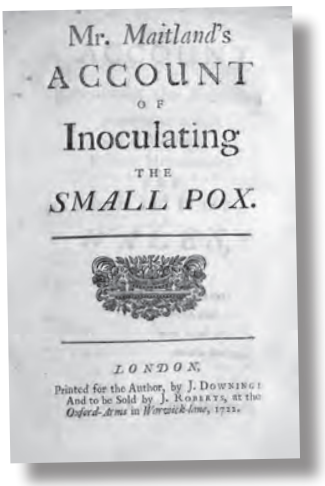

Mr. Maitland's
ACCOUNT
OF
Inoculating
THE
SMALL POX.

LONDON,
Printed for the Author, by J. Downing:
And to be Sold by J. Roberts, at the
Oxford-Arms in Warwick-Lane, 1722.

Cover of *Mr. Maitland's Account of Inoculating the Smallpox* from 1722. Source: *The Wellcome Collection* at https://tinyurl.com/33yunp5e.

Variolation to Vaccine

Smallpox Inoculation Travels East to West and Back Again

By Susan Spencer

The history of the inoculation process itself might help shed light on the roots of controversies we are facing today.

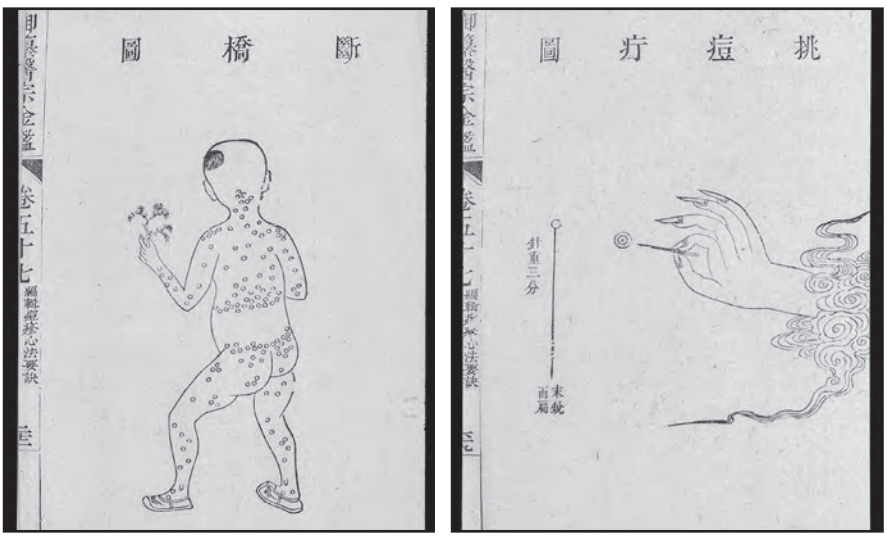
In the spring of 1721, England struggled in the grip of a deadly smallpox epidemic. Mandated shutdowns affected businesses, schools, and social venues, health care services were overwhelmed, and the newspapers reported alarming death tolls. Doctors in London seized the opportunity to introduce the public to the concept of inoculation, which had long been practiced in Asia and the Middle East but was known to only a handful of western scientists. The result was an important confluence of scientific knowledge from the East and the West, which by the end of the eighteenth century resulted in the production of the world's first modern vaccine. By the end of the nineteenth century, vaccination had spread across the globe. By the end of the twentieth century, the once dreaded disease was entirely eradicated.

A less positive outcome of this East-West exchange came in the form of cultural tensions that are familiar to us three centuries later: widespread inoculation hesitancy, xenophobia, religious-based objections, and the spread of misinformation about the virus's origins and treatment. An examination of how these reactions played out, and the history of the inoculation process itself, might help shed light on the roots of controversies we are facing today.

Smallpox Inoculation in China and India

Although evidence of the use of inoculation as a preventive measure against life-threatening disease is found in ancient Sanskrit Ayurvedic texts and early Chinese and Arabic medical treatises, documentation of an organized campaign against the smallpox *variola* virus does not appear until after Manchu invaders from the north overpowered China's Ming dynasty and founded the Qing dynasty in 1644. Earlier in Ming China, the disease had become endemic over the course of centuries, and smallpox—which tends to be more virulent when contracted as an adult—was classified by medical professionals as primarily a childhood ailment. Children were often deliberately exposed to *variola* through the process of variolation, where scabs from someone with a mild case of smallpox were ground into a powder and diluted with water or wine, then set aside for a month or exposed to hot steam to weaken the viral load. The mixture was either blown up the nose by means of a long pipe (insufflation) or introduced under the skin with a needle.[1]

Since the Manchu population lacked the built-up immunity of the native Han Chinese, as the Qing conquerors moved into crowded urban areas they were at the mercy of an invisible enemy. Having inherited the medical establishment of their Ming predecessors, the new dynasty concentrated on strengthening smallpox



An example of "broken bridge" (*duanqiao*) smallpox and an illustration of inoculation with a needle from *The Golden Mirror of Orthodox Medicine*, commissioned by the Qianlong emperor (r. 1736-1795) in 1742. Composed by a team of eighty specialists from China's Imperial Academy of Medicine, the *Golden Mirror* devoted three sections—eleven of the ninety volumes—to children's diseases, with an emphasis on smallpox. Through extensive use of diagrams, mnemonic verses, and illustrations that revealed different patterns of pockmarks along with an explanation of what those patterns meant for prognosis, the book's purpose was to establish an official canon of recommendations for various ailments and reach as broad an audience as possible. Such texts were an important weapon in the Qing dynasty's battle against the disease. Source: *The Wellcome Collection* at https://tinyurl.com/5n7znh6v and https://tinyurl.com/bdh75txw.

protections through strict quarantine procedures and contact tracing, and even created an official smallpox investigation agency that lasted more than two centuries. By the time of the Kangxi Emperor (r. 1661–1722), the royal family and entire army had undergone variolation.[2] As doctors at the Qing court were pressed to concentrate their attention on the eradication of smallpox, manuals with advice about prevention and treatment spread along trade routes, reaching Constantinople as early as 1650.[3]

The history and efficacy of variolation was a major topic discussed in these texts. In 1727, Yu Tianchi's *Collected Commentaries on Smallpox* claimed that smallpox inoculation first arose in the Ming dynasty's Longqing reign-period (1567–1572), and described the first inoculator as "an eccentric and extraordinary man who had himself derived it from the alchemical adepts."[4]

In India, door-to-door smallpox inoculation was performed in people's homes by itinerant Brahmin specialists known as *tikadars* who maintained a relationship with client villages that they visited on a regular circuit, generally once or twice a year in February or March before the disease hit its annual peak. The process, known as *tika*, involved several days of religious rites, dietary restrictions, and close observation of inoculated patients during the recovery stage. Entire households and their neighbors were treated at the same time. Simultaneous treatment was an important factor in creating a form of herd immunity, as variolated patients contracted a milder version of the virus that was nevertheless contagious, and potentially deadly, to members of the community who lacked natural or induced immunity. The tikadar inserted a large sharp needle under the skin, preferably somewhere on the arm, and bound the wound with a cloth that contained smallpox virus. Unlike their Chinese contemporaries, tikadars did not harvest infected matter from patients with naturally occurring smallpox, instead collecting scabs from patients in the recovery phase of the tika procedure and setting them aside for the following year.

Western physicians seem to have been largely unaware of Indian preventive measures against smallpox until a surgeon stationed at Calcutta, Robert Coult, described his observation of the inoculation process in a letter dated February 1731. By that time, it had been long established as an accepted practice throughout India, especially in the south. According to Coult, "The operation of inoculation called by the Natives *Tikah* has been known in the Kingdom of Bengall (*sic*) as near as I can learn, about 150 years."[5]

Variolation was a risky business, though considerably less so than contracting the disease naturally; mortality in variolated patients was approximately 1 percent to 2 percent, as compared to the 30 percent mortality rate of ordinary smallpox.[6] Variolation was also less likely to result in common side effects such as blindness or serious disfiguration. Like naturally-contracted smallpox, it conferred lifelong protection against the disease after the patient had recovered.

Awareness of Inoculation Spreads to the West

As Britain expanded its global reach, London's Royal Society (founded by King Charles II in 1660 for the purpose of "improving natural knowledge") became an important clearing house for international scientific information, frequently receiving letters and specimens for study. In January 1700 a trader stationed with the East India Company in China sent a letter describing smallpox insufflation to Dr. Martin Lister. Coincidentally, Lister's colleague Dr. Clopton Havers had received a similar letter from another correspondent, which he submitted to the Society in February, before Lister's letter arrived in England.

By 1712, the Society was actively soliciting information from informants abroad, and in the spring of 1714 they published in their *Transactions* a translation of parts of a Latin monograph by Emanuel Timoni, the family physician to the British Ambassador in Turkey. Timoni described the practice of inoculation by means of a needle under the skin as having only recently come into common usage "altho' at first the more prudent were very cautious in the use of this Practice; yet the happy Success it has been found to have in thousands of Subjects for these eight Years past, has now put it out of all suspicion and doubt."[7] Timoni, who had witnessed successful variolation procedures in Constantinople, provided a detailed description of how to prepare the patient, where and how to insert the needle, and instructions for aftercare. This last was important, since a successful variolation produced fever and a scabby rash that would usually last for several days. Asymptomatic recipients were generally advised to repeat the procedure to ensure their immune system would recognize the virus upon future exposure.

Despite the information from China and Turkey, for years discussion of inoculation against smallpox was treated as an academic curiosity rather than a practical treatment. Since the 1660s, smallpox had edged out the bubonic plague as the leading cause of death in English cities. Like plague, smallpox was described by the clergy as a scourge sent by God, either as judgment for past sins or as a trial to test one's faith. To tamper with God's will risked condemnation by the Church.[8]

It took a celebrity endorsement to bring public attention to the procedure, and luckily an appropriate influencer arrived on the scene when Edward Wortley Montagu was appointed Britain's Ambassador to the Ottoman Empire. He was accompanied by his wife, Lady Mary, a well-connected Earl's daughter whose brilliant wit had established her at the center of London's political and literary circles.

Mary Wortley Montagu had lost her brother to smallpox in 1713 and was herself disfigured by the disease two years later, so it was inevitable that when she took up residence in Constantinople in 1717 she had a keen interest in the inoculation process. Lady Mary enlisted Emanuel Timoni and the surgeon she had brought from England, Charles Maitland, to assist a local variolator in the inoculation of her four-year-old son. A

A Malaban woman invoking the goddess of smallpox and carrying fire on her head as symbolic of the disease.
Source: *Wikimedia Commons* at https://tinyurl.com/2p93ethh.

Since the 1660s, smallpox had edged out the bubonic plague as the leading cause of death in English cities.

Top: John Zirbes' Vaccinator Patent Model, 1872, and bottom, W. Gordon Automatic Vaccinating Instrument Patent Model, ca 1857.
Source: *Smithsonian* website at https://tinyurl.com/35s96wf5.

Lady Mary Wortley Montagu with Her Son, Edward Wortley Montagu, and Attendants, by Jean Baptiste Vanmour, c. 1718. Source: *Wikiart* at https://tinyurl.com/58a3ehpv.

famous portrait of the mother and child shows them in a peculiar pose, with Lady Mary grasping the boy's elbow and forcing his arm into an awkward position, which has led some scholars to speculate that she is drawing attention to the site of his inoculation. It was Lady Mary's involvement and extensive social network that would hasten variolation from academic speculation to practical application, serving as the messenger to carry the practice of inoculation from the Eastern world to the West.

Under Lady Mary's enthusiastic endorsement, within a year inoculation became a trend among the English aristocracy.

Introduction of Inoculation Techniques and Clinical Trials in London, 1721

By the time smallpox ravaged London in the spring of 1721, the Wortley Montagus had returned to England. Alarmed, Lady Mary summoned Charles Maitland from retirement to inoculate her daughter. Despite his initial reluctance to perform the first variolation on British soil, Maitland agreed to conduct the operation and to invite a number of fellow physicians to observe the child's progress of recovery. They were impressed enough to petition King George I for permission to conduct an experimental study on death-row convicts, with a promise of full pardon if they survived. That summer, six volunteers from Newgate Prison were inoculated by the Turkish method under the supervision of Hans Sloane, the President of the Royal College of Physicians. All survived. A seventh received the nasal insufflation method as practiced in China, but since she experienced an immediate painful migraine and more severe symptoms over the recovery period, the experiment was not repeated.[9]

Under Lady Mary's enthusiastic endorsement, within a year inoculation became a trend among the English aristocracy. Even the Princess of Wales had her daughters inoculated—though the King was not yet willing to submit his male heirs to a potentially dangerous procedure.

Yet despite its evident success and popularity in high society, inoculation was not immediately embraced by the medical community at large, even among physicians who spent their days trying to save the lives of people suffering from a disease that killed nearly a third of its victims and disabled many more. Although variolation could be administered under controlled circumstances, determining where and when a patient would contract smallpox and enabling quarantine measures before symptoms appeared, the *variola* virus itself was still the agent of infection. Injecting live virus was dangerous and potentially fatal. Inoculated patients remained infectious for several days, so unless an entire household could be inoculated at once those who had not contracted the disease in the past would be placed at risk.

Conservative doctors felt nervous about a procedure that seemed radically novel despite its long history in the East. Infecting a healthy person purposefully seemed against nature and contrary to the Hippocratic

theory of balancing the humors that prevailed in Western medical education. Even more problematic in the exclusively masculine world of medical science was the fact that inoculation was being promoted by Lady Mary, a female with no formal medical training. Worse, the treatment in Turkey was traditionally administered by women—Muslim women, in fact, which made it all the more suspicious.

Resistance and Misinformation

Maitland tried to get ahead of the inevitable backlash by publishing a thirty-five-page pamphlet in February 1722, beginning with his operation on Lady Mary's son in Constantinople and concluding with a detailed account of the Newgate trials. Since the knowledge of inoculation was "obtain'd amongst an illiterate Sort of People," he claims in his introduction,

> *I thought it became me, to give the Publick a plain and honest Account of the Truth of Facts; both to prevent, if possible, any one's being impos'd upon, as to the Trials already made; or scar'd from the Practice of it for the future.*[10]

It is clear he already anticipated the disinformation campaigns to come.

Criticism was not long in arriving. The respected physician William Wagstaffe, a Fellow of the Royal Society, wrote in an anti-inoculation diatribe a few months later,

> *Posterity perhaps will scarcely be brought to believe that a method practised only by a few* Ignorant Women*, amongst an illiterate and unthinking People should on a sudden, and upon a slender Experience, so far obtain in one of the Politest Nations in the World as to be received into the* Royal Palace.[11]

To make the procedure more in line with Western expectations for professional medical treatment, practitioners added state-of-the-art embellishments such as purging, blood letting, and extended periods of fasting. Not content to follow the traditional method of simply pricking the patient with a needle, surgeons laid open a large portion of the arm or leg with a lancet to create an avenue of escape for bad humors, prescribed cordials to hasten the onset of fever, and occasionally inserted multiple doses of smallpox matter on the principle that if some therapy was good, more must be better.

Later that year, an unbroken string of successes was cut short when two people died after being inoculated. Although it is uncertain whether the inoculation itself was the cause of death, their demise was publicized by newspapers and pamphleteers, creating additional safety concerns. Lady Mary fired back with an anonymous letter to the *Flying Post* newspaper, under the masculine guise of a "Turkey Merchant" who had witnessed inoculations in Constantinople. The letter blames the deaths, which she refers to as "murders," on the excessive zeal to justify charging high fees for dangerous add-ons to what should have been a simple and easy procedure.

As the media profile of variolation increased, so did the use of jingoistic and racist language on both sides of the argument. One of the most influential pamphlets on the pro-inoculation side, anonymously published in 1725, encouraged the hesitant by pushing the blame for smallpox onto global expansion and describing the disease in terms of an invasion, "both of a Foreign Extract, and of a late Origin." Smallpox must be "extirpated from the Nation. . . . For why shou'd we cherish the cruel Blood of Africa or Asia in our Bowels, that have made these frightful Ravages among us?"[12] In 1733, an anti-inoculation pamphleteer described how "This barbarous and dangerous Invention was about 10 Years past imported at *London* from *Turkey*; the Curiosity like many other *foreign* Monsters pleased at first, but soon after grew ungovernable by it's own Masters, and when let loose, made great Havock and Slaughter."[13]

From Variolation to Vaccine

One of the recipients of painfully "enhanced" treatment was Edward Jenner, who was inoculated as a child in 1757. Having suffered acutely in the recovery phase, when he became a doctor in adulthood he made it his life's work to find a better solution. Since dairy maids had a reputation for their unmarked complexions and unusual resistance to smallpox, he hypothesized that immunity might be transferred across species through cowpox, a disease that caused lesions on the hands after milking infected cows. In 1796, he extracted matter from cowpox lesions and used it to inoculate a young boy, who developed minor fever and discomfort but no further symptoms. When he carried out a follow-up inoculation using the variolation technique of introducing actual smallpox virus, the boy experienced no reaction at all and was pronounced immune. Jenner called the process "vaccination," a word derived from the Latin *vacca*, or cow, and *vaccinia*, cowpox.[14]

Although Jenner's initial paper describing his findings was rejected by the Royal Society, he persisted in his experiments and published a pamphlet on his own. Eventually his ideas were taken up by doctors in London and other cities who ran clinical trials, and by the end of the eighteenth century the idea of vaccination as a safe alternative to variolation was widely accepted throughout Europe. In 1840, England's Parliament passed a National Vaccine Act that outlawed variolation and legislated the first guaranteed free medical service in Britain's history: smallpox vaccination for infants.

Jenner called the process "vaccination," a word derived from the Latin vacca, or cow, and vaccinia, cowpox.

Portrait of Edward Jenner. Source: *Wikimedia Commons* at https://tinyurl.com/uvrxkyfd.

The First Vaccination of Edward Jenner (1749–1823) by Gaston Melingue (1840–1914). *Notice the symbolism of the milk maiden (on the right), wrapping her infected hand and the cow yoke on the ground at her feet.* Source: *Wikimedia Commons* at https://tinyurl.com/2zjpm4vu.

1808 cartoon showing Jenner, Thomas Dimsdale and George Rose seeing off anti-vaccination opponents. Coloured etching by I. Cruikshank, 1808. The caption at the base of the picture reads "VACCINATION against SMALLPOX or Mercenary & Merciless spreaders of Death & Devastation driven out of Society!" Source: *Wikimedia Commons* at https://tinyurl.com/2rf74abr.

Words in the cartoon balloons:

The shortest agent of disease grumbles: "Curse on these Vaccinators, we shall all be starved, why Brother I have matter enough here to Kill 50."

The tallest extrapolates: "And those would communicate it to 500 more."

The third, whose knife reads "The curse of human kind", agrees: "Aye. Aye. I always order them to be constantly out in the air, in order to spread the contagion."

Jenner, brandishing a knife that reads "milk of human kindness," beseeches: "Oh Brothers, Brothers, suffer the love of Gain to be Overcome by compassion for your fellow creatures, & do not delight to plunge whole Famileis [sic] in the deepest distress, by the untimely loss of their nearest and Dearest relatives."

A cherub places a wreath on his head while declaring: "The preserver of the Human Race".

A bystander quips "Surely the disorder of the Cow is preferable to that of the Ass."

Response to Vaccination in India

As early as 1802, the British East India Company began to export lymph derived from vaccinated patients, preserved on threads pressed between glass plates. In 1808 a British surgeon posted at the imperial court in Delhi presented the Mughal Emperor Akbar II with "some lancets properly prepared, by means of which the King vaccinated, with his own hand, many of the Royal grandchildren."[15] Contrary to expectations, however, this new variation on the centuries-old practice of inoculation did not gain universal acceptance despite its promise of lifelong immunity without the potential of serious side effects and fatality associated with variolation.

Vaccination faced several obstacles to widespread adoption. Vaccinators were required to be licensed, but they received no financial compensation from the state until provincial governments established salaried positions in the second half of the nineteenth century. They were forced to charge a fee for their services, which led to low coverage in rural and impoverished areas. Worse, the lack of official support put them in direct competition with the Brahmin tikadars, who had already established a longstanding relationship with the communities. Faced with the loss of an important source of income, the tikadars embarked upon an organized opposition campaign. To complicate matters further, many Hindus were concerned about the vaccine's origins, since cows are a sacred animal.[16] This last objection persisted in India for at least a century, especially as distrust in the British was significant and well-founded; in 1913, Mahatma Gandhi remarked that "I personally feel that in taking this vaccine we are guilty of a sacrilege." In 1929, he went on record to claim that vaccination should be eschewed by pious Hindus as the injection of a serum derived from a cattle disease was "tantamount to partaking of beef."[17]

Lessons for Today

The story of smallpox inoculation can add historical perspective to a number of controversies that dominate today's headlines, opening avenues of discussion that can be difficult to address in our current divided political climate. The parallels to challenges our society has faced in the midst of the recent pandemic are enough to catch students' attention immediately and connect with their lived experience. This topic can also serve

as a useful jumping off point in the classroom to address difficult questions that may seem peculiar to our own situation in the twenty-first century, even when some of the details may seem very culturally specific and perhaps even alien.

For instance, the Hindus' concerns about the origins of Jenner's vaccine have similarities to misgivings that some Christians in the US have voiced on the use of fetal stem cell lines in COVID vaccines. A related example that occurred in one of the major branches of the Federal Government is Justice Neil Gorsuch's dissent published on December 13th 2021, when the US Supreme Court upheld New York's vaccination mandate for health care workers with no religious exemptions. Gorsuch was joined by devout Catholics, Justices Alito and Thomas, in an unsuccessful attempt to block the decision to let the ruling stand. In contrast, Justices Roberts, Kavanaugh and Coney Barrett—also devout Catholics—sided with the three other justices who upheld New York's mandate.

The 300-year-old rhetorical strategies that we see drawing on racial prejudices in the variolation "pamphlet wars" could open a conversation about the causes and effects of hate speech, and whether the same attitudes have persisted or have evolved—and if so, how? The characterization of smallpox as an invasive Asian virus in English periodicals and pamphlets may bring to mind similar invective in twenty-first century media outlets, especially social media, that is one factor that possibly contributed to the widespread rise in violence against Asian Americans reported in the news in the spring and summer of 2021. In addition, Dr. Wagstaffe's pamphlet included the language of misogyny ("ignorant women") and Islamophobia ("illiterate and unthinking People"), problems that are not related to COVID issues but are still present in society.

Another topic with potential for lively discussion is the role of special interests, a subject under examination in the news lately that even impacts how we view the reliability of news outlets themselves. In the case of the British doctors and the Indian tikadars who decried unfamiliar methods (similar to objections to Pfizer-BioNTech and Moderna's introduction of mRNA vaccines), some protestors were sincere but others were motivated by a concern that their livelihood would be endangered. One might argue that a similar sentiment led to objections against COVID restrictions that affected businesses.

A more controversial parallel would be the reports of misinformation about the COVID vaccines spread by social influencers who had a financial interest in selling alternative treatments and supplements. Often, students have a better knowledge about the landscape of social media than their instructors; such a conversation or homework assignment empowers them to jump in as discussion leaders. Here's a question we might ask ourselves and our students: how would Lady Mary Wortley Montagu's campaign fare in a comparison with today's coverage of high-profile figures who received a COVID vaccine and recorded their experience of the shot and its aftereffects on Facebook or TikTok? ◆

How would Lady Mary Wortley Montagu's campaign fare in a comparison with today's coverage of high-profile figures who received a COVID vaccine and recorded their experience of the shot and its aftereffects on Facebook or TikTok?

Shanghai COVID-19 lockdown January 21, 2021. Source: *Wikimedia Commons* at https://tinyurl.com/yeey3p55.

NOTES

1. Information about early methods of variolation, as well as suggestions for its origin and the story of its spread from East to West, can be found in Arthur Boylston, "The Origins of Inoculation," *Journal of the Royal Society of Medicine* 105, no. 7 (July 2012): 309–313.
2. For details about the Qing dynasty's efforts to combat smallpox both before and after their conquest of China, see Chia-Feng Chang, "Disease and Its Impact on Politics, Diplomacy, and the Military: The Case of Smallpox and the Manchus (1613–1795)," *Journal of the History of Medicine and Allied Sciences* 57, no. 2 (April 2002): 177–197. Chang comments on the "social, political, and ethnic disturbances" created when the investigation agency's officers were accused of government overreach—another parallel that will sound familiar to twenty-first century readers.
3. Boylston, 311.
4. Joseph Needham, *Science and Civilisation in China,* vol. 6: Biology and Biological Technology (Cambridge: Cambridge University Press: 2000), 134.
5. From Robert Coult, "An Account of the Diseases of Bengall," extracted by Dharampal in *Indian Science and Technology of the Eighteenth Century: Some contemporary European Accounts* (Hyderabad: Academy of Gandhian Studies), 1971, 149–150. More specific details, including the mention of the tikadars' collecting matter from variolated patients only, are given in a later letter by J. Z. Holwell, a Fellow of the Royal Society. Addressed to "the President and Members of the College of Physicians in London, A.D. 1767," Holwell's letter pieces together information gleaned from multiple unnamed informants who had been sending their observations to the society for the past several decades (Dharampal, 151–167). The word *tika* is still used as the word for vaccination in many parts of India.
6. Public Health Service Historian, "Smallpox: A Great and Terrible Scourge" (online exhibit), last modified July 30, 2013, https://www.nlm.nih.gov/exhibition/smallpox/index.html.
7. Emanuel Timoni, letter excerpted by John Woodward, "An Account, or History, of the Procuring the Small Pox by Incision, or Inoculation; As it Has for Some Time Been Practised at Constantinople," *Philosophical Transactions* 29 (1714): 72–82, p. 72.
8. The religious objection to inoculation against smallpox—an argument sometimes heard today from proponents against vaccination—was dismissed relatively quickly by the British medical establishment but carried on in Catholic France. Inoculation was condemned by the medical faculty of the University of Paris until King Louis XV died of smallpox in 1774. See Arthur M. Silverstein and Genevieve Miller, "The Royal Experiment on Immunity: 1721–1722," *Cellular Immunology* 61, no. 2 (1981): 437–447, regarding details of the public hesitancy that accompanied early British experiments with inoculation. The section on French resistance is a relatively short passage on pages 443–444.
9. Ibid., 441–442.
10. Charles Maitland, *Mr. Maitland's Account of Inoculating the Smallpox* (London: J. Downing), 1722, 1.
11. William Wagstaffe, *A Letter to Dr. Freind Shewing the Danger and Uncertainty of Inoculating the Small Pox* (London: Samuel Butler, 1722), 5–6. The italics are in the original.
12. *A New Essay on the Small-Pox with a View to Preserve This Nation from the Infection of That Distemper* (London: J. Roberts, 1725) 3, 9.
13. Martin Warren, M.D. "An Answer to a Pamphlet, Entituled [sic], Some Reasons Why the Practice of Inoculation Ought to be Introduced into the Town of Bury at Present." (Bury St. Edmunds: Thomas Bailey), 1733, 3. The italics are in the original.
14. Stefan Riedel, "Edward Jenner and the History of Smallpox and Vaccination," *Baylor University Medical Center Proceedings* 18, no. 1 (2004): 21–25.
15. Quoted by Rana Safvi from a letter written by Archibald Seton, resident surgeon in Delhi, to the governor general in Calcutta, 1808, April 30, 2021, https://tinyurl.com/2p8dpysd.
16. Chandrakant Lahariya, "A Brief History of Vaccines & Vaccination in India," *Indian Journal of Medical Research* 139, no. 4 (2014): 491–511.
17. Benita Fernando, "India's Troubled History of Vaccination," *The Indian Express*, February 21, 2021, https://tinyurl.com/m7y8mysk.

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