ORIGINAL ARTICLE

# "No Good Deed Goes Unpunished": Ignaz Semmelweis and the Story of Puerperal Fever

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## 1. A SHORT BIOGRAPHY FOR THE UNINITIATED[a]

Ignác Fülöp Semmelweis was born almost 200 years ago, in 1818, to a well-to-do middle class Hungarian family. He started law school in 1837, switched to medicine a year later, and graduated in 1844. Semmelweis failed to obtain a position in internal medicine, became a resident in obstetrics, and later, still in obstetrics, became an assistant to Professor Johann Klein,[b] head of the maternity service at the AKH-Vienna General Hospital.[2] Professor Klein resented his predecessor's approach of minimal pelvic examinations and the use of mannequins, and ushered in the area of obstetric examinations using cadavers for teaching purposes. Each morning, medical students started off with postmortem examinations before joining the morning rounds.[3] However, only the all-male medical students from the first clinic were part of this routine; it did not include the all-female midwife students from the second clinic.

During his 5 years' tenure in the maternity department he was first struck, then appalled, then intrigued by the magnitude of maternal mortality of 9.4% (!) due to puerperal fever, which seemed to be specific to the first clinic. Mortality was much lower (3.4%) amongst women who gave birth just across the corridor, in the second clinic, and mortality from puerperal fever was less than 1% amongst women who gave birth at home. Even patients who gave birth in the street suffered a lower mortality than patients of the first clinic.[2–4] Further research into this phenomenon brought up 2 clues in trying to resolve this conundrum: mortality from puerperal fever had increased with (1) the institution of lying-in hospitals and (2) the recent introduction of autopsies into the syllabi of medical students and residents. This paradoxical state of affairs—that home birth was safer than giving birth at the largest hospital in Europe[2]—haunted Semmelweis. He became obsessed with it, read vastly, and performed hundreds of autopsies searching in vain for the cause of puerperal fever.

On March 20, 1847, upon returning from a holiday in Venice, he learned that his close friend and idol, the professor of forensic medicine Jacob Kolletchka, had died after sustaining a minor injury during an autopsy. Devastated, he went to the archives and looked up Kolletchka's autopsy report.[3] The findings at his friend's autopsy—lymphangitis, peritonitis, pericarditis, pleurisy, and meningitis[2]—were identical to those he saw with his own eyes time and again in hundreds of puerperal fever victims.[3] However, Kolletchka was not a woman and was infected not during childbirth, but through a minute puncture wound during an autopsy. Thus, the same disease that killed Kolletchka also killed the tens of thousands of women, and this disease was not specific to childbirth.

Semmelweis correctly hypothesized that this disease originated from poisonous material in particles of rotten flesh, which must have penetrated Kolletchka's body through this minute puncture wound. In addition they could be detected by their typical smell (which lingered after washing hands with soap and water) and transmitted from a cadaver or even an infected patient with erysipelas[c] to a healthy body by the hands of the physician.[d,2]

Semmelweis, as a result of his research, went further than any of his predecessors had until then and instituted in mid-May 1847 mandatory hand-washing not only with soap but with chlorinated lime.[e] Mortality rates from puerperal fever immediately plummeted and equalized between the 2 departments. They now were below 1.5% throughout 1848.[2]

Despite (and perhaps because of) this brilliant and unprecedented achievement, Professor Klein opposed the idea and Semmelweis had to step down as his assistant in 1849.

On May 1850, Semmelweis delivered the one and only lecture of his lifetime in order to draw the attention of his colleagues at the Medical Society of Vienna to his findings. He presented his impressive statistics and the lecture was generally well accepted[2] but was not enough to turn the tables on puerperal fever thinking. Semmelweis failed to obtain a privatdozent position, and eventually was demoted to a theoretical teaching position.[f] Broken by this, Semmelweis secretly escaped from Vienna to Pest on October of the same year, and found a job without pay as an obstetrician at the small St. Rochus Hospital.[7] From the date of his arrival in 1851 until his departure in 1857 mortality from puerperal fever in that small hospital dropped to less than 1%.[8]

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In October 1860, Semmelweis published his wordy magnum opus,[9] which was largely ignored, driving him to desperately seek other means of distributing his iconoclastic findings: He wrote frantic, abusive letters to his fellow obstetricians urging them to stop participating in the "massacre."[10] His desperate struggle could not alter any physician's mind, except perhaps his own—Semmelweis's mental health was deteriorating. In 1865 he was committed to a private mental institution in Vienna. In the mental asylum he was savagely beaten by the orderlies; 2 weeks later he died.[7] His official autopsy report indicated multiple abscesses on his fingers and legs due to the beating. Modern revisions of his autopsy papers indicate that he suffered from tabes dorsalis; others suggested early onset dementia.[3]

## 2. WHAT WAS KNOWN PRIOR TO IGNAZ SEMMELWEIS

### 2.1 Proponents

Semmelweis was not the first to suggest the iatrogenically transmissible nature of the disease. From the 1750s until the mid-1840s a surprisingly large body of data, accumulated by many observers (mostly in Britain), was already built and pointed in that direction.

John Burton (1710–1771), born in Colchester and later living in York, was among the firsts, to the best of our knowledge, to indicate in 1751[11] that puerperal fever was a contagious disease. He advocated that the fever could be brought to the patient by a careless attendant.[12] He also criticized his famous rival William Smellie for using leather pieces on his forceps, makes their cleaning more difficult.[11]

William Hunter (1718–1783), the famed Scottish obstetrician, was one of the most prominent figures in practicing hygiene to avoid the spread of infectious diseases in eighteenth-century British hospitals. Hospitals refused quite commonly to admit patients with "feverish symptoms" in order to protect their other patients.[g] In 1749 he established the first lying-in hospital in London, after the Middlesex hospital refused to construct a separate maternity ward. Following a puerperal fever epidemic in 1760 inside his hospital, he separated his teaching facilities from his midwifery practice. Hunter must have had some intuition for the role of man-midwifes in the transmission of puerperal fever: despite his appointment as Physician Extraordinary to Queen Charlotte in 1762,[14] he took only a passive role during the births of 14 of the Queen's children.[h] He left the actual delivery work to a midwife![4] This was due to neither indolence nor coincidence.

John C. Lettsom (1744–1815), who founded the Medical Society of London in 1773,[16] treaded in Hunter's steps and was able to keep puerperal deaths to less than 0.5% while attending the City of London Maternity Hospital.[i,4]

Charles White (1728–1813), from Manchester, forced perfect cleanliness and complete separation of parturient women. Trained under William Hunter, he carried out a reform in Warrington and Manchester, keeping the lying-in wards small. He also advised Joseph Clarke, the head of Rotunda lying-in hospital in Dublin, to follow in his steps. He even noted in his 1772 treatise: "It may seem strange, but it is nevertheless true, that the puerperal [fever is] more common and more fatal in London than in the country; and yet it must be acknowledged that in general the ablest men in every branch of the profession resort to the metropolis."[18]

Francis Home (1719–1813), another Scot doctor, wrote in 1780 on the infectious nature of the disease, pointing out the "erysipelatous [ = contagious] nature" of the disease.[j,19] Home reviews the different treatments suggested by different doctors[k] and adds: "we may, with great truth, conclude, that we know little of the theory, and still less of the cure, of puerperal fever, and that our chief aim, therefore, should be to prevent this disease."

The British scientist Thomas Young (1773–1829), a prominent figure in the formulation of the wave theory of light, related the puerperal fever to a local infection[4] and not to miasma, which was a popular explanation among the British doctors, though he never published an essay about this disease.[20]

Robert Collins (1801–1868), one of the pioneers of fetal auscultation, was head of Dublin's Rotunda Maternal Hospital between 1826 and 1833. He believed in the contagious nature of the disease and in his work from 1835 he detailed his steps towards cleaning the wards, which included the use of chlorine gas and washing the wards' woodwork with lime. Blankets were treated in a stove with high temperature: "No patients … should be admitted; but that attendance should be afforded to all such as wished for assistance at their own homes, and that they should be supplied with gruel, whey, and medicine from the Charity, until the entire wards of the Hospital should have been thoroughly purified"[21]; thus Collins clearly understood that "this fever derived its origin from some local cause, and not from anything noxious from the atmosphere." However, unlike Semmelweis, he failed the "quantum leap" to the idea of hand-washing. Still, these measures decreased mortality rates to 0.53%. After his retirement his methods were abandoned and the epidemic returned to Rotunda Maternity Hospital.[22]

James Blundell (1791–1878),[l] from London, wrote in his 1834 treatise[24]: "Gossiping friends, wet nurses, monthly nurses, the practitioner himself, these are the chambers by which the infection is principally conveyed."

Edward Rigby (1804–1860), of Norwich, wrote in his 1841 comprehensive obstetric essay that it is "already known" that it is not safe to attend patients after postmortem visits, and discharges from puerperal fever patients are in the highest degree contagious. He listed Vienna hospital as an example. Unfortunately, the Westminster Hospital committee refused to accept his recommendations on controlling the outbreak of puerperal fever.[25]

Alexander Gordon (1752–1799), from Aberdeen, wrote a dissertation on the matter in 1795, some 3 years after the Aberdeen puerperal fever outbreak.[26] He wrote: "I had evident proofs that every person, who had been with the patient in the Puerperal Fever, became charged with an atmosphere of infection, which was communicated to every pregnant woman, who happened to come within its sphere." He connected

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childbed fever and erysipelas in the existence of a portal of entry.[m] He could also foretell what woman will be affected upon hearing by which midwife or nurse she was attended. In his dissertation he also attacks the miasma theory by stating that if "a noxious constitution in the atmosphere" is the culprit, it would have seized women indiscriminately and not those who were visited by practitioners or nurses who attended the sick previously. Gordon did not shun cruel self-criticism: "It is a disagreeable declaration for me to mention, that I myself was the means of carrying the infection to a great number of women." Approximately a hundred years after Gordon's untimely death, Dr W. Stephenson, professor of midwifery in the University of Aberdeen, had the following inscription painted on the wall of his class room: "The infectious nature of puerperal fever was first demonstrated by Dr Alexr. Gordon. Aberdeen, 1795."[27]

However, therapeutically he was "a doctor of his time"[28] and recommended copious bloodletting.

His candor cost him dearly—a growing opposition from local midwifes and practitioners who were mentioned by name in his treatise forced him to leave his position and he never again practiced midwifery. Shortly after the publication of the treatise he donated his books to the medical society of Aberdeen and was recalled by the Admiralty to active service in the war with France. However, in 1799 he contracted tuberculosis, and after being invalided home, died on October 19 that year in his brother's home at Logie. He was 47 years old.[29]

Semmelweis's Bostonian contemporary Oliver Wendell Holmes, Sr (1809–1894) openly stated that puerperal fever was an infectious disease and that it was carried and transmitted by medical personnel, including physicians who performed autopsies. Quite like the situation with Semmelweis, it was a death of a physician after a postmortem exam that was performed on a puerperal fever victim that drew Holmes to the subject.[30] He published his take on the matter twice—in 1843 and again 12 years later.[31] In his work he unmistakably indicates that careless doctors convey the disease to patients; however, his observations are based on the connection between postmortem studies and postpartum illness. According to Holmes 3 or more cases of closely connected puerperal fever are the "prima facie evidence that the physician is the vehicle of contagion."[31] Yet, unlike Semmelweis, Holmes steps away from belligerent accusations of such puerperal fever "vehicles": "I have no wish to express any harsh feeling with regard to the painful subject that has come before us."[n,31] His suggested solution was quite radical: to separate midwifery from postmortem studies of puerperal fever or erysipelas surgery by at least 24 hours. If cases do occur in his clinic, the physician must relinquish midwifery practice for several weeks.[31]

And what about the simpler solution of washing one's hands? In one of Holmes' written cases, the obstetrician even washed his hands in chlorinated water, but the concept was not developed further. Holmes wrote: "In the present state of our knowledge upon this point I should consider such doubts [against the infectious nature of puerperal fever] merely as a proof that the sceptic had either not examined the evidence, or, having examined it, refused to accept its plain and unavoidable consequences." This quote, however, is the second sentence in his exposition and not words of conclusions. In his second publication, Holmes mentioned Semmelweis in the closing "additional references" section, mentioning the use of chloride of lime and nail-brush before admission that have caused an "alleged sudden and great decrease in mortality."[31]

"The greatest Brahmin," as nicknamed by William Osler,[32] will be remembered as a courageous proponent of the infectious nature of the disease (and an avid writer[o]),[31] however, not for suggesting practical solutions.

Semmelweis's immediate surroundings included the internist Joseph Skoda (1805–1881), pathologist Carl von Rokitansky (1804–1878), dermatologist Ferdinand von Hebra (1816–1880), and surgeon Ludwig von Markusovszky (1815–1893). The 4 were very active in their attempts to dissipate Semmelweis's *Lehre* especially until Semmelweis penned his thesis in 1860.[2,6,10] The Dutch Christiaan Tilanus (1796–1883) and the German Gustav Michaelis (1798–1848), a pioneer in pelvimetry, adopted Semmelweis's prophylaxis in as early as 1848. Michaelis, upon learning that he might have transmitted the fatal disease to his cousin, committed suicide in the same year. Another German obstetrician, Louis Kugelmann (1828–1902) compared Semmelweis to Jenner,[6] but these were all too few.

### 2.2 Opponents

Charles Delucena Meigs (1792–1869), perhaps the most notorious opponent of the contagious nature of the fever, came from a noble family[33] and was one of the most influential professors of obstetrics of his time. He was a leading conservative, at least when it came to medical novelties.[p] Meigs challenged the contagious nature of the disease[35] by asking, "How comes it then to pass, that a mortal virus or contagion should have power over a woman who is pregnant, or recently delivered, while it is innoxious for all others in the world?" When speaking of a fellow obstetrician he noted: "Did he carry it on his hands? But a gentleman's hands are clean." Meigs derogatively referred to his infectionist nearby-resident O. W. Holmes as a "very young gentleman" and to his six thousand cases' experience with "the jejune and fizenless dreamings of a sophomore writer."

Hugh Lenox Hodge (1796–1873), another famous obstetrician, shared Meigs' views. In a lecture delivered in Philadelphia in 1852, under the title "on the non-contagious character of puerperal fever,"[36] he is appalled by fellow medical men who suggested that "in the practice of self-denying and anxious vocation, [the obstetrician] occasionally convey from one patient to another a terrible poison." In Hodge's observation on the matter, there is not enough evidence to support the contagious nature of the disease. Hodge wonders why in puerperal fever, "no particular fluid secretion… can be collected, examined or analyzed, or by which inoculation may be [practiced] as in the case of vaccinia [or] variola." He also mentions the case of Dr Rutter, that after

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attending the death of a couple of his parturient women he took leave for 2 weeks, shaved, burnt his clothes, and changed his garments, gloves, and shoes, only to see the disease reappear. Can we have a "puerperal virus that is so retentive to the person of the accoucheur and so terrible in its effect it must be pronounced the most efficient and the most indestructible poison in nature?"

Semmelweis's predecessor as an assistant to the head department of Obstetrics, Ede Flórián Birly (1787–1854), believed that the fever developed from infection of the bowels and Pest's lower death rate is ascribed to a more lavish use of purgatives. Leopold Wittelshöffer (1818–1889), the editor of the Viennese medical weekly journal, called for the end of misleading about chlorine washing. Carl Braun (1822–1891), Semmelweis's successor, continued to believe that miasma is the cause of puerperal fever. August Breisky (1832–1889), a student of Václav Treitz (1819–1872), wouldn't accept that puerperal fever and pyemia[q] are indeed identical and claimed that other factors should also be accounted for. The Dane Carl Edvard Marius Levy (1808–1865) published in 1848 an article criticizing Semmelweis's lack of scientific proofs.[2] Paul Dubois (1795–1871), the head of Maternity Hospital in Paris and later dean of the faculty of medicine in the University of Paris, wrote that the contagious element is neither that effective nor that pervasive as described by Semmelweis.[2] He also added that Semmelweis doctrine is now entirely disregarded even in Vienna.[6] Even the great Rudolph Virchow (1821–1902) erred when claiming that the weather and an existing inflammation state must preexist for this fever to develop.[r] In 1864 he changed his mind in favor of the contagion, but not without adding that the "significance of the infection concept had been exaggerated."[10] The Pennsylvanian obstetrician William Dewees (1768–1841) wrote: "In Europe and especially in Great Britain, [puerperal fever] and number of other diseases are believed to be contagious; while in this country it only amounts to a fear and not to a conviction… In this country, under no circumstance that puerperal fever has appeared hitherto, does it afford the slightest ground for the belief, that it is contagious." He continues (quoting Nathaniel Hulme's treaties[37]) —"puerperal fever is not an infectious disease, any more than iliac passion (ileus), pleurisy, nephritis, or an inflammation of any other part of the body."[38]

One of the most ardent opponents of Semmelweis's work was also one of Europe's most influential obstetricians, Friedrich Scanzoni (1821–1891), to whom many of Semmelweis's polemic letters were directed.[s] Scanzoni, and his successor as head of obstetrics in Prague, Bernhard Seyfert (1817–1870), manipulated the death statistics to demonstrate that chlorine washing was not helpful. Scanzoni, too, would change his mind completely, 2 years after Semmelweis's death.[6]

## 3. IN WHAT WAY WAS SEMMELWEIS A TRAILBLAZER?

First, Semmelweis refuted with a razor-sharp logic (based on statistics about death rates in the 2 maternity clinics) all the current theories on the origin of puerperal fever (Supplementary Table 1).

Second, to the best of our knowledge, he was among the first to execute a large-scale clinical trial, starting in mid-May 1847. The all-male students from the first clinic (the "intervention" group), who often commenced their day with dissecting corpses, were required to wash their hands with chloride of lime before entering the maternity department. The all-female midwifery students in the second clinic (the "control" group) were not mandated to make any change. This practice resulted in an immediate mortality drop in the first clinic from an average of 10.5 percent (seen in the previous 12 months) to 3.2 percent in the second half of 1847, and 1.2 percent throughout 1848, while in the second clinic the mortality ranged from 1 to 1.3 percent over the same period.[2] Both departments had similar numbers of patients per year (about 3,500 and 3,400), and patients were admitted to each department on alternating days, regardless of their clinical presentation. The scale of Semmelweis's clinical trial is very impressive for his era. A century before him, James Lind (1716–1794), who is considered by many to be the conductor of the first modern clinical trial, summarized a trial with 12 patients divided into 6 treatment groups and demonstrated the efficacy of daily oranges and lemons for the treatment of scurvy.[39] Pierre Louis (1787–1872) pioneered the "numerical method" in medicine, shortly after conducting his trial from 1828 involving 77 men that showed the ineffectiveness of bloodletting for the treatment of pneumonia.[t,41] A. Gordon and O. W. Holmes, whose contribution to the concept of iatrogenic transmission of the disease is often considered as important as Semmelweis's, each published (in today's terminology) a series of case reports only, while Semmelweis published a double cohort quasi-randomized controlled trial. It is worth mentioning that O. W. Holmes was one of Louis's students, and Louis's methods were published before Holmes' second publication of his series of cases. Therefore, Semmeweis's clinical trial should be remembered as a standard-setting trial both in its magnitude and methodology.

Third, Semmelweis also included (preclinical) animal experiments[u] performed on rabbits in 1849.[42]

Fourth, Semmelweis correctly explained that patient isolation and limiting autopsies were insufficient. He indicated 4 possible sources for the puerperal disease: a cadaver, an infected puerperae, a patient suffering from erysipelas, and an infected wound.[v] Semmelweis suggested, in a meeting of the Vienna Society of Physicians in 1850,[6] and 10 years later again in his magnum opus,[2] that the "decomposed animal-organic substances… are found abundantly in surgical departments"[2] and his prophylaxis should be practiced in gynecological surgeries.[6] Despite the formidable opposition, a chosen few did grasp the greatness of his idea: in 1849, the "chief physician and provisional adjunct director of the imperial hospital in Vienna,"[2] Dr Carl Haller, published a report to the Ministry of Health, stating: "the significance of [Semmelweis's prophylaxis]… especially for the surgical wards is so immeasurable." Semmelweis's *Lehre* was on the verge of being extrapolated and generalized to the whole field

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of microbiology. He came closer than anyone before him to identifying Girolamo Fracastoro's (1476–1553) "seeds of contagion" (from "De contagione et contagiosis morbis," 1546). He was, in fact, the first modern microbiologist.

Fifth, Semmelweis synthesized all of the above into one comprehensive, coherent *Lehre*, from etiology to a simple yet very efficient solution.

Sixth, Semmelweis fought valiantly and ferociously for his patients and his *Lehre*, sacrificing all he had, including his life. In this he was unique.

## 4. EPILOGUE

Semmelweis's legacy includes 2 hospitals,[w] a museum, and a university in Budapest. Yet his most important legacy is a reflex named after him—the automatic rejection of new evidence that disputes prior practices. Or in the words of Timothy Leary, "Mob behavior found among primates and larval hominids on undeveloped planets, in which a discovery of important scientific fact is punished rather than rewarded."[43]

"To every action there is always opposed an equal reaction," wrote Isaac Newton. For Holmes it was a public insult exchange with Philadelphia's school of obstetrics. For Gordon, the reaction was a tenacious quarrel with midwives that caused him to abandon obstetrics. However, for Semmelweis, who presented a complete theory about the etiology, the concept, and the prophylaxis of puerperal fever, the reaction was devastating.

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## SUPPLEMENTARY MATERIAL

To view supplementary material for this article, please visit http://dx.doi.org/10.1017/ice.2016.100.

## NOTES

[a] The quote in the title is attributed to Oscar Wilde, Billy Wilder, and Andrew W. Mellon, but actually coined by Clare Boothe Luce (1903-1987).

[b] Rogers Lucas Johann Boër (1751-1835), Klein's predecessor, evaluated Klein thus: "The poorest candidate for this job."[1] This description proved precise and prophetic: Klein achieved mortality rates 8 times higher than Boër.

[c] The causative agent of erysipelas seen in infected wounds is the same strain of *Streptococcus* that caused the puerperal fever. This was not known until some 20 years after Semmelweis's death.

[d] The moment is commemorated in Semmelweis's popular biography, "The Cry and the Covenant," by Morton Thompson: "And he heard the sound of trumpets in Heaven, as he discovered the cause of childbed fever."[5]

[e] The description of hypochlorite solution as disinfectant was first made by Claude Berthollet (1748-1822) in 1789 (the "Javel water"), replaced by the more potent "Labarraque's solution" in 1820 by the French pharmacist Antonie Labarraque (1777-1850), 27 years prior to Semmelweis.[6] Twenty years after Semmelweis, Joseph Lister (1827-1912) introduced carbolic acid (phenol) as a surgical antiseptic material.

[f] Klein is assumed to play a major role behind the scenes in both the decision to allow Semmelweis to teach only theoretical obstetrics after his departure from AKH and in Vienna's persistent rejection of Semmelweis's theory.

[g] John Fothergill's (1712-1780) consequential treatise, "The account of the sore throat attended with ulcers" (1748), helped establish the contagious character of several febrile diseases. Hence patients exhibiting suspected symptoms were oftentimes not allowed to be admitted and were treated at home.[13] Other maternity wards barred visitors up to 1 week after delivery.[4] England's hygiene policies, especially on providing clean sheets, bore fruits as mortality in England was generally lower than that in the continent, although several puerperal fever epidemics struck even British hospitals.[4]

[h] Queen Charlotte had 15 children. The first newborn was George IV (1762), whose birth William Hunter attended passively. He later attended the next 13 births until his demise in 1783.[15]

[i] The City of London Maternity Hospital was established on 1750, by another Middlesex's retiree, Herman Heineken.[17] This hospital and Dublin's Rotunda Maternity Hospital (established 1745) were the main lying-in hospitals in eighteenth-century Britain.

[j] The connection between the nature of puerperal fever and erysipelas was first suggested, to the best of our knowledge, by the French surgeon Claude Pouteau (1724-1775). Pouteau is credited both by Francis Home and Alexander Gordon.

[k] Francis Home argued against the popular conjecture that the etiology of the disease is an inflammation process, which was promoted by many prominent obstetricians: "This inflammation mistaken from the cause, seems to be the effect only of their situation and fever." Therefore, F. Home was among the first to advocate against bleedings in the treatment of puerperal fever.

[l] James Blundell was the first to successfully transfuse a patient for the treatment of hemorrhage.[23]

[m] Erysipelas, at those times, was a broader name for a rapidly progressing infection around a wound. While in this case the portal of entry is clear, Gordon suggested that the exposed area in the uterus after the shedding of the placenta can serve as a portal of entry for puerperal fever. These 2 epidemics raged together in Aberdeen around the time his treatise was written.[3,4]

[n] For words of comfort for the physicians feeling betrayed by his accusations, Holmes quotes both Blundell and Rigby (mentioned above) who "speak with authority" that Holmes "cannot claim."[31]

[o] Holmes compiled several poems and novels, most famously the 3 breakfast-table books.

[p] Meigs also opposed obstetric anesthesia as an unnecessary intervention in the forces of nature, mentioning the fear that alleviating the physiological pain of a thousand of patients might not worth the price of destroying the life of one.[34]

[q] Pyemia was used to describe the state of abscesses-forming infection. Semmelweis's death was a result of pyemia.

[r] Virchow's claim about the connection between puerperal fever and the weather was countered by Semmelweis not with numbers but with simply replying that his pupils are more informed on the matter than Virchow.[6]

[s] Scanzoni helped in promoting Virchow to head of pathological anatomy in Wurzburg University, which can explain the latter's initial attack on Semmelweis's work.

[t] Much like Rokitansky, Louis began at the autopsy room by trying to relate a disease to an organ, refuting the systemic view of inflammation shared by many contemporaries (and the ensuing bloodletting treatment). Six years after his pneumonia trial, he published his treatise that establishes the rationale behind his theory.[40] James Lind, on the contrary, continued his predecessors' belief that damp weather is a central cause of scurvy and many other maladies.[39]

[u] The experiments were conducted with Rokitansky's assistant, George Lautner, following Skoda's advice.[2] They were carried out in the span of 5 months and were brought to an abrupt stop when Lautner was arrested. Another attempt to renew the experiments quickly dissolved when Semmelweis suddenly left for Pest on 1850.[6]

[v] On May 1850, Semmelweis finally presented his work to the Medical Society of Vienna, where he broadened the possible sources of decomposed matter beyond cadavers. Sadly, this wider etiology was missing from the debate on Semmelweis's proposed etiology and opponents constantly simplified it as "cadaver to parturient." [6,7,10]

[w] One is in Vienna, Austria, and one in Miskolc, Hungary.

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