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Physicians or Immigrants? The earliest smallpox inoculation in Europe

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Abstract. The first effective form of prevention against smallpox, variolation, was introduced to Europe in the early 18th century. This paper examines how the knowledge about variolation was mediated on its way to European medicine. We suggest that there were three primary sources of information on this anti-epidemic measure. Firstly, individuals with immediate experience such as diplomats, their staff, and other travelers, including well known cases such as that of Lady Mary Wortley Montagu.
Knowledge about the procedure was also shared through the academic networks of the time: medical publications and early scientific journals such as Philosophical Transactions, Ephemerides Academiae Leopoldinae, and Wrocławian Sammlung von Natur-Geschichten.
Finally, there were also migrants coming to Europe as healers, traders, or converts, who either offered inoculations or were themselves inoculated. In connection to this group, we provide a newly uncovered record of variolation in Vienna, which moves the date of the earliest inoculation in Europe to several years prior to the year 1721 which is traditionally presented in historical literature on the subject. The primary objective of this paper is providing this discovery with as much socio-professional context as possible given the limited scope of information available on the source.

Key words: smallpox, variolation, 18th century, Vienna, immigrants

Introduction

Smallpox is a viral disease and the only human infectious disease to have been completely eradicated. (1) Its effect on European populations during the early modern period was severe. It was everywhere, affecting all classes from the bottom of the social ladder up to the governing elites. It became a constant presence, lurking in the shadows waiting for an opportunity to strike. Nobody was safe until they had contracted the disease and thus developed a lifelong immunity.

Contemporary European medicine seemed to provide little relief, limiting itself to the management of the acute symptoms. The circumstances began to change for the better with the onset of variolation during the first decades of the 18th century. Variolation or inoculation is a preventative measure which made use of the fact that contracting smallpox leads to permanent immunity, effectively making every subject vulnerable to the disease only once. It took advantage of the fact that smallpox infection produces different outcomes depending on the mode of introduction to the host's body. "Natural" infection was often airborne, and the virus was therefore quickly introduced into the lungs where it started to spread rapidly with devastating consequences.

Variolation, as described by the early records, was based on the deliberate infection of vulnerable individuals with material taken from patients with well-developed smallpox. Rather than via the lungs, the infectious agent was introduced superficially through shallow skin cuts, giving the immune system more time to mount an effective response. The procedure was not without risk, and some variolated individuals

developed dangerous forms anyway. On average, however, the results were convincing enough that variolation slowly became an established medical practice.

Variolation was discovered in the East, with the exact date and place of origin remaining obscure, but at a certain point it found its way to Europe with the first well-documented cases known to historians reported three centuries ago (1721) in England and Hungary (currently Slovakia).(2,3,4,5,6) While the spread of awareness about this measure was sometimes, particularly in older historical writings, described as a rather simple act of a few well educated travelers who brought the invention home from their stay abroad, we will attempt to present a slightly more nuanced picture.

This paper therefore has several objectives, the first part will revisit some well-known cases highlighting those individuals who might have had early personal experience with the procedure. After which we will shift the focus towards the role of the academic writings of the period as a medium for sharing medical knowledge. In order to achieve this we will discuss early public reports on variolation in Philosophical Transactions, as well as two other continental scholarly journals. Our second objective will be a summary of these texts with particular attention paid to lesser known sources from Central and Eastern Europe.

Finally, we will also introduce a new source which provides information about variolation, highlighting the role of immigrants who lived in the Christian regions of Eastern Europe. These individuals were either passive recipients of the procedure or actively performed variolation as part of their healing craft. Although we have found only a single such case, its timing (making it the first known variolation in Europe) and circumstances underline the need to broaden the perspective on the sharing of medical knowledge across the continent at the turn of the 18th century. The main objective of the final part of the paper will be to provide a social and professional context in which this source should be read so that other scholars will be encouraged to search for additional similar examples.

Travelers

Variolation became the first anti-epidemic measure used successfully against a specific infectious disease. It was brought to Europe simultaneously through several channels at the beginning of the 18th century. One such source were individuals who had first-hand experience with the procedure due to their stay in Levant where variolation was already widespread, particularly among certain ethnic groups. The most famous of these travelers was Lady Mary Wortley Montagu (1689–1762), wife of Edward Wortley Montagu (1678–1761), who briefly served as the British ambassador to the Ottoman court. Her case has been extensively discussed in literature; therefore, we will limit the description to details relevant for our study. (7,8,9,10,11)

Lady Mary famously referred to variolation for the first time in a letter addressed to her friend Sarah Chiswell dated 1 April 1717, which later became part of her Embassy Letters.(12) It provided the readership with a thorough description of the custom practiced by experienced old women, who used a large needle to "rip open" the skin and infect the wound with "the matter of the best sort of smallpox".(13) Lady Mary also shared this observation concerning the position of the wounds, which will become relevant later in the paper:

The Grecians have commonly the superstition of opening one in the middle of the forehead, in each arm, and on the breast to mark the sign of the cross, but this has a very ill effect, all these wounds leaving little scars, and is not done by those that are not superstitious, who choose to have them in the legs or that part of the arm that is concealed.(12)

The letter claimed that the writer was so convinced of the safety of the procedure that she would use it on her "dear little son" and "patriot enough to take pains to bring this useful invention into fashion in England". (12) Lady Mary kept her promises: the son, Edward Wortley Montagu (1713-1776), was inoculated before the family returned from the Ottoman empire. During their stay in the Ottoman empire, the Montagues also employed a surgeon, Charles Maitland, who published his own report on the variolation of Lady Mary's son in 1722.(14) Shortly after arrival to England, Mary's daughter also underwent the procedure in Spring 1721. This operation has been thought to be the earliest inoculation against smallpox in Europe outside the Ottoman territories.

The Montagues were not the first among the British ambassadorial families who variolated their children. A secretary to the British embassy John Hefferman, who served from 1705 to 1721, also let his two sons undergo the procedure during his tenure.(2,10) It seems likely that the link between both families and variolation was their Greek physician Emanuel Timonis (1669-1720).(10)

It is entirely possible that the willingness to protect children against the disease by using the local custom spread generally among the diplomatic circles in Turkey, as suggested in a 1722 report written by Walter Harris.(15) Harris recorded that an English merchant, who spent eight years in Aleppo, Syria, was shown three inoculated children of local French consul. The procedure was performed while the consul served as secretary to the French Ambassador, the marquis de Châteauneuf. This is probably a source for an incorrect statement by Arnold C. Klebs, who claimed that it was the French ambassador himself who had his three sons inoculated. Klebs does not cite any source for this information.(16) There might be a connection because the letter to Sarah Chiswell mentioned that "the French ambassador says pleasantly, that they take the small-pox here by way of diversion, as they take the waters in other countries."(12)

The third individual who might have had early personal experience with variolation was a Scot, Peter Kennedy (life dates unknown), who was a well-travelled surgeon with an interest in ophthalmology. (2,9,16) Everything we know about Kennedy's connection to variolation was recorded in his treatise titled "An Essay on External Remedies" from 1715.(17) Kennedy believed that all the curable diseases should be treated by external means, and variolation seemed to him to be another example which confirmed his theory. His description of the procedure also notes a Greek custom of cutting the skin in certain places:

… the common way, now used in Turkey, and more particularly at Constantinople, is thus; they first take a fresh and kindly pock, from some one ill of this distemper, and having made scarifications, upon the fore-head, wrists, and legs, or extremities, the matter and pock is laid upon the foresaid incision, being bound on there, for eight or ten days together.(17)

While Kennedy probably did not perform the procedure himself, his account suggests that he was in the capital of the Ottoman Empire and likely met Timonis, an early source of information on variolation, in person.(17)

The English and French diplomatic families, and perhaps others, as well as two surgeons (Maitland and Kennedy) were therefore the earliest group of Europeans who either performed variolation or were in direct contact with those who did, several years before the procedure was recorded in Europe. They represent one source of medical knowledge which began to take root in Western and Central European countries from the early 1720s. The second well known source were the medical writings and reports circulating in the contemporary academic networks, particularly those published in the scientific journals of the time.

Academic Networks

In the hands of early modern scholars, the Republic of Letters became a powerful instrument for enabling the sharing of information, which would otherwise be very difficult to obtain through personal experience. During the second half of the 17th century, this network of shared contacts became even more sophisticated with the rise of the first academic journals. While personal experience certainly played an important role in obtaining knowledge about the smallpox inoculation, the academic networks had an arguably greater effect spanning literally the whole continent from Britain to eastern Slovakia.

The British side of the story is well known and has been already described numerous times in historical literature, most recently and very thoroughly by Alicia Grant and Anne Eriksen.(2,18) We will therefore provide only a general outline of the topic and focus instead on the continental context. Although variolation had briefly appeared in the Journal-Book of the Royal Society, the earliest comprehensive description of variolation, written by Greek physician Emanuel Timonis, (1669–1720) appeared in Summer 1714.(2) Timonis was born on the island of Chios, and practiced in Constantinople. Little is known about his life and career apart from the fact that he studied medicine in Padua and graduated from Oxford.(19,20) This link with the English milieu may be the reason

why he served ambassadorial families and was visited by Peter Kennedy.(18) Timonis became a physician at the Ottoman imperial court, and while some historians claim that he found out about inoculation as early as 1701, Alicia Grant suggests that he might have been informed rather late (1712).(2,19)

In 1713 Timonis sent a letter to a former member of the Royal Society, John Woodward (1665–1728), which was read to the Society and published the following year in issue 339 of the Philosophical Transactions.(21) Timonis' description, as rendered by Woodward, contains some details which also appear in Lady Mary's letter. For example, in both cases it is emphasized that the original donor of the infected matter should suffer from a mild form of smallpox.(21) Interestingly, Timonis, who was himself Greek, did not mention the religious aspect of the procedure quoted previously from Lady Mary's letter. Timonis attempted to frame smallpox and variolation within the context of contemporary Western medical theory. Variolation was explained by using comparisons to bread baking or beer brewing, when a certain large mass is made to rise by the addition of yeast.(21)

Another early discussion of the procedure was submitted to the Society through William Sherard (1659–1728), the British consul in Smyrna. The author was also a Greek physician, Jacob Pylarini, who wrote his own description of the procedure dedicated to Sherard in a short volume titled *Nova et tuta variolas excitandi per transplantationem methodus* (New and secure method of provoking smallpox through transplantation). The text was initially published in Venice in 1715, and was reprinted the following year in the 347th issue of the Philosophical Transactions.(22,23) Most issues had a short note on the place and date of publication at the end of the last paper. This note is missing in issues 347 and 348; however, the previous issue 346 was published in 1716 (see page 388) and the following issue 349th in 1717 (see page 504).

Pylarini noted that the procedure originated in Greece, particularly a region called Thessaly, from where it slowly spread to other areas including the Ottoman capital. It was first practiced among the lower classes until the turn of the 18th century. He also explicitly stated that variolation was not accepted by the "Turks" for religious reasons. The recurring theme of the Greek origin and use of variolation will be relevant for the last part of this paper.

Anne Eriksen rightly noted how early variolation authors strove to achieve legitimacy while dealing with a topic seen as foreign in terms of ethnicity, place of origin, or gender.(18) The process of the "repackaging" of inoculation within the contemporary academic discourse was also taking place in this book, as evidenced by Pylarini invoking four authorities, Andreas Tenzel (1605–1647), Michael Ettmüller (1644–1683), Thomas Bartholinus (1616–1680) and William Maxwell (1581–1641) in order to distance variolation from the popular "magnetic" or "sympathetic" remedies working "at distance" like a famous weapon salve.(22) Pylarini called these measures superstitious, while inoculation was "true and pure medicine".(22)

In his account of the procedure performed in 1701 by a local woman, the religious motif of a cross surfaced again because she reportedly made inoculation wounds on the forehead, chin and both cheeks; an additional wound was made on both of the wrists and insteps.(22) He also noted later in the text that many inoculators were content to simply make one single incision on the arm.(22) The rest of the treatise is not relevant for the topic of this paper.

In Britain, the early chronology of texts on variolation starts in 1714 with Timonis, and continues in 1715 (Kennedy) and 1716 (Pylarini). After which there was a lull before a new wave of texts emerged at the beginning of 1720s fueled by the public variolation of Lady Mary's daughter, Charles Maitland's report on the variolation of her son Edward, and others.

Turning now towards continental medicine, as noted above the earliest print was the Venetian edition of Pylarini's report (1715). After which both Timonis' and Pylarini's accounts were bundled together and republished twice. The first of these editions saw the light of day in 1717 as a paper in the journal of German Academia Leopoldina. It neatly illustrates the dynamic of sharing knowledge about the procedure in educated European circles.(24,25)

The most important fact about the 1717 edition is its provenance, because neither of the texts were copied from the British sources. Timonis' report has a very interesting history which the editor, Wrocławian

physician Gotofredus Klaunig (+1731), explained at the beginning of the paper. It was taken from a version provided by the personal physician to the king of Sweden, Samuel Skraggenstierna (ca 1660–1718), who obtained the text while serving king Charles XII during his exile in Turkey (1709-1714). Swedish forces were cut off from their homeland for several years after being defeated at the battle of Poltava by the Russian army.(24) The Swedish physician reportedly first found out about the procedure from local practitioners, and later personally met with Emanuel Timonis who gave him a copy of his report.(24) Alicia Grant has also recently discovered that, as well as Skraggenstierna's copy, there was another version brought back to Sweden by the surgeon Melchior Neumann (1670–1741), which has been kept unrecognized among the collections of Uppsala University library.(2)

The second part of this edition by Jacob Pylarini was copied from the 1715 Venetian publication.(2) After appearing in the German journal, Timonis' and Pylarini's accounts were printed once more in Leiden (1721).(26) The origin of Klaunig's texts suggests that rather than a single route of translation through British contacts in the East, the inoculation was "seeping through" the Christian-Ottoman barrier in several ways. This view will be expanded upon in the last part of the paper.

Perhaps the most informative case demonstrating how European academia shared knowledge about variolation took place very far away from those countries traditionally associated with its introduction. In 1717–1718, Jan Adam Reimann (1690–1770), a physician from city of Prešov (now in Slovakia, but then in the Kingdom of Hungary), wrote the most concise summary of sources on variolation in Europe. Reimann (also spelled Reiman, Raiman, or Rayman) was a young graduate from Leiden university, who was highly interested in smallpox therapy and prevention. We are not aware of a well written summary on Reimann published in English.(27,28) Otherwise, the very thorough Genevieve Miller mentions Reimann only briefly in connection to the inoculation of his daughter and missed his previous writings about smallpox.(3) The most complete source to date is by Jozef Lukáč, which is partially written in German.(29) During the summer of 1721, only few months after Lady Mary did the same in Britain, Reimann variolated his own daughter and published a report about the procedure.(30,31) However, before this experiment Reimann had anonymously published two early reports on variolation in Wrocławian *Sammlung von Natur- und Medicin- wie auch hierzu gehörigen Kunst- und Literatur-Geschichten*. The first paper described the current epidemic of smallpox in the city of Prešov.(32) Reimann's authorship is validated indirectly, first because he is called the "learned physician from Eperies (=Prešov)", and also through his subsequent publications in the same journal, which were not anonymous. What is more important is a follow up piece discussing all the available therapies for smallpox including variolation. (33) Here Reimann referenced seven sources (six of which have already been mentioned in this paper): two editions of Timonis' report (Woodward's and Klaunig's), three editions of Jacob Pylarini (Venetian stand-alone issue, Philosophical Transactions and journal of German Academia Leopoldina), and Kennedy's text on variolation.(17,21,22,23,24)

The seventh source cited as "*Historia tussis*" (History of Cough) attributed to a certain Antonius Loigh has remained obscure due to Reimann's errors; the treatise should have been cited as *Historia pestis* (History of Plague) with two editors, both physicians of Slovenian origin, Antonius Loigk (born 1679) and Joannes Baptista Werloschnig von Perenberg (2nd half of 17th–1st half of 18th century).(34,35)

Historia pestis is a compilation of various texts such as the reports of local physicians or academic treatises dealing primarily with the plague epidemic, which swept through several regions in central and eastern Europe during the period from 1708 to 1718. It was published twice, in 1715 and 1716, but both editions are virtually identical and both include a passage on variolation.(36,37)

Before moving forward, it is important to make a few remarks on Reimann's significance because it offers an interesting perspective on the sharing of knowledge in early modern academia. At the very early stage of variolation history, this physician from a provincial town in Upper Hungary had access to and listed all the early texts on variolation which had been published in Britain, Venice, Germany, and Austria. It is also

noteworthy that passages from Kennedy's treatise were quoted in English, which suggests some level of familiarity with the language. Reimann was not just a passive consumer of this wealth of information either, through Wrocławian *Sammlungen* his research on prevention against smallpox was made available to the local readership. In 1718, subscribers to this central European journal had a broader list of sources on the procedure than even the readers of the contemporary Philosophical Transactions. It is also worth noting that for Reimann all this knowledge was not just simple curiosity. When the opportunity arose, he acted on his knowledge in order to inoculate his own daughter.

The Immigrants

Reimann's last citation had remained undeciphered until now, because from the three pieces of information provided (title of the work, author, and pagination) only the last one was correct. It is part of an "epistolary discourse" on plague written "from personal experience" by Antonius Loigk, who styled himself as "military physician in the army of three emperors [Leopold I, Joseph I, Charles VI], chief physician emeritus of all the army forces of the Kingdom of Hungary, and now practicing physician in Vienna."(36,37) The discourse, divided into four parts, was dated February 1714.(36,37) Records of the Viennese medical faculty confirm that two years later Antonius Loigk was a physician serving in the local hospital of St. Marx, which was affiliated with the Burgerspital.(38)

On its own, Loigk's discourse is a rich source for the history of medicine, combining expert knowledge of contemporary plague literature with a wealth of personal and local details from military hospitals in eastern Europe. Equally remarkable is the brief passage on variolation, which is part of the fourth letter called "On the mode of opposing the plague".(36,37) Here, it plugs into a broader discussion on the role of "ferment" in infectious diseases because, from author's point of view, using smallpox "pus" from one person to infect another is just like the use of ferments in cooking. The reader might recall that the same metaphor was nearly contemporaneously used by Timonis.

The English translation of this passage is as follows:

It is not therefore against the reason, the method of that Arabic quack [medicaster] from Constantinople, who arrived few years ago, and who similarly to our charlatans [agyrtae] who ape the physicians, imitates Greek method of infallible introduction and cure [of smallpox]; since when they want to variolate someone, they take mature pus from another [person], who suffers from benign and separate [i.e. not confluent] smallpox and rub it into subtle wounds on forehead, both hands and both thighs of that individual, so that the body marked with said stigmata would cover with little ulcers, which are identical to the original ferment, so that it is conveniently healed, [these little ulcers] are known as Blatter-Peltzen in German, I saw a young lord healed in this way.(36,37)

This text is very likely the earliest evidence of variolation performed in Europe outside the Ottoman empire. It was provided by an immigrant who came to Vienna some time before this testimony was published from Constantinople. Gender correspondence in the pronouns and adjectives shows that this individual was male and he was not an academically educated physician, hence the use of the Latin words "medicaster" (quack) and "agyrta".

Reference to the inoculator's arrival, as well as the use of terms for a lay healer, exclude the possibility that this passage would be a slandering reference to Timonis himself. The depiction of variolation as a Greek custom and the location of the wounds (forehead, both hands, both legs), suggesting ritualized administration, strengthen the authenticity of the report. Notice the similarities with Lady Mary's depiction of the local superstitious application of the treatment. The final sentence is particularly telling as it cannot be a second-hand report, Antonius Loigk witnessed the use of variolation among the Viennese nobility.

There are some unexpected pieces of information in the passage as well. The male gender of the healer stands out in comparison to early lay variolation usually being described as a female activity. He was called "Arabic" referencing either his ethnicity or religion. The wording suggests that he was not Greek but rather mimicked the Greek method. The location and timing of these Austrian variolations was given by Loigk's date and place of writing (February 1714 in Vienna), which becomes therefore terminus ante quem for the earliest European variolations.(36,37)

Admittedly, Loigk's description of early variola-

tion is a singular point of reference lacking additional supporting evidence. However, there is a younger, rarely cited source depicting something similar in France.(2,3,16) In his posthumously published Observations on Discerning and Curing of Diseases (1762), the German physician Johann Theodor Eller (1689–1760) mentioned an experiment with variolation performed in or before 1721.(39,40) Eller recalled a story from forty years prior, when he was young student of medicine in Paris. There he became acquainted with a "certain Greek called Carrazza, who was a very honorable young man endowed with many intellectual gifts."(40)

Carrazza explained inoculation to Eller, who immediately proceeded to test the method on a human subject. In early 18th century Paris this turned out to be rather easy task, Eller simply "bought" permission to use a seven year old orphan boy from his caretaker, who was a poor widow. Fortunately, the experiment was successful and the boy left Eller's "care" with lifelong immunity after a mild attack of smallpox. It is worth noting that Eller himself was not entirely sure about the ethics of his test, which is evident from a rather defensive comment that prior to the variolation, the relative did not even ask what was supposed to happen to the boy. This episode resembles other poor or disadvantaged individuals, who were also the subjects of early variolation experiments in Britain (Newgate prisoners, orphans at St Jacob) and the American colonies (the slaves of doctor Zabdiel Boylston).(2,5,9,41,42)

The date for Eller's inoculation is given by his remark that in 1721 he went back home to Germany where he secured a position at the court of Princes of Anhalt in Bernburg. The date is given as "anno 1721 l. 22".(40) The meaning of this passage is not entirely clear, it might be a print error but Eller was 22 in 1721. Genevieve Miller puts the date of Eller's experiment plausibly at 1719, when a major epidemic appeared in Paris in late Autumn.(3) Colorful details of early experiments notwithstanding, the crucial piece in this story is the role of Carazza, who was the mediator of knowledge about variolation. Unfortunately, Eller's recollection is all we have about Carazza. We can only speculate about his background and reasons for staying in France, although Genevieve Miller believed that he was a "fellow student from Leyden".(3) Was Carazza connected to the Greek merchant families which were conducting business across the Christian-Muslim border in eastern Europe? Such a link would explain his knowledge of the recently developed medical procedure.

Conclusions

Loigk's early report on variolations from Vienna and Eller's records of his Parisian experiment are interconnected through the theme of immigrants from the East who were actively sharing knowledge about the procedure or providing inoculation as a service. This offers a new perspective to 18th century medicine, where Europeans are often understood as the active agents who went overseas and brought the foreign knowledge to accommodate in their own medical practice. Instead, in these two sources we see immigrants serving as a "bridge", crossing cultural borders between Christian Europe and various Eastern ethnic groups.

There is also an interesting parallel to be made with the early inoculations in the American colonies, where the procedure was brought across the Atlantic not by European medical personnel but rather by the slave population. The first inoculated person recorded in literature was Onesimus (dates unknown), who was a slave abducted from Fezzan region in North Africa and was owned by churchman and prolific writer Cotton Mather (1663–1728).(3,5,46) Onesimus came to Boston already inoculated and shared the details of the procedure with Mather in 1716, who then played the role of middleman by passing it on to American and European academia via his contact with physicians in Boston and the Royal Society.(47) The similarity between the social groups of slaves and immigrants, who belonged to the lowest social stratum and yet were in possession of vital information not available to those residing higher on the social ladder, is obvious.

In Austria and the surrounding countries there were communities with extensive links on both sides of the Habsburg-Ottoman divide such as the Jewish, Greek, and Armenian merchants, diplomatic personnel like the imperial oriental couriers, and interpreters, as well as Muslim converts to Christianity.(43,44,45) Although we do not have information

about inoculation among them, more study may shed light on the possibility that some individuals might have been inoculated long before the European academic literature took notice of the procedure.

Further research into this topic may focus on several possible avenues of exploration. The first would involve the early modern Latin academic writings from Central and Eastern Europe, which are still a rather underutilized source and may render new references to the procedure. We also still know very little about author of the report, Anton Loigk. We should therefore examine the network of his professional contacts in order to answer the question of what was his position within the Austrian (and Slovenian) medical sphere. Additionally, we may also examine criminal records, as the lay providers of inoculation may have occasionally run afoul of the law. As a final note, we would suggest that it might be fruitful to apply the core message of this paper, which is the invisibility of certain social groups in the established narrative on other themes in early modern medical history.

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References

1. Fenner F, Henderson DA, Arita I et al. Smallpox and its Eradication. Geneva: World Health Organization; 1988.
2. Grant A. Globalisation of Variolation: The Overlooked Origins of Immunity for Smallpox in the 18th Century. New Jersey: World Scientific; 2018.
3. Miller G. The Adoption of Inoculation for Smallpox in England and France. Philadelphia: University of Pennsylvania Press; 1957 (reprinted in 2015).
4. Hopkins DR. The Greatest Killer. Smallpox in History. Chicago – London: University of Chicago Press; 2002.
5. Glynn I, Glynn J. The Life and Death of Smallpox. Cambridge: Cambridge University Press; 2004.
6. [6] Williams G. Angel of Death. The Story of Smallpox. Basingstoke – New York: Palgrave Macmillan; 2010.
7. [7] Grundy I. Lady Mary Wortley Montagu. Oxford – New York: Oxford University Press; 2004.
8. Grundy I. Montagu's variolation. Endeavour 2000; 24(1):4–7.
9. Miller G. Putting Lady Mary in her Place: a Discussion of Historical Causation. Bull Hist Med 1981; 55(1):2–16.
10. Barnes D. The Public Life of a Woman of Wit and Quality: Lady Mary Wortley Montagu and the Vogue for Smallpox Inoculation. Fem Stud 2012; 38(2):330–62.
11. Barker H, Chalus E (Ed.) Women's History: Britain, 1700–1850, an introduction. Abingdon – New York: Routledge; 2005.
12. Halsband R (Ed.) The Selected Letters of Lady Mary Wortley Montagu. London: Longman; 1970.
13. Wortley Montagu M. Letters of the Right Honourable Lady M---y W---y M----e. Dublin: P. Wilson, J. Hoey Jr., J. Potts; 1763.
14. Maitland Ch. Mr. Maitland's Account of Inoculating the Small Pox. London: J. Downing; 1722.
15. de Castro Sarmento J, Harris W, le Duc A. Dissertationes in novam, tutam, ac utilem methodum inoculationis. Leiden: Johan Arnold Langerak; 1722.
16. Klebs AC. The Historic Evolution of Variolation. Bull Johns Hopkins Hosp 1913; 24(265):69–83.
17. Kennedy P. An Essay on External Remedies. Wherein it is Considered, Whether all the Curable Distempers incident to Human Bodies, may not be cured by Outward Means. London: A. Bell; 1715.
18. Eriksen A. Smallpox inoculation: translation, transference and transformation. Palgrave Commun 2020; 6(52):1–9.
19. Poulakou-Rebelakou E, Lascaratos J. Emmanuel Timonis, Jacobus Pylarinus and inoculation. J Med Biogr 2003; 11:181–2.
20. Alivisatos CN. The First Immunologist, James Pylarino (1659–1718), and the introduction of variolation. Proc R Soc Med 1934; 27(8):1099–1104.
21. Timonis E. An account, or history, of the procuring the smallpox by incision, or inoculation; as it has for some time been practised at Constantinople. Philos Trans R Soc Lond 1714–1716; 29(339):72–82.
22. [Pylarini J. Nova et tuta variolas excitandi per transplantationem methodus. Venice: Jo. Gabriel Hertz; 1715.
23. Pylarini J. Nova et tuta variolas excitandi per transplantationem methodus, nuper inventa et in usum tracta: per Jacobum Pylarinum, Venetum, M.D. et Reipublicae Venetae apud Smyrnenses nuper Consulem. Philos Trans R Soc Lond 1714–1716; 29(347):393–9.
24. Klaunig G. Observatio II. Historia variolarum, quae per insitionem excitantur. Academiae Caesareo-Leopoldinae Carolinae naturae curiosorum Ephemerides ..., centuria V. et VI. Norimberg: Wolfgangus Michahelles; 1717.
25. Rebohm S. Knowledge, Community and Authority at the Academia Naturae Curiosorum. In: Omodeo PD, Wels V. Natural Knowledge and Aristotelianism at Early Modern Protestant Universitites. Wiesbaden: Harrassowitz Verlag; 2019:299–314.
26. Pylarini J, Timonis E. Tractatus bini de nova variolas per transplantationem exicitandi methodo; quorum prior ex

Veneto exemplari fideliter hic reponitur; alter vero ex Transactionibus Philosophicis Anglicanis desumitur. Leiden: Janssonios van der Aa; 1721.
27. Duka N. Pokus prešovského lekára J. A. Raymanna s očkovaním proti kiahňam. Dejiny Ved Tech 1968; 1:48–50.
28. Dubay L. K problematike variolizácie na Slovensku a v Európe. Bratisl Lek Listy 1969; 52(2):230–2.
29. Lukáč J (Ed.) Zborník vedeckej konferencie – I. Reimanových dní – s medzinárodnou účasťou pri príležitosti 250. výročia prvej variolizácie v kontinentálnej Európe, ktorú uskutočnil J. A. Reiman, fyzikus mesta Prešova a Šarišskej župy. Prešov 5. – 7. októbra 1972. Prešov: no publisher given; 1973.
30. Reimann JA. Historia der in Epperies An. 1721 grassierten Blatter-Seuche, nebst kurtzen Reflexionibus von deren Ursprung und Curatione per Vomitum und durchs Peltzen oder Inoculation. In Sammlung von Natur- und Medicin- wie auch hierzu gehörigen Kunst- und Literatur-Geschichten. Leipzig – Bautzen: David Richter; 1721.
31. Reimann JA. Verfolg und Schluß der Mense Aug. communicirten Relation aus Epperies von der bißherigen Blatter-Seuche, und von dem Experiment mit der Inoculation oder Blatter-Peltzen. In: Sammlung von Natur- und Medicin- wie auch hierzu gehörigen Kunst- und Literatur-Geschichten. Leipzig – Bautzen: David Richter; 1721.
32. Reimann JA. Von der Blatter-Seuche zu Eperies in Ober-Hungarn insonderheit. In: Sammlung von Natur- und Medicin- wie auch hierzu gehörigen Kunst- und Literatur-Geschichten so sich Anno 1717 in den 3. Sommer-Monaten in Schlesien und andern Ländern begeben. Wrocław: Michael Hubert; 1718.
33. Reimann JA. Von neuen oder ungewöhnlichen Blatter-Medicamentis, Curen. In: Sammlung von Natur- und Medicin- wie auch hierzu gehörigen Kunst- und Literatur-Geschichten so sich Anno 1717 in den 3. Sommer-Monaten in Schlesien und andern Ländern begeben. Wrocław: Michael Hubert; 1718.
34. Pintar I. Brložnik de et in Pernberg, Ivan Krstnik. In: Slovenska biografija. Slovenska akademija znanosti in umetnosti, Znanstvenoraziskovalni center SAZU, accessed 18 June, 2020, http://www.slovenska-biografija.si/oseba/sbi150380/#slo-venski-biografski-leksikon.
35. Pintar I. Lojk, Anton (1679–?). In: Slovenska biografija. Slovenska akademija znanosti in umetnosti, Znanstvenoraziskovalni center SAZU, accessed 18 June 2020, http://www.slovenska-biografija.si/oseba/sbi333563/#slovenski-biografski-leksikon.
36. Werloschnig JB, Loigk A (Ed.) Historia Pestis quae ab anno 1708 ad 1713, Transylvaniam, Hungariam, Austriam, Pragam et Ratisbonam, aliasque conterminas provincias depopulabatur. Steyr: Joseph Grünenwald; 1715.
37. Werloschnig JB, Loigk A (Ed.) Λοιμογραφια, seu Historia Pestis quae ab anno 1708 ad 1713 inclusive, Transylvaniam, Hungariam, Austriam, Pragam et Ratisbonam, aliasque conterminas provincias, et urbes progrediendo, depopulabatur. Steyr: Joseph Grünenwald; 1716.
38. Senfelder L (Ed.) Acta Facultatis medicae Universitatis Vindobonensis. Vol. VI 1677–1724. Wien: Verlag des Wiener medizinischen Doktorenkollegiums; 1912.
39. Stürzbecher M. Eller, Johann Theodor. In: Neue Deutsche Biographie 1959; 4:456, accessed online 21 August 2021, https://www.deutsche-biographie.de/pnd100121934.html#ndbcontent.
40. Eller JT. Observationes de congoscendis et curandis morbis, praesertim acutis. Kaliningrad – Leipzig: Vidua Woltersdorffii; 1762.
41. Weinreich SJ. Unaccountable Subjects: Contracting Legal and Medical Authority in the Newgate Smallpox Experiment (1721). Hist Workshop J 2020; 89:22–44.
42. Esfandiary H. 'We could not answer to ourselves not doing it': Maternal obligations and knowledge of smallpox inoculation in eighteenth-century elite society. Hist Res 2019; 92(258):754–770.
43. Hochedlinger M. Austria's Wars of Emergence: War, State and Society in the Habsburg Monarchy 1683–1797. London – New York: Routledge; 2013.
44. Mauro F. Merchant communities, 1350–1750. In: Tracy JD (Ed.) The Rise of Merchant Empires: Long-distance Trade in the Early Modern World 1350–1750. Cambridge: Cambridge University Press; 1990:255–86.
45. Teply K. Die Einführung des Kaffees in Wien. Georg Franz Koltschitzky, Johannes Diodato, Isaak de Luca. Wien: Verein für Geschichte der Stadt Wien; 1980.
46. Ford WCh (Ed.) Diary of Cotton Mather. Vol. I. 1681–1708. Salem, MA: Higginson Book Company; 1912.
47. Williams T. The Pox and the Covenant: Mather, Franklin, and the Epidemic that Changed America's Destiny. Naperville: Sourcebooks, Inc.; 2010.

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