

RESEARCH ARTICLE

Innovations from the Levant: smallpox inoculation and perceptions of scientific medicine

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Abstract

Modern public-health initiatives in industrialized countries revolve around immunization against contagious diseases. The practice of engendering immunity against disease through disease first emerged in Western European social and medical landscapes in the eighteenth century as inoculation, based on the imported Middle Eastern practice of ‘engrafting’. By the nineteenth century, this practice had evolved into the procedure of vaccination, in the first instance directed against smallpox. Popular and academic narratives thus often categorize inoculation as a procedure from the Middle East which was transformed into the truly scientific procedure of vaccination by English and French knowledge. This characterization has obscured the complex traditions of intellectual exchange between English and French networks and Middle Eastern societies in the eighteenth and nineteenth centuries. This article examines these networks in order to show how knowledge was transformed as it circulated between communities during this period. Both Western Europeans and Egyptians across different social hierarchies translated foreign or new medical practices according to the needs of their knowledge and goals, creating cycles of adoption and adaptation. This exploration of inoculation and vaccination furthers our understanding of the bilateral translation processes ingrained in the global circulation of knowledge.

In 1717, Lady Wortley Montagu, wife of the English ambassador to the Ottoman Sultan, wrote of smallpox in Constantinople, ‘A propos of distempers, I am going to tell you a thing, that will make you wish yourself here. The small-pox, so fatal, and so general amongst us, is here entirely harmless, by the invention of engrafting’.¹ Smallpox was a topic close to her heart as she was one of many women who had lost her beauty to the scourge. The procedure she described became known across Western Europe and the Americas as inoculation against smallpox, or variolation. Although Wortley Montagu spoke positively about engrafting, she also anticipated difficulties introducing the ‘Turkish’ innovation into English medicine. Indeed, variolation became a controversial topic in Western Europe and the American colonies for much of the eighteenth century, even as the imported procedure was modified to be made to seem more ‘scientific’ and integrated into the medical marketplace. Inoculation in England and France, and later vaccination in the Ottoman territories, had to be translated and accommodated to local practice and mores in order to gain credibility. In both regions, the particular debates that

1 Mary Wortley Montagu, *Letters of the Right Honourable Lady M--y W---y M---e*, Aix: Anthony Henricy, 1796, vol. 1, p. 167; letter 36, to Mrs S.C. from Adrianople, n.d.

arose around these separate approaches to immunization reflected the shifts in scientific theory and practice, in gender attitudes and in authority that were transforming medicine in the eighteenth and nineteenth centuries.

Employing the framework of the global circulation of knowledge, we can engage with debates framing medical science in both Western Europe and the Ottoman Empire during the eighteenth and nineteenth centuries. We will build on recent work, such as that of Sonja Brentjes and B. Harun Küçük, that has undermined the notion of the sixteenth to eighteenth centuries as a period of isolation in the Middle East and of a growing intellectual divide with Western Europe.² While scholars have always referenced inoculation's connection to Constantinople, historians have traditionally situated immunization practices as scientifically 'Western' in origin, thereby diminishing the roles of the initial practitioners of inoculation and those who first introduced and modified the procedure for acceptance in elite medical circles of Europe and the American colonies.³ At the same time, scholars have not sufficiently challenged the idea that medicine and science stagnated during this period in the Near East, and that this was due to a lack of interest and of capability, and to the dominance of Islam.⁴ This ahistorical perspective amplifies the idea of modern medicine and science as inherently Western and secures a narrative in which the science of vaccination was 'imposed' on non-Western, undeveloped countries in the nineteenth century.⁵ By approaching the eighteenth to nineteenth centuries as a distinct period in the circulation of knowledge and tracing the cross-cultural discussions of inoculation and vaccination, we can confirm the complementary relationship between the two regions.

Closely examining sources produced from English and French perspectives allows us to discern correlating shifts in ideas of science and medicine in both territories that deconstruct Eurocentric narratives in the scholarship and reconstruct a more complete model for the circulation and ongoing translation of scientific practices and theories within and across societies. 'Translation' here covers an array of meanings as it includes the act of converting information between languages, but also broader conceptual processes of assimilating knowledge from one community into another. Conceptual translation requires authority in the new community to render the information credible and relevant.⁶ We will focus on how conceptual translation in the eighteenth century fashioned complicated relationships between categories of people: informants (or witnesses),

² Sonja Brentjes, *Travellers from Europe in the Ottoman and Safavid Empires, 16–17th Centuries: Seeking, Discarding, Transforming Knowledge*, Abingdon, Oxon.: Routledge, 2010; Brentjes, 'The interests of the Republic of Letters in the Middle East, 1550–1700', *Science in Context* (1999) 12(3), pp. 435–68; Kapil Raj, *Relocating Modern Science: Circulation and the Construction of Knowledge in South Asia and Europe, 1650–1900*, London: Palgrave Macmillan, 2007; Tzvi Langermann and Robert G. Morrison (eds.), *Texts in Transit in the Medieval Mediterranean*, University Park: Pennsylvania State University Press, 2016; Sietske Fransen, Niall Hodson and Karl A.E. Enekel (eds.), *Translating Early Modern Science*, Boston, MA: Brill, 2017.

³ Pierre Darmon, *La longue traque de la variole: Les pionniers de la médecine préventive*, Paris: Librairie académique Perrin, 1986; Catriona Seth, *Les rois aussi en mouraient: Les lumières en lutte contre la petite vérole*, Paris: Desjonquères, 2014; Anne Eriksen, 'Cure or protection? The meaning of smallpox inoculation, ca 1750–1775', *Medical History* (2013) 57(4), pp. 516–36; Meghan K. Roberts, *Sentimental Savants: Philosophical Families in Enlightenment France*, Chicago: The University of Chicago Press, 2016, pp. 70–101.

⁴ See, for example, Wasim Maziak, 'Science in the Arab world: vision of glories beyond', *Science* (2005) 308 (5727), pp. 1416–17.

⁵ See, for example, Sylvia Chiffolleau, 'Un siècle de vaccination antivariolique en Égypte (1827–1927): Politiques de santé publique et de pédagogie de la modernisation', in Anne-Marie Moulin (ed.), *Islam et révolutions médicales: Le labyrinthe du corps*, Paris: Karthala, 2014, pp. 59–92; Poonam Bala (ed.), *Biomedicine as a Contested Site: Some Revelations in Imperial Contexts*, Lanham, MD: Lexington Books, 2009.

⁶ Patrick Manning, 'Introduction', in *Knowledge in Translation: Global Patterns of Scientific Exchange, 1000–1800 CE*, Pittsburgh: University of Pittsburgh Press, 2018, pp. 3–4; Anne Eriksen, 'Smallpox inoculation: translation, transference and transformation', *Palgrave Communications* (2020) 6, article no. 52, at <https://doi.org/10.1057/s41599-020-0431-6>.

mediators of information who held some credibility in either society, as well as recognized translators who had the status to assimilate information between two cultures. These networks of translation expanded or collapsed based on source material and the individuals involved.

In this paper, we will contextualize the development and dissemination of two smallpox immunization practices – inoculation and vaccination – within the enduring tradition of exchange and accommodation of scientific information between European and Ottoman intellectuals and medical practitioners. For Europe, we will focus primarily on England and France, as both countries led intellectual movements in the eighteenth century and were sites of prolonged, international debate over inoculation. Inoculation, as first popularized in Constantinople, involved inserting smallpox pus under the skin of a healthy person to cause smallpox. Discussions of inoculation, written in English and French, were transmitted across broader networks of elite medical and scientific communication in the eighteenth century, promoting the exchange of information across borders.⁷ As we will show, English colonists in Boston were corresponding with London physicians, who communicated with Italian physicians in Constantinople, who also wrote to French royal physicians, and so on. Referring to these sources as simply English or French erases the complexity of the multinational intellectual networks they represent.

When exploring the dissemination of inoculation, we will adopt contemporary Europeans' broad geographic reference to the 'Levant', roughly covering Muslim territories along the Eastern Mediterranean, with Constantinople as a primary site of exchange.⁸ We will begin by considering the debates concerning the origin and causation of smallpox, putting them in the context of key conceptual and empirical concerns, in order to examine how the relationship between practical and theoretical knowledge, both within and between communities, impacted the understanding of inoculation practices. We will go on to consider how different informants were assessed as credible sources of authoritative information as inoculation practices moved west in the eighteenth century. We will conclude with an analysis of vaccination, a modification of inoculation that employed the infectious by-products of cowpox, an epizootic disease less lethal to humans than smallpox, as this immunization practice moved eastwards in the nineteenth century. In particular, we will focus on the case of Egypt, an important commercial centre and an early site of French and British imperial ambitions in Ottoman domains, in order to see how vaccination, presented as part of the modernization project of Mehmed Ali, remained the focus of resistance and acceptance for both European and Middle Eastern populations.

Smallpox and inoculation in Europe

Modern medicine categorizes smallpox – *variola* in Latin – as an acute contagious disease characterized by flu-like symptoms and a rash of flat red sores that concentrate on the face and extremities before filling with pus. There remains no known cure, nor is there an effective treatment once symptoms arise with this endemic and epidemic malady. Physicians by the eighteenth century recognized the increasingly lethal nature of smallpox, calculating that an individual had a one-in-seven chance of death once infected, and modern scholars have estimated as many as sixty million Western Europeans alone died of

7 On the circulation of these texts beyond the borders of France and England see Eriksen, *op. cit.* (3), pp. 519–20; and Genevieve Miller, *The Adoption of Smallpox Inoculation in England and France*, Philadelphia: University of Pennsylvania Press, 1950, pp. 197–8.

8 Western Europeans rarely acknowledged the ethnic diversity of the Ottoman Empire in their descriptions and reports. Brentjes, *Travellers from Europe*, *op. cit.* (2), p. 385.

smallpox in the eighteenth century.⁹ A series of high-profile deaths within the aristocracy around 1700, including members of the Spanish, French and English monarchies, made smallpox the most feared disease faced by Europeans in the period.¹⁰

The high smallpox mortality rate was in part due to a lack of a canonical symptomology that would distinguish it from other pox diseases. According to the Galenic understanding of medicine then held across Western Europe and the Ottoman Empire, disease was primarily a result of imbalances in the humours that were often instigated by environmental corruption or miasma, along with contributing factors related to age, gender and diet. One disease could result from different particular causes and could manifest in diverse ways – creating a fundamental problem in medical semiotics. Moreover, theories on the causes of epidemics ranged from miasmas to contagion, then a malleable concept across societies.¹¹ Without a clear understanding of smallpox aetiology or guidelines for its early diagnosis, effective treatment was a matter of prolonged academic and practical debate among medical practitioners, though remedies from the so-called ‘Arabic’ medical tradition dominated. These included alternating applications of heat and cold, a therapy sourced from Ibn Sīnā (or Avicenna, c.980–1037) and Al-Rāzī (or Rhazes, 865–925), Persian physicians whose works had long been influential in Europe as part of the perceived Arabic medical canon.¹² European reliance on Ibn Sīnā and Al-Rāzī elevated them beyond mere mediators of knowledge from ancient Greece; they were recognized for their own advances in medicine and expansions of Galenic theory, both of which shielded them from the broader, negative views of Arabic culture.¹³

Reports of a new, prophylactic approach to smallpox remediation – inoculation – had reached England and France from Constantinople by 1711, through two Padua-trained physicians, Emmanuel Timoni (1669–1718) and Jacob Pylarini (1659–1718).¹⁴ The first publicized administration of inoculation in Europe occurred in England a decade later, when the previously mentioned Lady Wortley Montagu had her daughter inoculated following the successful variolation of her son in Constantinople. Subsequent royal patronage in England escalated medical and popular discussions of inoculation, though deaths associated with the practice undermined its broader acceptance among elites, medical and religious communities, and the general public. Disputants from across the Republic of Letters entered the debate, creating overlapping dialogues on variolation aimed at, but struggling to reach, a universal and rational conclusion. For example, the pro-inoculation Bostonian clergyman Cotton Mather (1663–1728) read an account of variolation by the

9 For example, Dr Faust, *Communication au congrès de Rastadt sur l'extirpation de la petite vérole*, 1798, National Archives, Paris, F⁸ 124, cited in Darmon, op. cit. (3), p. 12. See also Henry James Parish, *A History of Immunization*, Edinburgh: E. & S. Livingstone, 1965, p. 21.

10 Mary II of England died of smallpox in 1694. Joseph I of the Holy Roman Empire died in the same grand smallpox epidemic of 1711 that killed Louis, le Grand Dauphin of France. Louis XIV of France died of smallpox in 1715, and Louis I of Spain in 1724.

11 Justin K. Stearns, *Infectious Ideas: Contagion in Premodern Islamic and Christian Thought in the Western Mediterranean*, Baltimore: Johns Hopkins University Press, 2011; Margaret DeLacy, *The Germ of an Idea: Contagionism, Religion, and Society in Britain, 1660–1730*, London: Palgrave Macmillan, 2016.

12 Ibn Sīnā's *Canon of Medicine* (c.1025) became a standard medical text in the Ottoman Empire and Europe. Al-Rāzī was the premier authority on smallpox, being the first to distinguish it from measles in 925, in *A Treatise on the Smallpox and Measles*. See Samir Johna, ‘Marginalisation of ethnic and religious minorities in Middle East history of medicine: the forgotten contributions to Arabian and Islamic medicine and science’, *AMHA: Acta medico-historica Adriatica* (2010) 8(2), pp. 203–10; Dag Nikolaus Hasse, *Success and Suppression: Arabic Sciences and Philosophy in the Renaissance*, Cambridge, MA: Harvard University Press, 2016.

13 See Brentjes, *Travellers from Europe*, op. cit. (2); Brentjes, ‘The interests of the Republic of Letters’, op. cit. (2).

14 Jacobus Pylarinus, *Nova et Tuta Variolae Excitandi per Transplantationem Methodus ...*, Venice: Gabriel Hertz, 1715; Emmanuel Timoni, ‘Historia variolarum, quae per incisionem excitantur’, *Acta Eruditorum* (August 1714) 3, pp. 382–4.

Venetian Pylarini in *Philosophical Transactions* and corresponded with Drs John Woodward (1665–1727) and James Jurin (1684–1750) of the Royal Society of London about the practice. Mather sought intellectual support and confirmation as he faced massive resistance in Boston from the medical community and sections of the public.¹⁵ We can understand these discussions as a prolonged process of translation of the ‘Arabic’ practice of inoculation by communities of learned medicine and popular health in anglophone and franco-phone societies.

Origins and causes

A central point in the early phase of this translation process revolved around the origins of smallpox and of inoculation. The predominant theory in the eighteenth century traced the genesis of variola to the Arabian peninsula, with Muslim conquests spreading the disease to the borders of Europe in the seventh century. The Crusades of the twelfth and thirteenth centuries then rendered variola endemic in Western Europe. The mutual genesis of smallpox and variolation in Arabia became a factor in the evaluation of inoculation by physicians and non-physicians alike. For some observers, such as the French physician Jean Astruc (1684–1766), the belief that smallpox first emerged in Muslim lands only confirmed negative views of the region: ‘the eruption of the Saracens, among the many evils it spread in the world, introduced the small-pox ... which in its progress has made greater havoc against mankind’.¹⁶ Yet for other Galenists, instead of foreshadowing doom, the common origin of smallpox and inoculation around the Arabian peninsula lent greater credibility to the preventive and broached the accommodation of inoculation to Galenic models.¹⁷

However, the appropriation of variolation into the medical thought of European societies was not dependent merely upon the humoral perspective. By the end of the seventeenth century, elite scholars of natural philosophy and learned medicine, such as the Anglo-Irish Robert Boyle (1627–91), had begun to re-evaluate understandings and categories of disease. This reconsideration of theory and the role of experience left university medicine in a state of flux. Miasma no longer dominated explanations of epidemics, and a handful of maladies, including syphilis and consumption, came to be recognized as contagious diseases transmitted between individuals.¹⁸ Smallpox and the idea of inoculation relied on the acceptance of a particular substance causing a specific disease.

During this period of transitions in understandings of disease and contagion, treatises on inoculation traversed a landscape of contradictory methods and beliefs, representing the challenges to the adoption of foreign medical practices in the eighteenth century. Some early proponents of inoculation sought to map the still-developing ontological concept of disease to traditional theoretical medicine by proposing an innate ‘seed of smallpox’, an idea rooted in the work of Al-Rāzī that had re-emerged at the start of the eighteenth century.¹⁹ One such early supporter of inoculation was English apothecary Isaac Massey, who posited that smallpox existed in each body from birth and that

¹⁵ Mather translated Timoni’s and Pylarini’s accounts into English and published them in Boston in 1721. Miller, *op. cit.* (7), p. 142.

¹⁶ Jean Astruc, *Doutes sur l’inoculation de la petite vérole ...*, Paris, 1756, pp. 7–8.

¹⁷ James Burges, *An Account of the Preparation and Management Necessary to Inoculation*, London, 1754, p. 1.

¹⁸ Vivian Nutton, ‘The seeds of disease: an explanation of contagion and infection from the Greeks to the Renaissance’, *Medical History* (1983) 27, pp. 1–34; see also Melvin Santer, *Confronting Contagion: Our Evolving Understanding of Disease*, Oxford: Oxford University Press, 2014.

¹⁹ Al-Rāzī proposed that smallpox was a natural and necessary process caused by a ferment in the blood of each human being. Miller, *op. cit.* (7), p. 242. While a Latin translation appeared in 1498 in London, Richard Mead commissioned an English translation of the Arabic text of Al-Rāzī, which appeared as *A Treatise of the Smallpox and Measles* in 1747.

exposure to either a miasma or pus from a smallpox sore would set off the infection.²⁰ The French royal physician Jean-Claude-Adrien Helvétius (1685–1755) developed this idea further in the early 1720s, arguing that some source of impurity, either air or a patient's regimen, would stimulate an innate 'ferment in the blood' (here invoking Al-Rāzī's terminology), leading to the condition physicians diagnosed as smallpox.²¹ For French mathematician Charles Marie de La Condamine, the theory of an innate germ explained the ubiquity of smallpox. He grandly proclaimed that smallpox was 'a dreadful and cruel disease, which we carry the seed of in our blood', though he noted that physicians were split on this idea, and he considered the cause more a 'disposition' that rendered man 'vulnerable'.²² With the idea of an innate germ, advocates of inoculation in the eighteenth century were able to unite ancient theory and contemporary practice in the circulation of scientific knowledge.

Lending further credence to innate germ theory was the commonly held belief that individuals contracted smallpox only once. This observation was confirmed by experts such as the famed Dutch physician and chemist Herman Boerhaave (1668–1738), who proposed that something remained in the body after smallpox that prevented reinfection.²³ The singularity of smallpox infection, though, came under renewed debate during the eighteenth century as prior assumptions were subjected to new standards of evidence. The detractor William Wagstaffe, for example, asserted that 'we know no Reason, nor can they give us any, why ... we should not be liable to catch [smallpox] a second time'.²⁴ The idea that surviving variola provided lifelong protection was prevalent among elites and the popular classes, who had employed a rudimentary version of inoculation sometimes referred to as 'buying the pock'.²⁵ Yet with medical orthodoxy in flux, the once commonly held belief in singular infection was re-evaluated, even as other intellectuals used it as a foundation to accommodate the new practice of inoculation.

Despite the theory of an innate germ thus seemingly integrating ancient and modern views of disease in support of inoculation, many physicians attacked this accommodation. The Swiss physician Samuel Auguste Tissot (1728–97), a major proponent of variation, rejected the idea of an innate germ and argued that only external factors caused smallpox.²⁶ The French physician Jean-Jacques Paulet (1740–1826) dismissed the innate germ as a chimera, complaining that 'it was shocking that in our century, an age of enlightenment, people believed that the first [case of smallpox] was born in man'.²⁷ Another opponent of inoculation like Paulet, French physician Jean Astruc, went farther. He decried the seed theory as a 'chimera of Arabs', twisting the influence of Al-Rāzī's work on smallpox into a negative.²⁸ By using 'Arab' as shorthand for irrationality and linking both innate-germ theory and inoculation to Arabs, Astruc dismissed the benefit of even attempting

20 See, for example, Isaac Massey, *A Short and Plain Account of Inoculation*, London, 1722, p. 12; Francis Howgrave, *Reasons Against the Inoculation of the Smallpox*, London, 1724, p. 6; John Friend, *The History of Physick*, London, 1727, tome 2, p. 191. For an in-depth discussion of the theory of the innate seed see Miller, op. cit. (7), pp. 242–51.

21 Jean-Claude Adrien Helvétius, *An Essay on the Animal Oeconomy: Together with Observations upon the Small Pox*, London, 1723, 129–31.

22 Charles Marie de La Condamine, *Mémoire sur l'inoculation de la petite vérole*, Paris: Durand, 1754, p. 1.

23 Herman Boerhaave, *Praxis Medica*, vol. 5, p. 308, quoted in James Kirkpatrick, *The Analysis of Inoculation: Comprising the History, Theory, and Practice of It*, Brussels, 1764, pp. 17–18.

24 William Wagstaffe, *A Letter to Dr. Freind*, London, 1722, pp. 29–30.

25 Perrot Williams, 'On the method of procuring the smallpox, in South Wales', *Philosophical Transactions* (1723) 32(375), pp. 262 ff; Thomas Schwencke, 'Lettre', in anon., *Recueil de quelques pieces interessants sur l'inoculation de la petite-verole*, La Haye, 1755, pp. 103–4.

26 Samuel Auguste Tissot, *L'Inoculation justifié ...*, Lausanne, 1754, pp. 138–9.

27 Jean-Jacques Paulet, *Histoire de la petite vérole ...*, Paris, 1768, vol. 1, p. 2.

28 Astruc, op. cit. (16), pp. 7–8.

inoculation trials on scientific grounds. Astruc's simplification of Al-Rāzī's complex idea of internal and external causes of smallpox thus perpetuated the idea of Arabic learning as inferior, despite contemporary reliance on Al-Rāzī's theory of smallpox aetiology.²⁹

Challenges of evidence and experience

Questions on the nature and soundness of evidence for or against inoculation were another dominant feature of the debate by the 1740s. Disagreement over what qualified as evidence versus example reveal how the conceptualization and practice of medicine both encouraged and hindered the circulation of knowledge from beyond Europe. Anxiety over how to evaluate information from different regions, such as inoculation, derived in part from broad questions about the role of experience in medical practice and theory and the frequently only rhetorical differences between popular and elite medical practitioners.

As Mathew Ramsay and Sherry Sayed Gadelrab have addressed, the medical worlds of early modern Europe and the Ottoman Empire were diverse marketplaces with a spectrum of practitioners, ranging from academy-trained physicians to folk healers.³⁰ B. Harun Küçük and Gadelrab have further proposed that a primary way to distinguish between medicine in Western Europe and the Ottoman Empire at the start of the eighteenth century is to consider the relationship between practical, empirical medicine and theoretical medicine.³¹ While university-educated physicians in Western Europe mixed theoretical discussions with practical applications on real patients, madrasa-educated physicians in the Ottoman Empire remained primarily academics who only occasionally treated patients. The majority of practical care for the Ottoman population was provided by a range of medical practitioners, from popular healers to those with formal apprenticeships linked to medical guilds.³² Thus, while Küçük contends that, in many respects, the practices of European and Ottoman science were analogous – based on a rationalist empiricism or what he calls a 'practical naturalism' – there was a clear professional divide between theory and practice in Ottoman medicine that did not exist in English and French medical marketplaces.³³

This difference in Ottoman and Western European professional structures intersected with relationships between theory and empiricism, influencing the status of inoculation in the Ottoman Empire and its reception in England and France. Inoculation arose from accumulated experiences passed among practitioners and patients confronting smallpox and does not seem to have garnered the attention of elite physicians in Constantinople before the early eighteenth century, resulting in a lack of Galenic evaluations of inoculation prior to this period.³⁴ As university-trained physicians in England and France did treat patients, however, and even competed for clients with other medical practitioners across the spectrum, they were motivated to demonstrate their superior medical expertise by explaining

²⁹ For further discussion see Felix Klein-Franke, *Die klassische Antike in der Tradition des Islam*, Darmstadt: Wissenschaftliche Buchgesellschaft, 1980; and Hasse, op. cit. (12).

³⁰ Sherry Sayed Gadelrab, 'Medical healers in Ottoman Egypt, 1517–1805', *Medical History* (2010) 54(3), pp. 365–86; Mathew Ramsay, *Professional and Popular Medicine in France, 1770–1830: The Social World of Medical Practice*, Cambridge: Cambridge University Press, 1988.

³¹ B. Harun Küçük, 'Medical translations and the hikmet-i tabiyye problematic in eighteenth-century Istanbul', in Langermann and Morrison, op. cit. (2), pp. 222–42; Gadelrab, op. cit. (30), pp. 365–86.

³² Küçük, op. cit. (31), p. 224.

³³ B. Harun Küçük, *Science without Leisure: Practical Naturalism in Istanbul, 1660–1732*, Pittsburgh: University of Pittsburgh Press, 2019, pp. 224–5.

³⁴ Pylarini first learned of variolation from a Greek nobleman who consulted him about having his children inoculated by a local woman. Jacobus Pylarinus, 'Nova et tuta variolas excitandi per transplantationem methodus, nuper inventa et in usum tracta', *Philosophical Transactions* (January–March 1716) 29(347), pp. 393–9.

inoculation in the broad context of medical theory. In this endeavour, though, in contrast to their understandings of smallpox, anglophone and francophone theorists had no pre-existing philosophy to adapt. The lack of theoretical discussion of variolation before its arrival in England and France was compounded by negative perceptions of Ottoman and Muslim societies in general, and Arabic science in particular, influencing both academic and popular discussions of inoculation.

Moreover, as the acceptance of inoculation lay at the intersection of rivalries between types of practitioners and perceptions of medical knowledge, the balance of experience versus theory became essential. Although observation and experimentation as the path to progress had been growing in importance since the fifteenth century, flourishing in the works and influence of seventeenth-century empiricists Francis Bacon, John Locke and Isaac Newton, frequently English and French observers, when discussing empiricism in medicine, perpetuated older understandings of an empiric as a vulgar, uneducated practitioner. The charge of being an ‘empiric’ was a serious censure against the learning of university-educated physicians as empirics relied on experience alone to dictate action and neglected why or how medicine worked.³⁵

Despite ambiguous understandings of empiricism, the negative associations with it caused difficulties for elite anglophone and francophone physicians who had to admit that variolation rose from empirical medicine or experience with no explanation of mechanism.³⁶ The famed Genevan inoculator Theodore Tronchin (1703–81) stated that the roots of inoculation were ‘a very simple observation’ among a ‘people denied all the Arts, particular that of Medicine ... [who] fixed their attention on an experience that presumably by some happy accident made them do it’.³⁷ For some, empirical medicine was an initial step towards medical knowledge. Or, as French physician Théophile de Bordeu (1722–76) explained when arguing in support of inoculation, empirical medicine was ‘comparable to natural religions: it was at first only the instinct of man’.³⁸ In other words, while observation could not stand on its own, inoculation’s roots in empirical medicine were an adequate starting point according to supporters. Though Tronchin applauded this creation of a beneficial procedure that emerged purely from experience, in order for inoculation to have a place in the learned medicine of Europe it needed to be rationally explained, as he and others then attempted to do in their treatises. Explanation, though, proved difficult, as the conceptual foundations of eighteenth-century medicine were subject to debate and uneven transformation.

Recent scholarship by Siegfried Bodenmann and Anne-Lise Rey reaffirms that the assumed division between empiricism and rationalism does not reflect the complex overlap that existed between the two approaches in the eighteenth century.³⁹ The emerging image of a learned physician articulated by Enlightenment thinkers and supporters of inoculation such as Louis de Jaucourt (1704–79) exemplifies the common ground between empiricism and rationalism in medicine by the mid-eighteenth century. Jaucourt asserted that physicians’ ‘empiricism [had to be] enlightened’, meaning an integration of theory and observation in medicine.⁴⁰

³⁵ See, for example, Ephraim Chambers, *Cyclopaedia*, London, 1728, vol. 1, p. 303.

³⁶ Elaine Leong and Alisha Rankin, ‘Testing drugs and trying cures: experiment and medicine in medieval and early modern Europe’, *Bulletin of the History of Medicine* (Summer 2017) 91(2), pp. 168–70.

³⁷ Théodore Tronchin, ‘Inoculation’, in Denis Diderot and Jean le Rond d’Alembert (eds.), *Encyclopédie, ou dictionnaire raisonné des sciences, des arts et des métiers*, vol. 8, Paris, 1772, p. 769.

³⁸ Théophile de Bordeu, *Recherches sur quelques points de l’histoire de la médecine ...*, Liège, 1764, pp. 11, 68.

³⁹ Siegfried Bodenmann and Anne-Lise Rey (eds.), *What Does It Mean to Be an Empiricist? Empiricism in Eighteenth-Century Sciences*, New York: Springer, 2018.

⁴⁰ Louis de Jaucourt, ‘Charlatan’, in Denis Diderot and Jean le Rond d’Alembert (eds.), *Encyclopédie, ou dictionnaire raisonné des sciences, des arts et des métiers*, vol. 3, Paris, 1753, pp. 208–10.

Already during the initial stages of the introduction and debate over inoculation, physicians such as Friedrich Hoffmann (1660–1742) were arguing in broader contexts that a learned physician could ‘rationally demonstrat[e] explanation of all those things which are included in the histories of disease’.⁴¹ As the integration of experience and reason increasingly became the standard of elite, learned medicine, advocates of variolation faced a dilemma: how to explain inoculation? From the end of the sixteenth century, medical practitioners relied on evaluating new drugs and practices by connecting observation to humoral medicine or chemical analysis.⁴² However, the chemical analysis of inoculation was impractical as the properties of smallpox were unknown in the eighteenth century. Division over smallpox’s aetiology blocked a rational explanation of how and why inoculation worked.

This led some, particularly non-medical, proponents of inoculation to embrace traditional empiricism. For example, Reverend Cotton Mather of Boston protested, ‘But to what Purpose is all this Jargon? And of what Significancy are most of our Speculations? EXPERIENCE! EXPERIENCE! ’tis to THEE that the Matter must be referr’d after all; a few Empiricks here, are worth all our Dogmatists.’⁴³ Mather and other advocates of inoculation operating within the anglophone scholarly network dismissed the value of accommodating inoculation to theory if experiences proved success, effectively challenging the authority of university-trained physicians.⁴⁴

Other supporters of inoculation, both physicians and non-medical scholars, stressed a certain kind of experience, observation and experimentation as the means to link foreign empiricism and elite medical rationalism. For example, a Dr Brady of Portsmouth in south-east England argued that ‘men neglect the true Method of enlarging the Faculty [of Medicine] by a just and judicious Observation’, which he cites as ‘the only true Method’.⁴⁵ Observation was a faculty of the mind that required understanding beyond a passive act of documentation. Empirics would see and repeat but not observe. Observation would lead physicians to discoveries that reason alone could not. Therefore experiments would have to be designed and conducted to discover the mechanism that made inoculation effective. The lack of a reasoned explanation from Ottoman medicine did not disqualify inoculation for Dr Brady. Instead, he and other like-minded physicians and scholars emphasized the need to support educated observations to accommodate the foreign empirical procedure to the standards of elite European theory.

Credible informants and observers

This brings us to the question of who had sanctioned access to scientific or medical knowledge and experience. When elite European scholars exchanged knowledge or encountered new ideas, their perception of the information’s worth depended in part on who provided the material. As Steven Shapin has examined in detail for England, within exclusive scientific networks the credibility of information depended on the reputation and perceived status of the individual who obtained it, rather than on its perceived accuracy.⁴⁶ If elite male scholars

41 Friedrich Hoffmann, ‘Prolegomena de medicinae natura fundamentis et principio demonstrandi’, in Hoffmann, *Medicinae Rationalis Systematicae*, 2nd edn, 8 parts in 4 vols., Halle, 1729–39, vol. 1, pp. 4, 10.

42 Leong and Rankin, op. cit. (36), pp. 158–9.

43 Cotton Mather, *An Account of the Method and Success of Inoculating the Small-Pox ...*, London, 1722, p. 8.

44 Harold J. Cook, ‘Victories for empiricism, failures for theory: medicine and science in the seventeenth century’, in Charles Wolfe and Ofer Gal (eds.), *The Body as Object and Instrument of Knowledge*, New York: Springer Publishing, 2010, pp. 9–32.

45 Samuel Brady, *Some Remarks Upon Dr. Wagstaffe’s Letter ...*, London, 1722, pp. 9, 6.

46 Steven Shapin, *A Social History of Truth*, Chicago: The University of Chicago Press, 1994; Raj, op. cit. (2), p. 23; Leong and Rankin, op. cit. (36), 158–60.

portrayed themselves as possessors of the requisite broader understanding of nature and humanity to provide credible advice and to bridge the gap between systems of thought, information from foreign or low-born individuals then necessitated an appropriate mediator to communicate and affirm new practices.

Once again, debates over inoculation illuminate these dynamics. Many works on inoculation were translated between France and England alone and translators were in increasing demand in the eighteenth century as members of the Republic of Letters progressively published in the vernacular and circulated their works across linguistic and cultural borders to reach broader audiences.⁴⁷ Initially, only learned physicians and natural philosophers were recognized as having sufficient influence and understanding to accommodate information to the canon of Western knowledge.⁴⁸ Not surprisingly, then, scholars have found that anglophone and francophone networks overall did not admit either ‘Turkish’ or women participants and observers of inoculation in Constantinople as qualified to verify and transmit the practice according to eighteenth-century dictates.⁴⁹ Certainly, Wagstaffe’s critique of inoculation as ‘practiced only by a few ignorant Women, amongst an illiterate and unthinking People’, epitomizes the ethnocentric and gendered critique of variolation circulating among his contemporaries.⁵⁰ The source of the information condemned the procedure as something that could not be trusted or assimilated into English medicine.

Not everyone discounted Muslim or Turkish informants, however. After all, the Hellenic intellectual tradition was understood to have reached Western Europe through Islamic sources and translations.⁵¹ Yet religious polemics during the Protestant Reformation had demonized the Turks.⁵² Most proponents of inoculation were no more positive in their assessments of the foundation of foreign knowledge than were its opponents. Supporters of inoculation, though, did not see the ignorance of its non-professional practitioners as automatically invalidating the information that came from them.

Decades after Pylarini and Timoni’s work was published in London, authors such as the Genevan physician Jean-Antoine Butini (1723–1810) might still note inoculation’s ‘birth in barbaric lands’ while advocating to implement the preventive.⁵³ Others, like the Portuguese physician Jacob de Castro Sarmiento (1690–1762), a member of the Royal Society living in London, were willing to leave the question of the origin of inoculation open. As Sarmiento declared, ‘whether by Chance, Deduction or Reason, or Experiment is not certainly known, they happily fell in with the Method of Inoculation’.⁵⁴ Both Butini and Sarmiento accepted Ottoman subjects as at least worthy informants if not legitimate mediators of knowledge. Still, Pylarini and Timoni, both physicians trained in Padua and practising in Constantinople, whose early reports recognized the value of a folk preventive practised among Greek women, became the actual informants. Their standing and

47 Sven Dupré, ‘Introduction: science and practices of translation’, *Isis* (2018) 109(2), pp. 302–7. See also Scott L. Montgomery, *Science in Translation: Movements of Knowledge through Cultures and Time*, Chicago: The University of Chicago Press, 2000.

48 See Eriksen, op. cit. (6); Victoria Meyer, ‘Divining the pox: the controversy over smallpox inoculation in eighteenth-century France’, PhD dissertation, University of Virginia, 2010.

49 Samantha Fenno, ‘“An experiment practiced by only a few ignorant women”: Lady Mary Wortley Montagu, the smallpox inoculation, and the concept of Enlightenment’, in Laura J. Rosenthal and Mita Choudhury (eds.), *Monstrous Dreams of Reason: Body, Self, and Other in the Enlightenment*, London: Bucknell University Press, 2002, p. 102; Brentjes, ‘The interests of the Republic of Letters’, op. cit. (2).

50 Wagstaffe, op. cit. (24), p. 7. See also Brentjes, *Travellers from Europe*, op. cit. (2), p. 136.

51 Klein-Franke, op. cit. (29); Hasse op. cit. (12).

52 Filiz Barin, ‘Othello: Turks as “the other” in the early modern period’, *Journal of the Midwest Modern Language Association* (2010) 43(2), pp. 37–58, 38.

53 Jean-Antoine Butini, *Traité de la petite vérole communiquée par l’inoculation*, Paris, 1758, p. 82.

54 Jacob de Castro Sarmiento, *A Dissertation on the Method of Inoculating the Smallpox ...*, London, 1721, p. 24.

credentials made the material trustworthy and signalled the potential to assimilate inoculation conceptually into European medical systems.⁵⁵

Such imprimatur was needed in this case in particular because European views of Muslims had never been static. There had been both an increasing anxiety about and fascination with the 'exotic East' since at least the late seventeenth century. As scholars such as Ian Collier have explored, there was a fear of individuals 'turning Turk' in some areas of Europe, particularly France and England.⁵⁶ 'Turning Turk' meant rejecting local customs and moral order, such as by engaging in heresy or cruelty. In England, this anxiety centred around a view of the Ottoman Empire as such a powerful threat that it could transform an individual merely through exposure to its culture. Fears of Ottoman power manifested in attacks on Islam, such as that of William Bedwell in 1615, which denounced Muhammad as an 'imposter' who seduced the 'Saracens and Arabs'.⁵⁷ These concerns endured in popular contributions to the English debate over inoculation, such as the handbook of a Mrs Hey, who opined that 'Mahometans, who hearing of our Ripeness for Infidelity, made a Present to us of this Custom [of inoculation] ... That the nearer we approach to Infidelity, the more will their Customs flow in upon us; and so vice versa'.⁵⁸ Significantly, even Mrs Hey recognized that cultural exchange could be transformative for all involved.

Anxiety over Turkification was more complicated in France than in England, in part as a result of the long-standing alliance between France and the Ottoman Empire. This history of interaction had enabled the French monarchy to recognize political and economic weaknesses in the empire by the 1720s, undercutting perceptions of Ottoman invincibility that circulated widely in other countries. At the same time, however, Louis XV (r. 1715–74) expanded Louis XIV's (r. 1643–1715) regulations to prevent French merchants and traders in the Levant from 'turning Turk', demonstrating a fear of 'cultural hybridization'.⁵⁹ In terms of intellectual assessments, already in 1735 the Marquis d'Argenson (1694–1757) felt secure in saying that 'although a thousand people in France consider the Turks a barbaric nation to whom Heaven has given only the most ordinary and crude ideas ... we are largely overcoming this prejudice'.⁶⁰ Indeed, an exchange of information in the arena of natural philosophy continued, although d'Argenson was overly optimistic about French recognition of Turkish intellectual contributions on a large scale.⁶¹

Significantly for this case study, France's fascination with Ottomans peaked in the 1760s, just as the inoculation debate reached new heights.⁶² Overall, it seems that the French were more concerned about Turkification occurring as a result of living in the Levant and changing one's daily habits, than by adopting any single practice.⁶³ Thus the initial idea of inoculation could be taken from the Turks without any real danger of Turkification. It would still need to be translated by an approved European into a civilized medical practice, though.

55 Eriksen, *op. cit.* (6), pp. 3–4, asserts that John Woodward both translated portions of Timoni's letter from Latin to English and situated himself as the true author.

56 Ian Collier, 'East of enlightenment: regulating cosmopolitanism between Istanbul and Paris in the eighteenth century', *Journal of World History* (September 2010) 21(3), pp. 447–70.

57 William Bedwell, *A Discovery of the Impostures of Mahomet and of the Koran*, 1615, cited in Barin, *op. cit.* (52), p. 38.

58 Mrs Hey, *A generous discovery of many curious and useful medicines and preparations*, London, 1725, pp. 9–10.

59 Collier, *op. cit.* (56), p. 455.

60 Jean-Baptiste de Boyer d'Argens, *Mémoires de Monsieur le marquis d'Argens avec quelques lettres sur divers sujets*, London, 1735, pp. 275–6.

61 B. Harun Küçük, 'The Copernican rhetoric', in Fransen, Hodson and Enenkel, *op. cit.* (2), pp. 258–85.

62 Many supporters of inoculation, for example Voltaire, also tended to be pro-Ottoman.

63 Collier, *op. cit.* (56), p. 455.

The fact that the original practitioners and observers of inoculation were Ottoman women subjects raised other issues in the adoption of the procedure. Initial reports from Pylarini and Timoni had tied the Turkish method to older women, either Greek or Circassian – both groups already dismissed as uncivilized and unreliable in Latinate scholarly networks. If none of these common women's other practices or superstitions had value, why would the practice of variolation be different? French royal physician Philippe Hecquet (1631–1737) could not believe that inoculation was 'a practice of the people, a remedy of a woman, picked up by an ignorant people; and we want to glorify this practice!'⁶⁴ English apothecary Francis Howgrave in turn demeaned inoculators as 'learned Mimics, of a few ignorant Greek Women'.⁶⁵ Again we see a divide between the rhetoric of physicians and their actions in practice. As Mary Lindemann and other scholars have demonstrated, laywomen in reality were still a primary source of medical knowledge in eighteenth-century Europe.⁶⁶ Prejudices about the gender and social rank of the inoculators, though, remained as much an issue as proto-nationalist or religious sentiment.

Indeed, very few advocates defended women as a credible source of information. One of those who did, Aubry de La Mottraye (1674–1743), argued that 'among barbaric people' it was elderly women who were 'renowned to be as wise and knowledgeable' as they are old.⁶⁷ The idea implicit in La Mottraye's position was that only when society was wholly ignorant could women's knowledge be of value to the progressive science of Europeans. For detractors, this association was merely another way in which the Levant operated in binary opposition to civilized Europe, where men embodied knowledge.⁶⁸

Some supporters creatively attempted to use Europeans' lack of personal familiarity with Ottoman peoples to elevate inoculation to a learned medical practice in the hopes of vindicating the prophylactic. For example, one anonymous author stated that women actually practised high medicine in Circassia, and La Mottraye went into great detail to show that these women did have a clear, Galenic understanding of the body that elevated variolation to the status of learned medicine.⁶⁹ Part of the issue in the different arguments about worth and origins depended on the audience. Describing inoculation as an 'ignorant women's' practice could reassure parents that the procedure thus was incredibly simple and even safer when in the hands of a learned European practitioner. Tronchin in fact declared that 'experience finally made it safer. We perfected it'.⁷⁰ When convincing other scholars or officials, however, women were troubling informants.

More often, the 'defence' of these women as sources of variolation required additional validation through orthodox, male, medical figures, primarily Drs Pylarini and Timoni. Even the aristocrat Lady Wortley Montagu's support was inadequate. As historians such as Londa Schiebinger and Erica Harth have shown, elite scientific communities in early modern Europe recognized only men as having a natural claim to knowledge and authority, while even women active in scientific pursuits and recognized by contemporaries for their work, such as the French Cartesian Emilie du Châtelet, were excluded formally from

64 Philippe Hecquet, 'Raisons de doute contre l'inoculation', in Hecquet, *Observations sur la saignée du pied et sur la purgation au commencement de la petite vérole ...*, Paris: Guillaume Cavalier, 1724, pp. 354–5.

65 Howgrave, op. cit. (20), p. 68.

66 Mary Lindemann, *Medicine and Society in Early Modern Europe*, Cambridge: Cambridge University Press, 2010.

67 Aubry de La Mottraye, *Voyages, en Anglois et en François, d'A. de la Mottraye*, The Hague, 1732, pp. 87–8.

68 On the gendering of knowledge see Londa Schiebinger, 'Women of natural knowledge', in Katherine Park and Lorraine Daston (eds.), *Cambridge History of Science*, vol. 3, Cambridge: Cambridge University Press, 2006, pp. 192–205.

69 Anonymous, *Opuscule sur l'inoculation*, Besançon: J.-F. Charmet, 1765, p. 7; de La Mottraye, op. cit. (67), pp. 87–8.

70 Tronchin, op. cit. (37), p. 770.

the halls of science due to their gender.⁷¹ We can view the repeated phrase ‘ignorant women’ describing the originators of inoculation as not only a product of Europe’s highly gendered understanding of intellect and authority, but also a result of professional concerns among European physicians. By reducing medical practice in the Ottoman Empire to only ‘ignorant women’ in the discussion of inoculation, European contemporaries and modern scholars magnified inoculation as a stand-in for medical knowledge more broadly, falsely effecting an erasure of a learned medical elite outside Western Europe.

Assimilating variolation

The recognition of variolation’s real medical potential, then, could only have been achieved by men such as Drs Pylarini and Timoni. Both had studied at prestigious Italian medical faculties and corresponded with elite Latinate physicians, and therefore could serve as guarantors of knowledge passed from elderly women. When opponents reduced the origins of inoculation to the work of ‘ignorant women’, supporters rejected that invective by asking, ‘Are Timoni, Pylarini, Boylston, Maitland, etc. ignorant Women?’⁷² Timoni and Pylarini were the first to document the practice in writing through a lens of academic learned medicine. Pylarini made sure to draw a clear line between himself and Greek women practitioners when describing how he had observed and recognized inoculation as having medical potential.⁷³

Yet for many in the elite medical networks intersecting through the Royal Society of London, Pylarini’s and Timoni’s uncertain European bloodlines and the decades they spent in Constantinople rendered them liminal figures.⁷⁴ Were they European or Ottoman? The conceptual translation of inoculation into the domestic medicine of English- and French-speaking communities, then, required another, properly European, agent. Though not expressly stated, this concern is clear in the way that Dr Woodward literally translated sections of Timoni’s work from Latin into English, despite the fact that readers of the *Philosophical Transactions* would have been literate in Latin. Woodward likely did so in hopes of communicating with a broader audience outside the Royal Society’s members. Convincing even upper-class members of English-speaking communities to undergo variolation would require another conceptual translation and accommodation signalled by use of the vernacular that only an English member of the Royal Society could achieve. Timoni and Pylarini were reduced from recognized translators to mediators of knowledge.⁷⁵

In order to frame variolation as learned medicine, supporters by the 1760s had begun to emphasize the perfection and development of inoculation away from its admittedly humble origins. In other words, they had translated and improved the practice. They asserted that the procedure had become a superior and *medical* procedure, an ‘art’, when physicians applied their orthodox knowledge to its practice.⁷⁶ As one anonymous source explained, ‘by the Assistance of an Almighty Providence we have now brought it

71 Londa Schiebinger, *The Mind Has No Sex? Women in the Origins of Modern Science*, Cambridge, MA: Harvard University Press, 1989; Erica Harth, *Cartesian Women: Versions and Subversions of Radical Discourse in the Old Regime*, Ithaca, NY: Cornell University Press, 1992.

72 John Crawford, *The Case of Inoculating the Small-Pox Consider’d ...*, London, 1722, p. 7.

73 Timoni and Pylarini disregarded the religious associations of folk practitioners of inoculation, as did Antoine le Duc in *Dissertatio medica inauguralis de Byzantina variolarum isitione*, Leiden, 1722, pp. 7–8, 12–13.

74 Eriksen, op. cit. (6), pp. 4–5.

75 Though the Royal Society did recognize non-English witnesses of smallpox, DeLacy, op. cit. (11), p. 141, downplays their credibility on inoculation.

76 Already in the 1750s, Charles Chais described inoculation as an ‘Art’. Charles Chais, *Essai apologétique ...*, The Hague: Pierre de Hondt, 1754.

to the very utmost and greatest Degree of Perfection'.⁷⁷ Thus many advocates, such as influential faculty physician Jean-Jacques Gardane (1726–86), presented the practice as not 'difficult or mysterious', but as a simple, natural and rational procedure.⁷⁸ Other proponents, including physician Jean-Antoine Butini, argued instead that it was the knowledge and experience of physicians that had transformed the primitive method into true medical knowledge.⁷⁹ Through these acts of translation, inoculation became a product of the European Enlightenment, heralded by supporters like the French playwright Louis de Laus de Boissy (1743–99), as a 'triumph of Philosophy', rather than a practice adopted from a barbaric past or 'Turks'.⁸⁰ Some English commentators even argued that 'the native country of inoculation' was truly England.⁸¹

We can see this process of acculturation and medicalization beginning even with the descriptions of the first inoculation done in Constantinople on Wortley Montagu's son.⁸² The embassy surgeon, Charles Maitland (1668–1748), detailed the boy's pain when 'the good woman' used her 'blunt and rusty Needle' to inoculate him.⁸³ This induced Maitland, as he explained, to inoculate the other arm 'with my own Instrument, and with so little Pain to him, that he did not in the least complain of it'.⁸⁴ Although Maitland reported that both techniques were successful, he clearly emphasized the boy's lack of pain as preferable and due to his Western instruments and skill. Maitland laid out a path for the translation of inoculation into Western medicine. English learned physicians and surgeons would systematize and therefore universalize the technique from a local practice centred in Constantinople into Western medicine.

Supporters increasingly stressed advances in technique and thus the qualifications of an elite, formally educated inoculator while presenting variolation as a successfully standardized practice. As the physician Nicolas Petit explained, with 'inoculation badly administered ... it is the abuse of a remedy and not the remedy itself, that caused all the harm'.⁸⁵ This shift in authority is key as advocates could not deny the risks of inoculation by the 1750s. Instead, they blamed adverse outcomes on an inferior method or application of inoculation. Deviations from the emerging standard were dangerous. Real medicine involved study and repetition, so 'the more that this method extends the good of humanity, the more we should endeavour to know it well and to perfect it'.⁸⁶ In other words, replication proved the practice and experience would lead to enlightenment – an ultimate embracing of experience over theory.

As we have seen, in the second half of the eighteenth century, a vocal percentage of anglophone and francophone physicians and natural philosophers linked inoculation to

77 Anonymous, *Inoculation Made Easy: Containing a full and true discovery of the method practised in the county of Essex*, London, 1766, pp. 5–6.

78 Joseph-Jacques de Gardane, *Le Secret des Sutttons dévoilé, ou L'inoculation mise à la portée de tout le monde*, Paris, 1774, pp. 36–7.

79 Butini, op. cit. (53), pp. 59–60; William Woodville, *The history of the inoculation of the Small-Pox in Great Britain*, London: J. Philipps, 1796, p. v; William Baylies, *Aphorisms on the smallpox ...*, London, 1768.

80 Louis de Laus de Boissy, *Avis aux mères au sujet de l'inoculation ...*, Paris: Des Ventres de la Doue, 1775, pp. 39–40.

81 *Critical Review*, or, *Annals of Literature*, vol. 5, London 1758, pp. 386–7.

82 While Eriksen, op. cit. (6), p. 3, sees the boy's body as a 'translational bridge', I would emphasize the 'improvement' of the procedure by a Western medical practitioner.

83 Charles Maitland, *Account of Inoculating the Small-Pox*, London 1722, p. 7.

84 Maitland, op. cit. (83), p. 7.

85 Antoine Petit, 'Lettre de M. Petit ... à M. Vandermonde', *Journal de médecine, chirurgie, pharmacie, etc.* (1759) 10, pp. 36–7.

86 *Journal Britannique* (May–August 1754), p. 105. After the initial variolation experiments in 1721, supporters compiled examples of successful inoculations to prove that the procedure did communicate real smallpox and would protect against further infection. See James Jurin, *An Account of the Success of Inoculating the Small-Pox in Great Britain*, London, 1724.

the advancement of medicine and considered it a demonstration of medicine's potential benefit to society. Or as the French physician Ambroise Hosty proclaimed, inoculation was 'the greatest discovery achieved in Medicine since Hippocrates'.⁸⁷ Such a discovery as inoculation could have expanded the range of accepted medical sources; however, we have seen how both the critiques and defences of variolation across francophone and anglophone scholarly networks instead largely reproduced persistent concerns about knowledge and authority in a competitive and protean arena of eighteenth-century thought. At the same time, this case study also provides greater insight into the reality of exchange of medical practices, and the elisions needed to declare inoculation only truly medical in its European explication.

Ultimately, the inoculation discourses allow us to examine an emerging rhetorical monolith of 'Western medicine' among cross-sections of intellectual elites that camouflaged both internal debates and malleable ideas about medicine in Western Europe in order to bolster the professional authority of learned physicians after the 1750s. And this fustian claim to the achievement of inoculation was replicated in modern scholarship until relatively recently.⁸⁸ As Lorraine Daston and Sonja Brentjes have demonstrated, the equation of progress with science was already clear in the second half of the eighteenth century, as was the use of 'science' to designate rational, advanced people versus backward groups and practices.⁸⁹ The claims to perfection of or intellectual ownership over the then 'scientific' procedure of inoculation by learned medical professionals supported and was bolstered by elite *philosophes*, such as Voltaire. This characterization of vaccination from the late eighteenth century was only made possible by decontextualizing it from the processes of circulation, translation and adaptation of the original 'Turkish' procedure of inoculation. These erasures, in turn, set the stage for the way British and French physicians and imperialists viewed nineteenth-century syncretic adaptations of vaccination in societies beyond Europe. Our project here is to recapture the work of adaptation and translation in both moments.

Vaccination exported

'Vaccination' was a term coined by the English surgeon Edward Jenner to describe the adaptation of inoculation he developed in 1796 using infectious material from cowpox, a mild malady to humans, as a substitute for discharge produced by smallpox to protect against the disease. Although vaccination would come to be seen as a triumph of rationalist, scientific medicine, the mechanism of vaccination had no more theoretical underpinning than inoculation at the time. Jenner portrayed his conclusions that the epizootic disease of cowpox would protect against smallpox as based on reasoned experimentation and observation, in a triumph of 'Empirick rationalism' and the new science embodied in nineteenth-century medicine.⁹⁰ Although still based on inductive inference,

87 Ambroise Hosty, *Recueil de quelques pièces intéressantes*, La Haye, 1755, Appendix, p. 11.

88 For example, Savage-Smith treats inoculation as European, referring to its 'adoption' in Ottoman Syria. Emilie Savage-Smith, 'Islam', in David C. Lindberg and Ronald L. Numbers (eds.), *The Cambridge History of Science*, vol. 4: *The Eighteenth Century* (ed. Roy Porter), Cambridge: Cambridge University Press, 2003, pp. 666–7.

89 Sonja Brentjes, 'Science as a weapon of cultural competition: interview with Lorraine Daston', in Sonja Brentjes, Taner Edis and Lutz Richter-Bernburg, eds., *1001 Distortions: How (Not) to Narrate History of Science, Medicine, and Technology in Non-Western Cultures*, Berlin: Würzburg Ergon Verlag, 2016, pp. 19–24.

90 Jenner contended that smallpox could be traced back through cowpox to a pox disease of horses, known as 'the grease'. His inquiry was predicated on acceptance of inoculation as a proven preventive of smallpox, and he offered no explanation of the mechanism of inoculation or therefore vaccination. Edward Jenner, *An Inquiry into the Causes and Effects of the Variolae Vaccinae*, London: Simpson Low, 1798, pp. 5–7. See also Nadav Davidovitch and Zalman Greenberg, 'Smallpox and variolation in a village in Palestine in December 1921: a case study of public

Jenner's theory regarding cowpox swiftly became medically valid in England and France because other theoretical foundations had shifted since inoculation's introduction. More precisely, despite a lack of conclusive evidence, the idea of disease specificity, or that each disease was unique and caused by a specific (not universal) factor, had gained significant ground.⁹¹ Furthermore, many contemporaries thought that vaccination seemed to resolve the continuing problems of risk with inoculation, which communicated a disease deadly to humans that could potentially be spread by inoculees. Notwithstanding the simplified narrative of vaccination's conquest of Europe, inoculation did not fade away immediately and resistance to the newer procedure, particularly among those outside the medical establishment, was considerable.⁹²

We can interpret the quick transfer from inoculation to vaccination, primarily among the political and medical elite in English and French circles, as partially due to vaccination's origins. Many of these elites conceived of vaccination as 'Western' or at least originating in England, and therefore a more acceptable, modern procedure.⁹³ Although many advocates of inoculation acknowledged the medicalization of the original folk practice, rising generations of English and French physicians anticipated a limit to how far inoculation could be advanced because the practice transferred smallpox and risked contagion with each procedure. Vaccination, then, was viewed as the next step necessary to move away from the limitations of rudimentary inoculation to a more efficacious procedure, a certain preventive for the individual and broader community.

By the nineteenth century, the refashioning of inoculation as a Western medical 'invention' and its normalization as a prophylactic against smallpox had become the foundation for attempts to control disease through vaccination. Against the backdrop of the shifting balance of power between European states and the Ottoman Empire in the nineteenth century, the circulation, embrace and adaptation of vaccination took on new significance in both contexts. As we will discuss using the case of Egypt, implementation of vaccination became a measure of Ottoman modernity and an ability to stay competitive with European states, while at the same time Egyptians' agency was limited by Europeans who made vaccination a component of their mission to 'civilize' benighted nations and peoples.⁹⁴ As Khaled Fahmy has shown, much of the early scholarship perpetuates the perspective of European physicians in the nineteenth century and the idea of a true, Western science being imposed upon a rudimentary society – of a pattern of modernization through imperialism.⁹⁵

Ottoman Egypt under the governorship of Mehmed Ali (r. 1805–49) offers a prism through which to consider the circulation of knowledge about inoculation and vaccination, complementing our analysis of inoculation in anglophone and francophone networks. We will see the crystallization of rhetoric of nineteenth-century Western Europeans of Western medicine as superior science, buttressed by portrayals of

health, culture and colonial medicine', in Anne Marie Moulin and Yesim Isil Ulman (eds.), *Perilous Modernity: History of Medicine in the Ottoman Empire and the Middle East from the Nineteenth Century Onwards*, Piscataway, NJ: Gorgias Press, 2010, pp. 177–90.

91 DeLacy, op. cit. (11), pp. 140–4; and Santer, op. cit. (18), pp. xviii–xix.

92 See, for example, Nadja Durbach, *Bodily Matters: The Anti-vaccination Movement in England, 1853–1907*, Durham, NC: Duke University Press, 2005.

93 Michael Bennett, *War against Smallpox: Edward Jenner and the Global Spread of Vaccination*, Cambridge: Cambridge University Press, 2020.

94 Bala, op. cit. (5), pp. 1–11. See also David Arnold (ed.), *Imperial Medicine and Indigenous Societies*, Manchester: Manchester University Press, 1986; Roy Macleod and Milton J. Lewis (eds.), *Disease, Medicine, and Empire: Perspectives on Western Medicine and the Experience of European Expansion*, Abingdon, Oxon.: Routledge, 1988.

95 Khaled Fahmy, *In Quest of Justice: Islamic Law and Forensic Medicine in Modern Egypt*, Berkeley: University of California Press, 2018, pp. 1–25.

vaccination as ‘Western’, decontextualized from inoculation and its historical evolution. As will be argued, the story of vaccination in Egypt instead should be understood in a longer context of the circulation of knowledge between Europe and Ottoman territories. Consistent with negotiations surrounding the earlier stages of inoculation, we will find a multiplicity of power relationships, rather than a singular expression of power dictated by the West.

An Ottoman military officer, Mehmed Ali (1769–1849) was part of the Ottoman force sent to resecure Egypt after the short-lived Napoleonic occupation of Egypt (1798–1801). From his arrival in 1801, Mehmed Ali successfully worked to navigate, and ultimately to eliminate, competition for power after the French withdrawal, earning his appointment as Ottoman governor of Egypt in 1805 and launching a far-reaching modernization project in the province. He reorganized Egypt’s institutions, including the military, agriculture, industry and education, building on the increasing emphasis on expertise broadly in the eighteenth century outside Europe. His employment of the French physician Antoine Barthélemy Clot (1793–1868, known as Clot Bey in Egypt) and establishment of a European-style medical school, Qasr al-‘Aini, identify medicine as a key aspect of this modernization. Studies of medicine in Egypt have fixated on Clot as the leading organizer, using his own abundant writings.⁹⁶ Clot, however, clearly positioned European learned medicine as in complete opposition to Egyptian practices. Regarding his work to establish Western medicine in Egypt, he wrote of ‘giving up one’s peace in order to conquer the prejudices of a people, to develop their intelligence, to extend the benefits of civilization’ – a sentiment encompassing what would later be termed France’s civilizing mission.⁹⁷ The focus on Clot in earlier narratives of science and medicine of the early twentieth century followed Clot’s own framing, giving him all the agency in reform and reinforcing an essential view of real medicine as Western European in origin.

Recent Middle Eastern scholarship has illuminated a more complicated, complex interaction of accommodation and translation occurring between Mehmed Ali, Clot and other Egyptian reformers. Far from medicine being solely or even primarily a tool of European imperialism, Mehmed Ali’s own plans were to revive medical practice in Egypt as part of his massive renovation of Egypt’s infrastructure, not to import new medicine from scratch; throughout the first half of the nineteenth century, Mehmed Ali remained firmly in control of the European experts in his employ and of the accommodation of Western practices in Egypt.⁹⁸ For example, Clot rejected quarantine as an effective response to the plague, insisting that filthy conditions caused the disease. Nonetheless, Mehmed Ali integrated quarantine into Egypt’s public-health response because his own military experiences had proved that quarantine worked.⁹⁹

Inoculation against smallpox in Egypt had been in use since the mid-eighteenth century. Napoleon’s surgeon general, Dominique Larrey, reported that inoculation in the region was called ‘finishing with smallpox’ (*takhlis al-jadari*) and also ‘tattooing smallpox’.¹⁰⁰ Vaccination, for its part, had reached Constantinople by 1800 but was not widely adopted, despite elite propaganda from early adopters, including English doctors George Pearson and John Coakley Lettsom, emphasizing vaccination as the modern, thus superior,

96 Fahmy, op. cit. (95), pp. 42–5.

97 Fahmy, op. cit. (95), p. 42; and Gadelrab, op. cit. (30).

98 Amira el Azhary Sonbol, *The Creation of a Medical Profession in Egypt, 1800–1922*, Syracuse, NY: Syracuse University Press, 1991, pp. 112–13.

99 Khaled Fahmy, *All the Pasha’s Men: Mehmed Ali, His Army and the Making of Modern Egypt*, Cambridge: Cambridge University Press, 1997, pp. 209–10.

100 LaVerne Kuhnke, *Lives at Risk: Public Health in Nineteenth-Century Egypt*, Berkeley: University of California Press, 1990, p. 113. Several different colloquial phrases were recorded by Europeans, for example *tishterie el jidderi* and *dak el jedri* (‘hitting the smallpox’).

technique.¹⁰¹ The continued use of inoculation demonstrates the independence of the medical and wider healthcare marketplace in Constantinople and Cairo at the turn of the century.

By 1819, Mehmed Ali called for the establishment of vaccination to address the problem of smallpox, as both anecdotal evidence and a new census indicated that inoculation was inadequate protection. Some Egyptians, however, still rejected vaccination as ‘contrary to their customs’.¹⁰² To overcome this resistance and to assess and more effectively treat the population, Mehmed Ali recognized the necessity of a new standardized medical system in Egypt. Clot arrived in Egypt in 1825, part of the retinue of French physicians who came at Mehmed Ali’s request to develop the public-health institutions of Egypt and establish vaccination in the countryside through an organized public-health campaign. Clot became the first director of Qasr al-‘Aini, a Western-style medical school, in 1827, and continued to work in Egypt until Mehmed Ali’s death in 1849. Restoring the context of Clot’s invitation and arrival is the starting point of our re-evaluation of vaccination in Egypt, building on recent scholarship that emphasizes the complex relationship between Egyptian state-centred reform and Western medical practices. Mehmed Ali forged an Egyptian version of modernity in medicine and public health.¹⁰³ Western medicine was not simply delivered and accepted wholesale as the superior version – neither theoretically nor in practice. Local experiences with inoculation and vaccination determined the state’s commitment to the practices.

Qasr al-‘Aini and practices such as vaccination became key sites of Egyptian translation of European medicine to a new vision of Egyptian public health. Vaccination became compulsory for members of the army, navy, arsenal and schools by 1826.¹⁰⁴ Universal compulsory vaccination was established in 1837, confirming health to be a ‘matter in the public interest [*maslaha al-‘amm*]’.¹⁰⁵ This priority aligned with the standardization bent of *tibb-i cedid* (new medicine) that had emerged in the urban centres of the Ottoman Empire in the early eighteenth century. The Ottoman state in that period had also set the precedent for the state management of medical practices for public health.¹⁰⁶ And similar to European tactics to establish inoculation in Europe in the previous century, Mehmed Ali and his family served as an example to the people, undergoing vaccination in 1840. This effort was moderately successful in urban areas, the central hospital in Cairo recording the vaccination of up to six hundred children per month by the 1850s.¹⁰⁷

The organized campaign to establish vaccination in Egypt proceeded under the administration of the first graduates of the medical school. The execution of this project required not only extensive surveillance of the population, but also a dedicated government workforce. Qasr al-‘Aini provided receptive agents to direct this process but also relied upon Egyptian barber surgeons across the region. The involvement of both

101 Pearson went on a wide-ranging campaign to spread vaccination globally (and link the procedure to himself) by sending threads impregnated with calf lymph to physicians, samples which were then passed on to others. John Baron, *The Life of Edward Jenner, M.D., with illustrations from his doctrines, and selections from his correspondence*, London: H. Colbourn, 1827, vol. 1, pp. 410–19, as cited in Gareth Williams, *Angel of Death: The Story of Smallpox*, Basingstoke: Palgrave Macmillan, 2010, p. 211.

102 Letter from Mehmed Ali to his deputy, 23 March 1819, National Archives of Egypt, register no. 3, doc. no. 247, cited in Kuhnke, op. cit. (100), p. 113.

103 For more on understandings of modernization detached from Europe see Ahmad Dallal, *Islam, Science, and the Challenge of History*, New Haven, CT: Yale University Press, 2012; Alan Mikhail, *Nature and Empire in Ottoman Egypt: An Environmental History*, Cambridge: Cambridge University Press, 2011; Dan Stolz, *The Lighthouse and the Observatory: Islam, Science, and Empire in Late Ottoman Egypt*, Cambridge: Cambridge University Press, 2018.

104 Anne Marie Moulin, ‘Changeante modernité, l’état égyptien et la modernisation de la santé publique (19e–20e siècle)’, in Moulin and Ulman, op. cit. (90), pp. 157–76, 164.

105 Moulin, op. cit. (104), p. 165.

106 Küçük, op. cit. (31), p. 223.

107 Fahmy, op. cit. (99), p. 210.

graduates of the medical school and local barbers in the campaign ensured the political authority of the administrators and a focus on Egyptian rather than Western European objectives. Moreover, the indigenous medical practitioners directing this operation could serve as translators of vaccination from European to Egyptian culture and science. Despite being educated at Qasr al-'Aini according to the European model, with its emphasis on Western scientific superiority, locally trained administrators did resist European practices and conceptualizations when they were in conflict with Egyptian cultural norms, to Clot's dismay.¹⁰⁸ It is consequently unclear how vaccination was understood by these native physicians, or how they explained the practice to popular healers and patients. Even less is known about the understanding and presentation of vaccination by the indigenous barbers essential for the vaccination of people beyond Cairo. The practices of inoculation and vaccination across the Muslim Mediterranean where European countries extended their powers in the nineteenth century are key areas for future research.

However, there is extant evidence that, following Mehmed Ali's approach to European-style modernization, vaccination was integrated into and accommodated within existing medical practices in the region. Vaccination evolved in Egypt just as inoculation had in Western Europe.¹⁰⁹ B. Harun Küçük has described this as a 'creolization', where 'European knowledge did not serve as a replacement but rather as an addition to existing scientific practices'.¹¹⁰ Creolization of vaccination underscores the enduring circulation of knowledge as well as the tension between the particular and the universal within science. For example, Clot collaborated with local sheikhs to head off religious and cultural resistance to the standardization of treatment. Clot also learned of the limitations on male physicians' treatment of Muslim women and consequently established medical education for women. These female physicians, *hakimas*, became a major force in vaccinating the youngest Egyptians because of their access to mothers and small children within the home. Women were essential and regular practitioners in the medical world of Egypt, working not only as midwives, but also as surgeons and physicians.¹¹¹ Contemporary Europeans treated this reliance on women as a major problem throughout the nineteenth century and a perversion of Western medicine.¹¹² These accommodations overall demonstrate that the translation of medical practices was not a unilateral process even in the nineteenth century. Despite the focus of earlier historiography on the visibility of Western European individuals and practices, Europeans and Egyptians across the social and political spectrum clearly accommodated vaccination to Egyptian culture and needs.

Resistance to vaccination

As this article has shown, neither European nor Egyptian medical practice was homogeneous in the nineteenth century, with physicians and patients adopting and adapting their responses to vaccination to match their activities and priorities. Adoption occurred at the administrative level and continued as the local population reacted to and interpreted vaccination's significance. The introduction of vaccination in Egypt went no more smoothly than had the introduction of inoculation in England and France. Levels of compliance fluctuated frequently, and resistance was driven by different ideological

108 Fahmy, op. cit. (95), pp. 4–6.

109 See also Martha Few, 'Circulating smallpox knowledge: Guatemalan doctors, Maya Indians and designing Spain's smallpox vaccination expedition, 1780–1803', *BJHS* (2010) 43(4), pp. 519–37.

110 B. Harun Küçük, 'Science studies and early modern Ottoman science', *International Journal of Middle East Studies* (2015) 47(3), pp. 584–7, 586.

111 Gadelrab, op. cit. (30), p. 378.

112 Ellen Amster, *Medicine and the Saints: Science, Islam, and the Colonial Encounter in Morocco, 1877–1956*, Austin: University of Texas Press, 2013, pp. 142–73.

factors, as opposed to a simple rejection of Western influence. While supporters envisioned vaccination as a modern medical procedure superior to the old, irrational practice of variolation, much of the public was more comfortable with the familiar and effective procedure and continued to elect for inoculation over vaccination. Accumulated experience was on the side of inoculation, especially since the mechanism of vaccination remained unclear. Thus, in both Egypt and Europe, the transition between inoculation and vaccination involved a long period of coexistence.¹¹³ Nonetheless by the mid-nineteenth century, physicians and public-health authorities in Europe and Egypt had reduced any popular resistance to a binary of enlightenment versus superstition and ignorance. Western Europeans and Western-educated physicians portrayed themselves as fighting to enlighten the less civilized masses as they worked to vaccinate the public. An irony obscured by this rhetoric and ignored by early twentieth-century scholars is that inoculation – a practice considered by many English and French physicians to have been perfected by reason and proved by experience in the eighteenth century – by the nineteenth century had become evidence of cultural inferiority.

Yet resistance to vaccination revolved around the evaluation of available evidence and fears of persecution by the government. In 1821, Mehmed Ali had ordered an aggressive campaign to vaccinate the troops of Upper Egypt, comprising primarily Sudanese soldiers. Unfortunately, many of these troops subsequently died of smallpox. As Fahmy has argued, this incident remained a major source of resistance to vaccination, not only because of its failure to prevent smallpox but also because Egyptians associated it with the military and with oppression. The belief that vaccination was actually a way for the government to mark children for conscription became widespread. Villagers thus resorted to various means to protect their sons: flight, camouflage, bribery, forgery of vaccination certificates and even attacking the barber–vaccinators.¹¹⁴ Fear that the state had an ulterior motive in vaccinating children was not unique to Egypt and was the foundation of working-class resistance to vaccination in England as well.¹¹⁵ It was not just Egyptians' mistrust of a medical procedure that mirrored resistance in anglophone societies, but also anxieties about the increasing reach of the state and its authority over individual bodies.

There were additional concerns affecting the acceptance of vaccination in Egypt, such as availability and safety. Cowpox was not a universal epizootic disease, so the vaccine had limited availability outside Europe.¹¹⁶ Vaccines thus varied in efficacy and safety. The vaccine material could become less infectious or rendered completely inactive during transport, creating a false assurance of protection and obscuring certainty about its effectiveness against smallpox. As in many other regions, practitioners in Egypt with only a limited supply of vaccination material resorted to passing the vaccine from arm to arm to keep the germ of cowpox active. This technique, however, created problems of contamination and resulted in the transmission of syphilis and other diseases. Europeans also railed against the same negative outcomes.¹¹⁷ The problem of supply was not resolved in Egypt until the British established a vaccine institute in 1896.¹¹⁸ The vaccine's failure to protect Mehmed Ali's Sudanese soldiers from smallpox and the

113 See Kuhnke, op. cit. (100), p. 158. On the transition from inoculation to vaccination in other colonies see Cristiano Bastos, 'Borrowing, adapting, and learning the practices of smallpox: Notes from colonial Goa', *Bulletin of the History of Medicine* (Spring 2009) 83(1); M. Hervieux, 'Variolisation', *Bulletin de l'Académie nationale de médecine* (1901) 45, pp. 276–82, 276.

114 Fahmy, op. cit. (99), pp. 225–6.

115 Durbach, op. cit. (92), pp. 93–9.

116 Andrea Rusnock, 'Catching cowpox: The early spread of smallpox vaccination, 1798–1810', *Bulletin of the History of Medicine* (Spring 2009) 83(1) pp. 17–36.

117 Durbach, op. cit. (92), pp. 171–83.

118 Chiffolleau, op. cit. (5), p. 78.

inadvertent spreading of disease due to unsanitary practices demonstrate the overriding importance of the safety and efficacy of a procedure, as opposed to any 'science' behind it, in determining the likelihood of its adoption. The process of evaluating efficacy reveals not only tensions with the accommodations that occur with the exchange of practices, but also claims to authority over reason and experience.

Conclusion

From the days of George Sarton, historians of science have acknowledged that the exchange of information is essential to new discoveries and scientific advancements. It is also necessary, however, to analyse how the dynamics of power influence the visibility and understanding of the dissemination of knowledge, particularly in the area of medicine. Although there has been a growing scholarship on the global circulation of knowledge, including within and beyond Islamic societies, much more remains to be done to replace the view of science as a product of Western Europe.

We have explored how the diverse dynamics of knowledge production in emergent English and French scientific and medical networks directly influenced how contemporaries viewed the circulation of medicine and the broader translation of medical practices between societies. As European societies underwent diverse economic and political transformations in the eighteenth and nineteenth centuries, many, including the English and French, linked these changes to a sense of improvement. Even as Enlightenment intellectuals turned an increasingly critical eye towards their own countries' political and social structures, they continued to retain a sense of superiority vis-à-vis the Ottoman Empire: rather than a two-way exchange, Western knowledge was being exported for the improvement of Ottomans.¹¹⁹ Nineteenth-century imperialism similarly framed science and medicine as a European achievement from which the rest of the world would benefit. Knowledge did not circulate but was delivered by Europeans and received by others. Our examination of inoculation and vaccination, however, demonstrates that, in reality, through the eighteenth and nineteenth centuries, knowledge moved within complicated processes of translation and negotiation, and was both accommodated and transformed as a result of these debates. As scholar Sven Dupré has argued, 'Change is the essence of translation, not incidental'.¹²⁰ Immunization practices are an especially illustrative case but not the only example of the rich exchange of medical knowledge lying beneath a rhetoric of universal 'Western' science that persists, despite deep-seated conflicts surrounding vaccination in modern, industrialized nations.

In conclusion, we find that there was no singular medicine represented in inoculation or vaccination, nor a clear 'Western' medicine in the past or today. Immunization methods were the product of complicated processes of translation between societies with no one point of origin. The introduction of inoculation emanating from elite scholarly circles in England and France reveals the multifaceted dynamics affecting the exchange of scientific and medical information across societies. Translation or circulation endured, but Europeans acknowledged and justified it through a different frame that began in the eighteenth century. Western practices became the universal standard for modern civilization, and scientific medicine was a key area of justification. Consequently, as we saw in Clot's frustration, some French and British imperialists described changes made to their practices as problems to be overcome. Despite the rhetoric, however, we see patterns of translation across nineteenth-century imperialism and striking similarities in health practices across cultures that remain today. Moreover, lingering tensions between

119 Brentjes, *Travellers from Europe*, op. cit. (2), p. 147.

120 Dupré, op. cit. (47), pp. 302–7.

universalism and particularism still define public-health efforts at the regional and global levels, influencing our notion of medical progress.

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