkala (8) using available records has studied the mortality in Airaksinen family and Iisvesi branch of Kekkonen family from 1720 to 1939 as examples of health condition of rural people. His paper does not contain sufficient data specifically on puerperal fever mortality, or the mortality of newborns. However, it is interesting to note that in 1840–1849, the mortality of infants under one year old was 14.5% in the Airaksinen family, where the overall mortality was usually 10%, and only 2% in the Kekkonen family where the mortality was regularly less than 10%.

### **World premier of Semmelweis drama in Turku, Finland**

In 1968, Norwegian author Jens Bjørneboe (1920–1976) wrote a play "Semmelweis" (2). The play presents 33 scenes and embraces a 20 year period of the tragic life of Semmelweis who died at the age of 47. This play claims that Semmelweis not only ceased puerperal fever, but he did much more having ruined the authorities, who were the embodiment of the mortal disease. Both in the prologue and epilogue the tumultuous student year 1968 comes through.

The World Premier of Bjørneboe's Semmelweis drama took place in September 1969 at Åbo Svenska Theatre – the Swedish theatre in Turku, Finland (Fig. 6). Lars Svedberg had just been elected to serve as new director of the Åbo Svenska Theatre in 1969. The Semmelweis-drama was his first piece there, and he himself presented the role of Semmelweis (Fig. 7).

VÄRLDSPREMIÄR		PERSONER (i den ordning de uppträder)	
<b>Semmelweis</b>			
ett anti-auktoritärt skådespel av JENS BJØRNEBOE			
REGI .....	PAUL BUDSKO (gäst)	REKTORN .....	Evert Lindkvist
SCENOGRAFI .....	JARI LINDBLAD	LOTTE .....	Cita Örndahl
DRÄKTER .....	SYLVI NYMAN	PROFESSOR KLEIN .....	Evert Lindkvist
BELYSNING .....	GUNNAR MATSSON	SEMMEWEIS .....	Lars Svedberg
INSPICIENT .....	RAINER FAGERSTRÖM	KOLLETSCHKA .....	Leif Lönnqvist
SCENMÄSTARE .....	MATTI BERG	SOPHIE .....	Solvig Labbaert
REGIASSISTENT .....	MARINA MOTALEFF	MARKUSOVSKY .....	Lasse Hjelt
MUSIK TILL SÅNGERNA .....	ILPO TOLVAS	ANNA .....	Janina Berman
SUFFLÖS .....	MARGARETA PALMBERG	MARIA .....	Marina Motaleff
		SKODA .....	Bjarne Commond
		JUSTITIEMINISTERN .....	Leif Lönnqvist
		VÄRDINNAN .....	Cita Örndahl
		NATTMANNEN .....	Matti Berg
		POLISCHEFEN .....	Erik Ohls
		BISKOPEN .....	Jari Lindblad
		DUBOIS .....	Jari Lindblad
		MARIA WEIDENHOFER .....	Marina Motaleff
		SKÖTERSKAN .....	Janina Berman
		BARNMORSKAN .....	Cita Örndahl
		von TANDLER .....	Erik Ohls

Fig. 6. The Program Booklet of the Åbo Svenska Theatre in fall 1969: Bjørneboe's Semmelweis-drama and the names of the director and key performers



Fig. 7. Director of the Åbo Svenska Theatre, Lars Svedberg in his role as Semmelweis, innovator of medicine

One of the personages of this drama – a patient – was taken by force to the clinic of professor Klein, although she pleaded to be transferred to Semmelweis' ward. This role was performed by Cita Örndahl (16). In Norway, the premier was later in 1969, and then very soon also in Sweden and Denmark.

In Norway and Denmark the critics considered that Bjørneboe's Semmelweis was next best after Peer Gynt. The piece was translated into English (2).

Earlier Louis-Ferdinand Celine (3) – a French medical student – had written a drama on Semmelweis life, but this never received similar attention and success as Bjørneboe's version.

### **Jens Bjørneboe**

Jens Bjørneboe's father was a ship owner. Due to his strong social criticism, young Jens was fired from school and later from other schools. So at the age of 16 Jens left to the sea. After three years he came back – to the funeral of his father. During the German occupation of Norway he lived in Sweden.

Bjørneboe's first literary works were published only in the 1950s. Bjørneboe's philosophy and literary career were pointed against the accepted rigid norms of the society. He lived a hard life as a seriously disturbed personality, but he never gave up his principles. He was one of the most talented Norwegian journalists and authors. He wrote novels, poetry, essays and plays for theatre. Among the most successful ones "Congratulations", "Amputation" and "Semmelweis" should be mentioned. Between 1966–1973, he wrote his famous trilogy on the history of animalism which started with "Frihetens Øyeblikk" and which was followed by "Krutttårnet" and "Stillheten". In these books the author claimed his demand against cruelty of the history. The opinions of young Jens, and of the mature author of his later works are in a way spiritually related to Ignác Semmelweis' life and work (2).

### **To conclude**

Today one can scarcely comprehend why was hand washing with sterilizing fluids so strongly opposed one and a half century ago. Furthermore, it is difficult to understand that clear statistics presented by Semmelweis in favor of effective hand washing was not taken seriously. Although, the ability of skin to resist Streptococci on one hand, and the great sensitivity of mucous membranes and wounds to these bacteria on the other hand even today is rather mysterious. Semmelweis clearly documented that medical students and staff transmitted the infection from the autopsies to the wards where mothers died of puerperal fever, but they themselves usually did not become infected. Jews have respected hygiene and careful hand washing for thousands of years. In the Middle Ages, they were accused for witchcraft and for polluting waters, as their own mortality rate was substantially lower than that of other nationalities (12). Semmelweis, as Lister a few decades later, had to live in the tempest of the incomprehension. Both

Semmelweis and Lister had difficulties in communicating with their own colleagues who were the heaviest opponents against the progress of their own profession even if the new innovations so clearly saved patients. Perhaps Semmelweis postponed publishing his innovative results due to his deep respect to his Professor, until it became senseless since public discussions had been started by other professors. In contrast to Semmelweis, Lister was lucky to live so long that his ideas were accepted, and he died as a respected hero of medicine. In Finland, Dr. Ehrström's academic thesis on puerperal fever published before Semmelweis' studies could not open the eyes, and only Pippingsköld was able with the help of Semmelweis' discovery to get through with a thorough change in the obstetrical practices and a practical elimination of puerperal fever before the bacterial etiology of the disease was known.

It is interesting to note that the World premier of Bjørneboe's drama "Semmelweis" took place in the Finnish Åbo Svenska Theatre. Bjørneboe's life and protest against established believes was much like that of Semmelweis. Mr. Lars Svedberg played the role of Semmelweis. He has later become one of the most eminent Finnish contemporary actors. Semmelweis drama was the first piece he introduced as he started as a young theatre director in 1969.

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