Treatise on Smallpox Vaccination

by Dan Beach Bradley
translation by Quentin (Trais) Pearson

Translator's introduction

In December 1842, the American missionary-physician Dan Beach Bradley (1804-1873) watched helplessly as his eight-month old daughter succumbed to smallpox. Although Bradley was well acquainted with the use of both variolation and Jennerian vaccination to inoculate against smallpox, he had been unable to locate either active smallpox or cowpox in Siam, and his daughter succumbed to the disease. Thereafter, his campaign to introduce vaccination to Siam took on a new urgency. He turned to the printing press to document his efforts and publicize his campaign. Bradley's *Treatise on Vaccination* was published in Bangkok in 1844 in an original press run of 500 copies.[1]

Bradley's treatise is at once distinctive and generic, recounting a local iteration of a global undertaking. Reading the treatise we are privy to the peculiar circumstances of the missionary-physician and his doubled efforts to spread both Western medicine and the gospel in a foreign land. The text reveals clues about the main challenges that Bradley envisioned his campaign would face, notably the supposition that Siamese bodies were fundamentally differently constituted than those of Westerners, and that Western medicine might therefore not be suitable.[2] The treatise also provides a record of Bradley's engagement with traditional Siamese medical practices and *materia medica*. It is therefore useful for considering the question to what extent did the practitioner of Western medicine seek out and recognize homologous therapeutics in indigenous traditions. In an era of rapid change in both Western and Siamese medicine, the treatise

[1] Dan Beach Bradley, ทำราปลูกฝีโคให้กันโรคธรพิศไม่ให้ขึ้นได้ *Thamra [sic: tamra] pluk fi kho hai kan rok thoraphit mai hai khun dai: Treatise on Vaccination Comprising a Narrative of the Introduction and Successful Propagation of Vaccina in Siam* (Bangkok: A.B.C.F.M. Press, 1844). The translation and reproduction of the title page were made from a copy held by the Boston Medical Library in the Francis A. Countway Library of Medicine at Harvard University, available through the Open Collections Program at: http://nrs.harvard.edu/urn-3:HMS.COUNT:1171575.

[2] As I have argued elsewhere, Bradley seems to have understood that the fundamental cultural barrier to the practice of Western medicine in Siam was what he took to be the widespread belief among Siamese that the Siamese people were distinct from Westerners in their metaphysical constitution, and that Western medical remedies might therefore not be appropriate for Siamese bodies. Bradley addressed this more explicitly in his *Treatise on Midwifery* (1842); see Quentin Pearson, "'Womb with a View': The Introduction of Western Obstetrics in Nineteenth-Century Siam," *Bulletin of the History of Medicine* 90, 1 (Spring 2016): 1-31.

also bears closer scrutiny for what it might reveal about medical understanding of disease vectors in the era before the germ theory of disease. Bradley's efforts to describe the nature of both smallpox and cowpox as well as the operations of the vaccination procedure seem to cohere with contemporary notions of communicable illness, in spite of his unequivocal commitment to a miasmatic theory of disease origination.[3]

At the same time, Bradley's text is representative of a global campaign predicated on networks that included physicians, missionaries, bureaucrats, and kings, who were all allied in the effort to eradicate the scourge of smallpox. From this perspective, Bradley's treatise might be seen as but one entry in a genre of medical treatises inspired by Edward Jenner's own submission.[4] In their zeal, Jenner's acolytes evinced a cultish following that seemed to prefigure the work of another biomedical pioneer, Louis Pasteur (1822-1895).[5] And, like Pasteur, there is good reason to reconsider the work of the "Jennerians" in light of recent theoretical insights into the relations between science and society.[6] Even if Jennerian vaccination failed to alter the ontology of society in the same manner that Bruno Latour claims for Pasteur's discovery of the microbe, it nevertheless provides important opportunities for evaluating the social nature of undertakings in medical science, specifically the nature of networks and discipline. Bradley's campaign was inevitably aimed at members of the Siamese elite,

[3] In what is the definitive study of the introduction of germ theory in Thai society, Davisakd Puaksom observed that although Bradley was committed to a miasmatic theory of disease, there is evidence in his early published works of the influence of contagionism; see his "Of Germs, Public Hygiene and the Healthy Body: The Making of the Medicalizing State in Thailand," *The Journal of Asian Studies* 66(2) (2007): 311-344, 316.

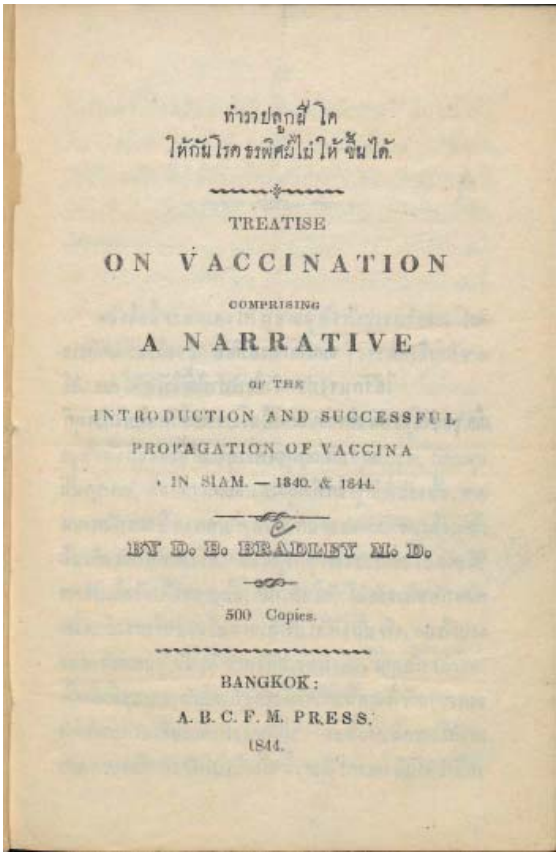
[4] Edward Jenner, *An Inquiry into the Causes and Effects of the variolae vaccinae* (London: Sampson Low, 1798).

[5] See, for example, Michael Bennett, "Passage Through India: Global Vaccination and British India, 1800-05," *The Journal of Imperial and Commonwealth History* 35, no. 2 (2007): 201-220.

[6] Bruno Latour, *The Pasteurization of France*, trans. Alan Sheridan and John Law (Cambridge, MA: Harvard University Press, 1988).

whose patronage he sought. He also had to enlist the aid of Siamese physicians if his campaign was to grow beyond the limited reach of his own two hands. But there are still other social implications that might be read into Bradley's text for those attentive to the agency of the cowpox lymph itself, which required careful mediation to survive the overseas journey to Siam.[7]

In the end, Bradley's campaign to eradicate smallpox in Siam was supplanted by the work of the Pasteurians. The efforts of missionary-physicians in the 19th century never fully took hold. Smallpox remained endemic in parts of Siam and deadly outbreaks continued until the waning years of the century.[8] The failure lay perhaps in his campaign's reliance on personal networks and individual humanitarian impulses: Bradley's charitable networks failed to ensure a constant supply of *vaccinae* matter, which had to be purchased from the United States at great expense.[9] It was not until the Pasteur Institute was established in Saigon in 1890, where vaccinia lymph was produced and distributed regionally at much lower cost, that true progress was made in eradicating the disease in Siam.[10]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ให้กันโรคธรพิศม์ไม่ให้ขึ้นได้.

TREATISE
ON VACCINATION
COMPRISING
A NARRATIVE
OF THE
INTRODUCTION AND SUCCESSFUL
PROPAGATION OF VACCINA
IN SIAM. — 1840. & 1844.

BY D. B. BRADLEY M. D.

500 Copies.

BANGKOK:
A. B. C. F. M. PRESS.
1844.

Title page of the 1844 original, from a copy held by the Boston Medical Library in the Francis A. Countway Library of Medicine at Harvard University; see footnote 1.

Treatise on Smallpox Vaccination

This book will demonstrate to both its readers and listeners alike how to deal with smallpox[11] in this land of the Thais, so that we can stop it from recurring in the future.

[7] See Michel Callon's formative sociological analysis of the creation of scientific knowledge in "Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St. Brieuc Bay" (1986, abridged 1998), chapter 5 in Mario Biagioli, ed. *The Science Studies Reader* (New York: Routledge, 1999), 67-83.

[8] Missionary Daniel McGilvary (1828-1911) testified to widespread deadly outbreaks in Northern Siam as late as 1884; see Donald R. Hopkins, *The Greatest Killer: Smallpox in History* (Chicago: University of Chicago Press, 2002), 153.

[9] Nipaporn Ratchatapattanakul, "Public Health in Modern Siam: Elite Thinking, External Pressure, and Popular Attitudes," *Journal of the Siam Society* 101 (2013): 177-192, 180.

[10] Ibid., 180-182.

[11] *Rok Thoraphit* (โรคธรพิศม์). Elsewhere, Bradley (1873: 577) defines *rok* (โรค) as "*siap thaeng,*

Suppose the population of tigers was to increase rapidly. And they were to advance, becoming increasingly bold and without fear of humans, surrounding every village and precinct all over the kingdom, and attacking everyone in the family—fathers, mothers, and children—killing many thousands of people per year. How many people would wish to kill those tigers? Now, suppose there was one individual who possessed the means of capturing those vicious tigers and killing them, without any expense and without any repercussions at all—no injury, no pain, no death. If one could really capture them in this way, how many people from all over the land would come and beg that person to help them capture and destroy the tigers?

The tiger is an analogy, in that it is comparable to the viciousness of smallpox,[12] which takes human lives in even greater numbers than tigers. Those who are afflicted[13] with smallpox in this country suffer terrible pain and death at an annual rate that is hard to calculate. There are some who survive, but they suffer from various ailments as a result of the smallpox poison,[14] including losing function in their arms, atrophied legs, blindness, and growths in their chest and stomachs. Who can estimate the number of cases of such ailments? Smallpox appears in every house and home, [among people of ever ethnicity] including those of the Lao, Mon, Chinese, Yuan [Vietnamese], Thawai, and Thai. Some survive and some perish. No one can determine the real extent of the smallpox disease on the people of this land.

Therefore the question becomes: Isn't there some way to protect against the dangers of this disease? The answer is: yes, a powerful method exists for dealing with it effectively. It is a method that does not cost any money, and is not harmful in any way. Men, women, and even children can be treated easily with only one application, which will last throughout one's lifetime. It is a method that has been used by millions and millions of English and Americans, who have passed down the method for over forty-six years.[15] It is now customary in England and in all the countries of Europe and America to use only this method. On account of this, the smallpox disease has all but been eradicated in those countries, with only a few remaining traces.[16] But those who do

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khu mi khwam puai khai khun nai kai khon pen tan [sic: *ton*] *nan"* (to stab and enter, meaning, for example, to have illness and develop a fever); *thoraphit* is defined as "the disease of smallpox" (*pen chuea rok fi dat nan*) (314); see Dan Beach Bradley, *Dictionary of the Siamese Language* (Bangkok, 1873), 577, 314.

[12] *Fi dat* (ฝีดาษ).

[13] *Khon thi pen fi dat*" (คนที่เปนฝีดาษ).

[14] "*Phit fi dat*" (พิศม์ฝีดาษ). There is some uncertainty in translating the term *phit* (พิศม์). Following Rusnock, who notes that Jenner and his contemporaries understood cowpox lymph to be a "poison," I have followed that usage in translating Bradley's Thai term *phit*; see Andrea Rusnock, "Catching Cowpox: The Early Spread of Smallpox Vaccination, 1798-1810," *Bulletin of the History of Medicine* 83 (2009): 17-36, 20.

[15] See the Appendix for a complete chronology of the discovery and spread of vaccination based on Bradley's dates in this treatise.

[16] Here Bradley uses the Thai term *chuea* (เชื้อ), which would later be made to serve the function of the modern sense of 'disease' (*chuea rok*, เชื้อโรค) in the context of germ theory. But there is some ambiguity in Bradley's use of the term at this time (see Davisakd Puaksom, "Of Germs, Public Hygiene," 317). In his dictionary, Bradley does not define the term '*chua*' in isolation; the definitions he offers pertain to the sense of a lineage or continuity of descent, as in the terms '*chuea*

not use this method in those countries still succumb to smallpox at times.

Among us American doctors[17] who have come to reside in this city of Ayutthaya [sic: Bangkok], we have all undergone this method of treatment prior to arriving in the city, with the exception of two people.[18] Although we arrived in this country during the [traditional] season of smallpox outbreaks, no one among us—man or woman—came down with smallpox at that time. And even though it is true that smallpox later appeared among some people in our families, the pox line[19] was not able to spread among us because we had already undergone the method of eliminating the trace of the pox line.[20] There was one doctor among us who had not undergone this method of treatment; he came down with smallpox and almost lost his life. Another doctor, while living in that foreign land [America] as a young child, received an injection of smallpox effluvia[21] by his father. That doctor was none other than myself. My father treated me with injections because there was a traveler who came down with smallpox in the midst of his journey and who had to stop and stay in the area near my father's house. People in the village were very afraid, so they went in search of all kinds of ways[22] of protecting themselves from the disease, but they were unable to find one. So in the end it was necessary to perform the method of injecting pus[23] directly from the smallpox.

Approximately four years ago I brought this method of using [cowpox] effluvia[24] from America, when doctors from abroad sent it to me. When I received the shipment, I first used it to treat the children of the American doctors. Next, I went to the residence of the Siamese Minister of Finance, where I used it to protect his own children and retainers numbering about fifty or sixty, as well as many more at the palace of Prince Itsaretrangsan, plus another forty or fifty people at the French Consulate. Among those

wong,' '*chuea kasat*,' '*chuea krakul* [sic: *trakul*],' '*chuea phra wong*,' and '*chuea sai*'; Bradley, *Dictionary*, 188). It is obvious from Bradley's use of the term, which approximates something like 'traces' or 'remnants,' in close proximity to smallpox, *rok thoraphit*, that the terms must have already been semantically linked in the Siamese vocabulary.

[17] Bradley refers to his traveling party as a community of American doctors, *puak mo amerika*, not missionaries or clerics.

[18] The Thai here is somewhat obscure.

[19] *Chuea fi* (เชื้อฝี).

[20] *Chuea fi nan ko mi dai tit to pai dai het duai dai chai withi thi tat fi dat sia mai mi chuea laeo* (เชื้อฝีนั้นก็มิได้ติดต่อไปได้. เหตุด้วยได้ใช้วิทีที่ตัดฝีดาษเสียไม่มีเชื้อแล้ว).

[21] Here Bradley uses the term *phan phi dat* (พันฝีดาษ). Although Bradley uses the term "to inject" (*pluk*, ปลูก), he is almost certainly describing the process of variolation, which involved inserting smallpox matter under the skin.

[22] *Phan withi* (พันวิที). Here Bradley's use of the term "phan" is clearly meant to suggest kinds or types of ways for protecting against the disease (จะกันได้).

[23] *Buppho* (บุบโพ). This time the description more clearly fits the older tradition of variolation, in which pus from a smallpox sore is used to spread the disease in the hopes of encouraging an attenuated form of infection that would nevertheless confer immunity. In this case it appears that pus was extracted from a pox on the stricken traveler and was then administered to the young Bradley (likely through a scratch on the surface of his skin).

[24] *Withi phan* (วิทีพัน). Bradley's terminology is somewhat in doubt here; I have followed Jenner's use of the term "effluvia"; see Jenner, *An Inquiry into the Causes*.

who have received the true method of protection,[25] not a single one has come down with smallpox up to the present time. But this method [sic: strain], which comes from abroad, can only be used for three or four months before it runs out.

I therefore sent letters abroad to many different cities asking them to send cowpox effluvia.[26] Foreign doctors sent it to me on several occasions, but the matter had spoiled on the long journey, and it was therefore not effective.[27] Then during the second month in the year of the Tiger,[28] one of my own daughters became ill with smallpox fever, and after suffering for about nineteen days, she passed away. For lack of cowpox effluvia with which to protect her, I lost my own daughter. On account of this, I understand all too well how much parents worry about their children who have not yet been infected with smallpox.[29] I therefore sent more letters to foreign doctors abroad asking them to send cowpox effluvia. I then received the effluvia from many foreign places, but it was ineffective, having spoiled in transit. Afterward, I received effective cowpox effluvia from America in July 1843. I used that strain with very good results. And today there is enough cowpox effluvia for every person in the Thai kingdom who would like to use it. I have great compassion for all children, especially those who have not yet been infected with smallpox, fearing that they will become feverish on account of an outbreak of smallpox. For all of these reasons, I have printed this book explaining in detail this powerful method of protecting against smallpox, so that all people will understand and abandon their suspicions, and in order to make the method readily available, at no cost whatsoever. I will now offer a detailed and straightforward description of this method of protecting against smallpox.

The method involves a type of pus that originates in the udder of a female cow, and that pus, which is taken from the pox of a female cow, is then injected into a person who has not yet been infected with smallpox. In order to inject it, one takes a blade and makes a small puncture, then allow the pus to flow down under the surface of the skin along the tip of the blade. The pain at the moment of the injection is no more than being bitten by a mosquito. Then, two or three days later, the area will redden. After eight days it will rise up into a small bump that discharges pus. After eleven to thirteen days have passed, it will subside and dry out by itself. There is no need to take any kind of medicine. If nineteen or twenty people are injected at once, there is a small chance of perhaps one person coming down with a fever. But even in that case, there is no need to

[25] *Withi pong-kan pen thae laeo* (วิทีป้องกันเปนแท้แล้ว). This is the first hint of the distinction between "true" and "spurious" or ineffective strains of pox, which was a crucial one for a physician hoping to demonstrate the universal efficacy of variolation/vaccination (see discussion below).

[26] *Phan withi* (พันวิที). Bradley uses this term to refer to the actual strain of pox that was used in inoculation/vaccination, which is distinct from the "method of using the strain" (*withi phan*, วิทีพัน).

[27] *Tham mai tid loei* (จึงทำไม่ติดเลย).

[28] January 1843. There seems to be an error in Bradley's use of the lunar calendar here, as Bradley's own diary notes that his daughter passed away in December 1842 (Bradley, Dan Beach, 1804-1873, *Papers, 1800-1991,* Diary, Vol. 8, Oberlin College Archives).

[29] *But thi yang mai dai pen khai thoraphit* (บุตรที่ยังไม่ได้เปนไข้ธรพิศม์). I use the term "infected" advisedly here. I initially avoided the term due to its connections with the germ theory of disease, but Jenner himself uses the term "infected" in his treatise on vaccination, which must have been well known to Bradley.

take medicine or abstain from certain foods.[30] Moreover, this method protects against smallpox with great certainty. If one wants to continue with the injections, they should take the pus that that was injected and that has risen to the surface again, and inject it into another person, and continue in this way. It can be passed on in this way thousands of times without ever turning into smallpox or any other sort of dangerous condition. That which we call cowpox effluvia can be used in this way. I will now describe the discovery of this method.

About fifty years ago, a preeminent English doctor named Jenner observed that among people who milk dairy cows on a daily basis almost none are infected with smallpox. He therefore investigated those people and realized that they would only bear pox on their hands, apparently as a result of the poison in the pox on the cow's udders. Dr. Jenner then reflected with insight that the pox on a cow's udder might very well protect against smallpox. The English doctor then extracted pus from the pox on the cow's udder, and injected it in several people. And [in those people] pox appeared, which produced pus and then quickly healed. He then extracted smallpox pus and injected it into those people who had been injected with cowpox. Smallpox did not arise, and he therefore concluded that this method could effectively protect against smallpox.

Jenner then reflected further, observing that the pox on a cow's udder actually came from the pox disease that first appeared on horses' feet. Initially, the horsepox appeared on the foot above the hoof and the pus was sticky. Then, after the horses and cows mingled together, it appeared that the pus from the horse's foot entered into the female cows and produced pox. Jenner developed yet another hypothesis: The pox on the cow's udder might be induced in cows by human smallpox. When it appeared on the cow, the pox did not appear all over; instead it became a benign variety of pox that no longer bore any toxin.[31] When Jenner took the pus from that cow and injected it into people only one or two pox appeared; and even though the pox did not develop fully, it was nevertheless sufficient to convey immunity against smallpox.

Thus Dr. Jenner recognized two distinct causes of cowpox: The pox on a horse was one type, and the pox that appeared on people was another type. In spite of this, however, he remained unsure about the causes of each. But over the last eight or nine years, English and American doctors have realized with certainty that the pox on a cow's udder can protect against smallpox when injected into a person because cows are afflicted with smallpox. That is how cows get pox. Doctors now understand this because they extracted pus from human smallpox and injected it into a cow, and they observed that only one pox appeared exactly as Dr. Jenner first observed on the cow's udder back then. Those English and American doctors then took the pox that they had injected into the cow's udder and injected it into people. Only one or two pox appeared on those people and they were protected against smallpox just as surely as in Dr. Jenner's original experiment. But taking smallpox pus from a person and injecting it into a cow is very difficult to accomplish. If you inject twenty to thirty cows, you will likely get only one successful transfer.

[30] A reference to the traditional Thai medicinal practice of identifying and avoiding certain foods thought to aggravate a medical condition (*khong salaeng*, ของแสลง).
[31] *Phet fi di mai mi phit ik* (เพทฝีดีไม่มีพิศม์อีก).

When I arrived in Bangkok, I and other foreign doctors did not yet know that pus produced by smallpox could be injected into cows to produce cowpox. For the last forty-six years, since the time when Jenner first realized that cowpox could protect against smallpox, doctors everywhere have had to search for naturally occurring strains of cowpox. When I first came to reside in this land, I brought a strain of cowpox with me, and injected it into the people of this land, but to no avail. I therefore started sending letters abroad and was able to obtain some cowpox pus from America and England. I injected it into many people on many different occasions, but I found that it did not produce any pox. And then, in the year 1200 [1838] there was a widespread outbreak of smallpox in the vicinity of the residence of the American doctors.[32] I was fearful that this disease might spread and become a danger to my children, so I searched for cowpox pus to establish a reserve for injection, but I was unable to find it. Myself and the other doctors then consulted together and decided that if the smallpox spread according to its natural course, it was likely to be fierce and have a great deal of dangerous toxins.

If, however, we were to use smallpox pus itself for injections, then it would not have the same degree of dangerous toxins.[33] This is because when you are injected with smallpox matter, there is a period of eight or nine days before the pox will appear, and during that time you can take care to abstain from all kinds of substances that would irritate the condition.[34] And after having abstained for eight or nine days, you can take medicines to purge the toxins [from your body].[35] With this method, pox will take root nicely and with less toxins. I, Dr. Bradley, and the other American doctors, after having reflected on these facts, injected smallpox pus into our children, servants, and hired laborers. The result was good: The pox took hold and did not contain dangerous toxins at all. This great news reached the exalted king, who graciously ordered the royal physicians to learn the method from the American doctors, and administer it to the religious ascetics [Buddhist monks], the children of major and minor civil servants, and then the population at large. In all these cases the pox took hold nicely and rarely contained dangerous toxins. During the hot season, however, smallpox was somewhat fierce and contained more toxins. And since we had taken a strain of smallpox and injected it in people—not a strain of cowpox—it therefore contained some dangerous toxins. If the strain had come from real cowpox, then it would not have had any dangerous toxins at all. But we doctors were forced to use smallpox because we simply could not find cowpox at that time. Since that time, I have been sending letters abroad requesting them to send me true cowpox effluvia.

[32] Bradley does not refer to his congregation as a missionary community per se. In this case, the outbreak occurred "next to my home among the community of Americans" (*rim ban khaphajao phuak mo amerika*).

[33] Here Bradley is simply explaining the difference between allowing a disease to take its course, and the interventionist measure of variolation.

[34] In contrast to the passage above, Bradley here explicitly advocates following the traditional Thai medical practice of avoiding certain foods that were thought to be irritants capable of aggravating a particular medical condition. This is an interesting instance of the coincidence of traditional Thai and Western homeopathic traditions.

[35] Another direct reference to traditional Thai medical practices, which involved the use of purgatives to cleanse the system of harmful substances.

Foreign doctors have received my letters and have sent cowpox effluvia from Kwantung [Guangdong, China], Macao, Singapore, Penang, and America. Upon receiving that cowpox pus, I have injected many people on many occasions, and for the most part no pox have appeared. In some cases, pox have appeared, but they were not true pox.[36] Then in the second month of the year of the pig [February 1840], a doctor in the city of Boston, in America, named Smith learned of my ardent wish to obtain cowpox pus. Smith set out in search of cowpox pus and sent it to me in the care of another American doctor who was on his way to Siam that same month. I notified the Siamese Minister of Finance, and he allowed me to use that cowpox to inject four or five of his children and more than sixty people among the resident *Chaloei* community.[37] I then used it to inject my own children, the children of Dr. Robinson, and a group of Thai children who lived nearby. In total, I was able to inject about seventy-five people with the cowpox that I received from America, but the injection took hold in only five people because the pus had spoiled during the long journey. Those five people included four *Chaloei* people and one of Dr. Robinson's children. But those four *Chaloei* people were already afflicted with scabies, frambesia (or yaws) growths, and many other diseases.[38] I was afraid that it would not be a good idea if I used them as a source of pox to inject on to others.

Instead, I decided to take that pus and test it in about twenty other people within the *Chaloei* community. Every one of them showed pox, but the head of the pox appeared to be the type that could not protect against smallpox[39] because the original host[40] of the pox was afflicted with other diseases. These complications[41] changed the cowpox into an abnormal state. The child of Dr. Robinson, however, was not afflicted with any other disease so I extracted pus from the pox of that child and injected it into my own children, a female friend of mine, and one Thai child. All three showed genuine pox. I therefore took that strain of pus and injected it into a group of four or five more children at the request of the Minister of Finance, five people at the request of Prince Mongkut,[42] and Prince Itsaretrangsan[43] had me inject one young prince. Four or five of those who were injected at that time did not develop pox, but most did, and they developed proper pox[44] [that signaled effective immunity]. I therefore decided to continue using that strain to inject others. The next month the Minister of Finance allowed me to inject three more of

[36] *Tae fi nan mai thae* (แต่ฝีนั้นไม่แท้).
[37] *Khaek chaloei* (แขกฉะเลย). An apparent reference to a community of foreign residents residing in Siam at the time (perhaps war captives).
[38] *Pen rok hit lae mareng khotcharat rok lai yang* (เปนโรคหิตแลมะเรงคชราช, โรคหลายอย่าง).
[39] Bradley used a visible inspection of the "heads" of the pox to determine whether or not the transfer had been successful and immunity had been conferred.
[40] *Jao khong* (เจ้าของฝีนั้น); lit. "the owner" of the pox.
[41] *Rok uen saek yu* (โรคอื่นแทรกอยู่) refers to the presence of other underlying diseases that complicate the gestation of the pox and the development of immunity.
[42] Prince Mongkut, the future King Rama IV (r. 1851-1868), was an ordained monk at the time, and head of his own monastic reform movement, the Thammayut Nikai.
[43] Mongkut's younger brother, who would be appointed heir-apparent during the Fourth Reign under the title Phra Pin Klao.
[44] *Ngam nak* (งามนัก).

his children. All three developed proper pox.[45] Since then, I have continued to use that strain of pus, taking care to perpetuate it by injecting it in others every eight days. I have already passed it on fifteen times.[46]

During the fourth month of the year of the pig [February 1840], a royal physician came to study this technique and brought a child with him for an injection. Then, that physician led me to the palace of Chao Nuam,[47] who requested that we inject two of his children and five or six of his retainers. Among those whom we injected, five or six produced proper pox, but two or three did not. I then injected about ten or fifteen people at the residence of Luang Surasadon. At around that time, a physician named Suk, who was among the retainers of the Minister of Finance, had had a chance to study the method of injection; he went on to inject another fifty or sixty people [on his own]. Doctor Suk told another royal physician that those who have undergone the method of injection would not succumb to smallpox even if they happened to mix with and reside among those who are afflicted. Some time later, during the waning phase of the fifth lunar month [April 1840], I went to inject four or five people at the home of Luang Nai. Pox did not develop, however, because the pus had already spoiled. I cannot be sure whether it spoiled because we had entered into the severe heat of the hot season or for some other reason, but since then that strain of pus had become ineffective. I mourned this loss, and began sending letters to doctors in America requesting that they kindly send me more pus. Moreover, I requested that the pus arrive at the start of the dry season each and every year. I would then try to inject this pox, which protects against smallpox, into the population every year in order that it should be a boon to this great city.

When my friends and acquaintances in America, Bombay, Kwantung, and Macau, responded and sent pus from cows to me, however, I conducted a trial injection and found that it did not produce pox. Around that time, a doctor in America sent a letter telling me that if I needed cow pus, there was no reason at all to import it from abroad. Instead, he suggested that it was possible to procure it in the land of the Thais. Doctors in England and America had recently discovered that if you took smallpox and injected it into a cow, it would produce cowpox that is the very same as the pus that naturally occurs in cows. The resulting pox that appeared in the cows was capable of protecting against smallpox and was not dangerous in the least.

When I heard the news, I wrote about this way of obtaining pus to the Minister of Finance so that the king might be informed. The king then ordered the high official in charge of cattle[48] to help inject a number of cows [with human smallpox] in the second

[45] *Fi khun ngam di* (ฝีขึ้นงามดี).

[46] I understand Bradley to mean that he was working with eight-day cycles of development and that he had been through fifteen cycles as of the time of writing. This same practice of timing injections and outbreaks in vectors had been successfully used to spread cowpox across the Pacific Ocean; see Catherine Mark and José G. Rigau-Pérez, "The World's First Immunization Campaign: The Spanish Smallpox Vaccine Expedition, 1803-1813," *Bulletin of the History of Medicine* 83 (2009): 63-94.

[47] *Phra ong jao Nuam* (พระองค์จ้าวนวม).

[48] This seems to refer to a specific bureaucratic rank (*khun kho*, ขุนโค).

month of the year of the rat [January 1841]. Unfortunately, the injections did not take hold in those cows.

Then in the first month of the year of the tiger [December 1842] there was a fierce outbreak of smallpox, so I took the smallpox pus from the outbreak and injected it into many more cows on many occasions. I hoped that it would produce cowpox pus that could be used to protect against smallpox. But again, cowpox failed to appear in even a single cow. Since I was unable to obtain cowpox pus at that time, I was forced to take smallpox pus and inject it into the children in our community of doctors. At the time when I still injecting the children of the other doctors, my own daughter, whom I was not able to inject in time, became afflicted with smallpox in the natural course[49] and died.

After I had lost my own daughter for want of cowpox pus that would protect against smallpox, I became fixated on cowpox pus 100 times more intently than before. My heart was full of compassion and sympathy for all the children of this land who were still at risk of being infected by smallpox. I wished to protect them by injecting them with pus from cowpox. I therefore sent many more letters abroad urgently and emphatically requesting cowpox pus be sent to me. In my letters, I explained that the strains of pus that they had sent to me in the past had all spoiled because they were exposed to air and humidity.[50] So from then on, I instructed them to take the scabs from cowpox[51] and place them inside a small glass jar, then close the mouth of the jar securely with sealing wax in order to keep out air and humidity. I then instructed them to drill holes in a piece of wood wide enough to fit those glass jars, and place the glass jars containing the cowpox matter into the holes. Secure the mouth of the jars tightly again with sealing wax.

One American doctor followed the instructions and sent me the material in just this manner. The package was in transit for six months, taking an extra month to reach me [after reaching Siam?], which amounted to seven months of total time in transit. It was shipped aboard the vessel of Mr. Hunter,[52] which arrived during the eighth month of that year [July 1843]. I removed three scabs from the jars, there were many left and they all remained properly closed as they had from before. I used just enough cow's milk to dissolve the three scabs, to make them moist, yielding a thick liquid. I then took the liquid and injected it into about seven or eight children. I then waited for eight days. After eight days, I noticed that there were no pox; they had all dried up already. I then mixed rain water with the remaining scabs and injected the liquid again in the same seven or eight children as before. This time pox appeared in only one Chinese child. Eight days after the injection, however, the pox progressed sufficiently to produce an outflow of clear pus. I then extracted the pus, and injected in into one of my own children, the child of another doctor in my community, as well as a number of Chinese and Thai children. I waited eight days and observed that the injections produced pox in each and every child. I therefore continued to extract the pus and inject it in dozens of

[49] *Ok fi dat tam thamada* (ออกฝีดาษตามธรรมดา).
[50] *Sia pai sin phrao thuk lom lae ai nam nan* (เสียไปสิ้นเพราะถูกลมแลอายน้ำนั้น).
[51] *Saket fi phan fi kho* (เสกดฝีพันฝีโค).
[52] As I have noted elsewhere, the cargo evidently arrived on a ship owned (or leased?) by the British merchant Robert Hunter, who was a long-time resident in Bangkok and who owed his vibrant import business to his affiliations with the crown; see Pearson, "Prefiguring Pasteurization," 13.

others and I continue to do so to this day. If anyone wishes to receive the injection let them be injected with this strain of pus. This is a batch of pox that has been taken from people and that can be used to inject others.

I will now describe the first symptoms of cowpox in detail. After placing the pox underneath the surface of the skin, there are no clear effects for two days until on the third day you will observe redness at the site of the original incision, and bumps will begin to rise up around the edges of the area. The spots that appear will be very small and difficult to notice; you will have to use a magnifying lens in order to see them clearly. Then, after five days, the swollen bumps will be seen clearly, and the pox will begin to come to a head. Around the base of that pox mark, redness and swelling will appear noticeably greater than the surrounding normal flesh. The center of the pox will begin to darken, more so than the color of the pus in the surrounding pox. On the sixth, seventh, and eighth days counting from the day of injection, the base of the pox mark will begin to expand, but the tip of the pox will remain flat, since the pus is not yet fully developed.[53] Then, after ten or eleven days, the pox mark will come to a head because the pus will have fully developed. The base of the pox will be red and will expand even more. The redness around the base will become firmer as the pox progresses. On the tenth or eleventh day, some people will have a slight fever, while others will have no fever whatsoever. Some people will experience pain in the armpit, while others will have no pain. Some people will develop pox marks only at the site of injection, and not elsewhere. In some people, only six to eight bumps will develop outside of the site of the injection. Cases such as this do occur, but they are few and far between.

On the eleventh or twelfth day the pox mark will begin to dry out, giving way to a scab. By the fourteenth day, the whole pox, including the head, will have vanished into a scab. That scab will then dry out and darken, with a different color from other types of pox. Sometimes it can take fifteen, sixteen, or even seventeen days for the scab to peel off. Sometimes it will even remain for twenty days before peeling off. Pox scabs in this country peel off more quickly than in foreign lands because it is warmer here than in foreign countries, and because people in this country do not wear shirts, so the scabs tend to peel more quickly. When the scab has peeled off and healed well, the scar will be uneven. Some marks will be raised and some will be depressed. In the immediate area of the sore, the skin will be calloused and not as soft as normal skin.

Doctors should take notice of the development of the pox from the first raising of the skin to the development of a bump and the hardening of the pus, until it becomes a scab, and finally, until that scab peels off. If the course of the pox develops as such, then it will protect against smallpox. Pox that develop with these characteristics are the most common, though in some cases the symptoms that develop will deviate in some small way. For instance, there are cases when pox develop rapidly, filling with pus, the red area around the base becoming firm only six or seven days from the day of the injection. In other cases, there will be no reaction after the injection for five or six days before the area turns red and a bump appears. In some cases only two or three bumps will appear outside the area of injection. But pox with these kinds of symptoms, which

[53] *Buppho yang mai boribun* (บุพโบยังไม่บริบูรรณ์).

appear outside of the area of injection, only occur in one or two people out of 100.

In order to be sure that it is genuine cowpox,[54] a bump must appears and symptoms as described above must follow two or three days after the injection. In that case it can be accepted to be genuine cowpox. But if someone is injected and bumps appear after only one day, do not rush to judgment, as one cannot be certain. Have a physician carefully inspect it in order to know for sure.

Reasons why pus spoils

Even genuine cowpox is capable of spoiling for a number of reasons. One reason is that the pus was not properly stored, exposing it to air and sunlight. Another reason why a strain of cowpox might spoil is that the person from whom it was taken scratched and damaged the site of the injection, and then treated the area with other medicine, such as applying turmeric to the wound.[55] If the pus was taken from a sore that was too old, this is another reason why the cowpox might spoil. Sometimes if a child is already afflicted with sores on their body before injection, those sores will cause the pox fluid that was injected to spoil. If the person is already afflicted by frambesia (yaws) or other skin diseases such as scabies or ringworm,[56] these conditions are also likely to affect the pox and make it spoil. The pox that appear in these people, if any, will sometimes protect against smallpox and sometimes will not. One will have to inject again to be sure. And even though genuine pox might appear in a child who is afflicted with some prior disease, you will not be able to take pus from that child and inject it into other children because that strain is not pure.[57]

About six or seven years ago, I received cow pus that was sent from Kwantung. A foreign doctor soaked a piece of thread in cow pus [as the medium for the strain] and then placed it in a jar and sent it to me.[58] I then cut a small piece of that thread, which had been soaked in cow pus, and used it to inject people at the palace of Prince Itsaretrangsan, and it produced pox. I then created a strain from that pus to inject into a community of foreigners,[59] each of whom showed pox. But I did not trust that strain since it arrived attached to the piece of thread. When I injected it, I had to do it by inserting the string underneath the surface of the skin, and I noticed that pox developed more quickly than usual. I was therefore dubious [that this pus was real cowpox], so I took smallpox pus and injected it into those people whom I had already treated with that strain of cowpox. Each and every one of them developed smallpox. I therefore knew that this strain of cowpox did not protect against smallpox, so I informed those people [who had been injected with it] not to trust this strain to protect them against smallpox. But

[54] *Tha ja ao pen thae wa pen fi kho laeo* (ถ้าจะเอาเบนแท้ว่าเปบฝีโคแล้ว).
[55] *Khamin* (ขมิ้น; sic: ขมิ้น), turmeric, was apparently used to treat open wounds in addition to other medicinal applications.
[56] *Khi klak* (ขี้กลาก).
[57] *Phrao phan nan mai borisut* (เพราะพันนั้นไม่บริสุทธิ์).
[58] C.f. Jenner's discussion of the use of a similar medium for preserving smallpox for use in inoculation ("An Inquiry into the Causes," 73).
[59] *Khaek* (แขก) .

those foreigners already believed that the injection would protect them. When smallpox season arrived, the young children of those foreigners came down with smallpox. They all blamed me, claiming that the cowpox does not protect against smallpox. They then disparaged the method of injecting cowpox, even though I had warned them not to trust in the injection [they had received]. Now no one has much faith in the method of injecting cowpox, for the simple reason that the strain of cowpox we injected that one time was not effective. People spread the word that that they were injected but it did not protect them against smallpox. Then they lie and blame me, claiming that because I injected them they were afflicted with a form of smallpox that was even more severe. They do not see that in fact I was trying to provide a beneficial service to them. All of this happened because that strain was created from the cowpox that was put on a piece of thread, which caused it to spoil. This rumor that spread around has had a damaging effect up to the present day. I therefore advise all doctors to be careful in dealing with the injection in order to be certain that the cowpox is genuine and that it will protect against smallpox without any doubt.

There have been other instances when I have taken pus and injected it into several hundred more people, and no pox developed. On each occasion, I told them not to trust it because the pox did not appear. Yet they refused to believe me. They trust that the injection was successful because they saw redness and a small bump appear at the site of the injection. But then when the smallpox season comes around, they are afflicted with smallpox. Then they blame me, saying, "you injected me, but it did not work." Among those people whom I injected at that time and in whom no pox appeared, afterwards some of them succumbed to smallpox and died, just as those who had been injected. The friends and family of these people blamed me, claiming that the pox were only dangerous on account of the poisons that I had injected in them earlier. Even though only one person in fifty among those whom the injection proved to be ineffective actually died of smallpox, they still gossip and lay the blame on me, claiming that because of my injection these people died of smallpox. All those who hear this are therefore unlikely to put their trust in injections any more. I am asking for your careful consideration with respect to my actions so far: have I come to this land in order to do beneficial service, or to harm the people? Consider the case of doctors who care for other diseases, such as in a child who is not yet afflicted with smallpox. If that child should later develop smallpox, why do people not blame that doctor who had previously treated that child with medicine? Why do they not blame the poisons in that doctor's medicine, which remain in the child's system? Why then do people blame only me in this manner?

Let all doctors who would take a strain of cowpox and pass it from person to person therefore carefully inspect and be absolutely certain before using it. If someone is not diligent and mindful, the strain will spoil and it will no longer be effective in preventing against smallpox. But most doctors do not pay close attention to the details; they deal with it in a cursory manner.

[For the benefit of those doctors,] I will now describe again the symptoms of pox that will protect against smallpox, and those of pox that will not. I will present them together side by side so that it will be easy to distinguish between them. If it is genuine cowpox there will not be any reaction after injection until the third day, when you will

notice bumps starting to rise. But if it is spurious pox, pus will form a head only one or two days after injection.[60] If it is genuine cowpox, after the first appearance of redness at the sight of injection on the third day, it will continue to develop until the seventh or eighth day, until the eleventh day counting from the day of injection, when the pox will begin to subside day by day. Spurious pox develop more quickly and begin to subside after only five days. Genuine cowpox will begin to gather into a circle and form a center on the fifth or sixth day after the injection, but the base around the pox will still not swell up. Spurious pox will produce a pointed head and the base will swell quickly, resembling the infected wound of a splinter; they will produce pus after two or three days, but that puss will not drain. In the case of genuine cowpox, on the other hand, after four or five days pus will develop and clear liquid will emerge. Spurious pox will produce yellowish pus. Genuine cowpox rises after four or five days into a head that is a pale whitish color. If the head is too white, however, you still cannot be sure that it is genuine cowpox. Likewise, if the sore is very flat, you cannot be certain that it is genuine cowpox either. If after a sore develops in four or five days, the base area next to the surrounding flesh [on the edge of the injection area] hardens excessively, then it is not genuine cowpox.

For these reasons, it is necessary that all doctors inspect the injection site carefully in order to determine with certainty whether it is genuine or spurious pox. When a doctor plans to take the lymph from one individual and use it as a source to inject others, he must inspect it closely first in order to ensure that it will protect against smallpox. After transferring it to another child, and following the time schedule for pox to develop, the child who was injected should be brought in to be evaluated to determine whether the cowpox is genuine or not. Let the doctor inspect very carefully first, and if it is genuine cowpox then tell the patient that it is so; but if the doctor is suspicious, then tell them that you suspect that it is not genuine cowpox. This way, one will not endanger the child. And nor will you give the people a reason to criticize doctors. Both the patient and the doctor must be in agreement. If it is necessary to inject again, then the doctor should inject again. This will be a boon to the patient and will be beneficial to the doctor himself. Finally, do not give them a reason to gossip to others about us doctors who work 'our fingers to the bone' to benefit all, protecting those people who have not yet been afflicted from succumbing to smallpox.

On the best time to extract pus

If one is going to create a strain of cowpox that can be used to inject in others, the best time to extract it is on the sixth or seventh day from the day that the pox first appears. In order to extract the pox strain, use a needle or the edge of a knife and carefully pierce the lowest part of the base of the pox. Do not pierce the hard center inside the sore. Insert the needle or knife edge into several different places in order to let the clear pus flow out. Then with a thin, sharp, and pointed feather scrape only the clearest pus.

[60] 'Genuine' versus 'spurious' lymph seems to have been the accepted terminology to distinguish between true cowpox (i.e. that which would provide immunity to smallpox) and false (that which would not); see Michael Bennett, "Passage through India: Global Vaccination and British India, 1800-1805," *The Journal of Imperial and Commonwealth History* 35:2 (2007): 201-20, 204.

Do not allow any blood to mix in with it. After you have collected the pus, set it aside to dry. Then seal it tightly in a jar. Do not let any air enter into it. Take a piece of wood and drill holes in it large enough to place the jar inside the holes in the wood. Then close the holes tightly with cotton. If you follow these instructions, then no matter where you have to take the lymph, the humidity in your hands will not touch those jars containing pus. And even if you have to take the pus and travel to a distant city, the pus will not spoil and it will continue to serve as a reserve for a long time to come.

Instructions for injection

If a doctor intends to inject pox using pus, they should take hold of the patient's arm with their hand and pull the skin tight. Then use the end of a knife that is sharp like the leaf of a rice plant to make a light cut just under the surface of the skin. When blood begins to seep out, apply the pus taken from the jar with the sharp end of a feather. Place the sharp end of the feather into the knife wound. Allow the blood to mix together with the pus on the end of the feather above the site of injection. Leave the tip of the feather in place in the wound for eight to ten minutes. Inject the patient in this way in two or three places just in case the first injection site does not produce a sore, the other sites will. After you have inserted the pus in this manner, gradually remove the feather from the sore and apply Wood Apple resin[61] over silk cloth to dress the wound. Then use white cloth to cover the area directly over the wound for two days, taking care not to let any water into the site of injection. If after two days the sore does not begin to rise, then repeat the injection according to the method described above.

If fresh lymph is not available, then it is necessary to use dried lymph as mentioned above. If fresh lymph is available—that is, after an injection has taken and sores arise that contain pus and are well formed—then puncture it using a needle or the end of a knife and transfer the pus to the tip of a knife. After the blood and pus have mixed together well, use Wood Apple resin to close the wound again. Injections using fresh pus will succeed more often and will transfer more rapidly [than those using dry lymph]. In order to inject using fresh pus, carefully take the end of a knife and scratch [the skin]. When blood seeps out, blot it, leaving just enough to mix with the pus. If blood rushes out of the wound excessively, it will wash away the pus, which will then not transfer to the surface of the skin and will not produce pox, just as if it were washed away by water.

How to care for cases when the injected pox contains poisons

When pox are injected at one time into nineteen or twenty people, it is likely that there will be but one person who becomes feverish and sometimes their arm will become inflamed and will swell and become painful. In such cases, boil rice over the fire until it becomes tender, then plaster it directly over the sore and the site of the swelling. This will quickly draw the lymph out and the pain will subside. Change the plaster covering three times per day, and the pain and swelling will subside. If the injection

[61] *Yang makhwit* (ยางมะขวิด).

produces a very high fever, give the patient Epsom salt[62] dissolved in warm water to drink. The patient will pass the poisons out and the fever will subside. In the case of a child, give them three *salueng*'s weight [worth of Epsom salt]. In the case of an adult, administer the Epsom salt according to their constitution, whether light or heavy, so that they will pass the poisons.[63] In cases when the pox sores covered in the boiled rice plaster continue to produce pus, dissolve *junnasi*[64] in water and daub it onto the sore. Then take one part hardened bee's wax and two parts coconut oil, boil them together to mix them well, and then apply it with white cloth to close the sore. Change the bee's wax dressing twice a day and the sore will heal.

On some occasions someone might approach you and ask with suspicion whether these pox that were injected, scabbed over, and dried of pus can really protect against smallpox for life in every person, or whether in some cases it might not. You should answer that in the case of genuine cowpox according to the exact characteristics described above, when injected at one time in 100 people, it might fail to protect just a single person. Just as in people who have already succumbed to smallpox but who nevertheless have another outbreak, such exceptions do occur, but they are very rare. In 200 people, there will only be one such case. When one injects genuine cowpox, even if some of the pox that develop contain poisons, these are usually few and they are not at all dangerous. Thus, with cowpox, the rate [of those who become infected later in life] is the same as that of those who have been afflicted with smallpox. Smallpox, in a person who has been injected thus, is like a fire ignited in a place soaked with water. There is nowhere for the fire to take hold.

Nevertheless, people continue to wish that there were some way to know for certain whether cowpox would protect against smallpox for one's entire life or not. You should answer that there is no way to be certain whether it will protect for all of one's life or not. In the case of cowpox, we know for certain that it can protect against smallpox for at least forty-six years. However, it seems probable that it can in fact protect against smallpox for one's entire lifetime. Among foreign doctors there are two contingents: the first contingent thinks that it can protect for one's entire lifetime, but the second contingent does not trust that it can. [The latter] thinks that when one arrives at middle age, they should be injected again. But in my own heart, I think that cowpox can indeed protect one [against smallpox] for their entire lifetime. This is because I have tested [the method of] injection among my own community, many of whom were injected abroad, as children, before traveling to this land. At the time when they entered this land, since they were approaching middle age, many of them did not trust [that they would still be protected against] the smallpox, which is so abundant in this land. Many of them therefore requested that I bring along a strain of cowpox in order to inject them again, but I was unable to do so.[65] Yet during the season when smallpox was abundant in the

[62] *Di kluea* (ดีเกลือ).

[63] *Tha phu yai hai kin tam that nak that bao sut tae thai sia hai dai* (ถ้าผู้ใหญ่ให้กินตามทาตุหนักทาตุเบาสุดแต่ถ่ายเสียให้ได้).

[64] จุลษรี (sic: จุนสี) refers to copper sulfate, which was used medicinally both internally, as an emetic, and externally, as topical detoxificant.

[65] The text is somewhat obscure here, but I think that this is Bradley's meaning: *ko ha pen ik mai*

community living in the village close to our homes, among my community of American doctors none succumbed to smallpox again. Because this method [of injecting] cowpox was still effective in preventing against smallpox, none succumbed. I therefore believe that it can protect for the duration of one's life.

Another lingering question concerns when one or two children are injected and pox appear, do other children living in the same house who have not been injected acquire it in the same way as they might be infected with smallpox poison, or not?[66] The answer is that since cowpox usually only has virtuous properties, and does not contain poisons, it does not spread in the same way as smallpox.[67] One injection protects only one person; it cannot be transferred on to others at all. This is the only limitation [of the method].

Another question concerns whether or not cowpox can be injected into even very young children who are still in diapers. The answer is that you can inject a baby, whether male or female, starting just ten days after birth. The younger a baby is, the greater the benefit, so long as the child does not show signs of sores or other diseases. If [the injection takes place] early on, there will be no pain, and when the pox appear they will not contain any poison. If the child is [older and more] conscious, they are likely to be afraid of the doctor and will let others know that it hurts a great deal by crying out. Moreover, the injection is less likely to transfer to children who are [older and more] conscious because when the child cries the blood will flow from the knife wounds that were scratched for the injection. The injection will not take in the same way as in a young baby.

I, Doctor Bradley, have written this book in order to inform others of this method of protecting against smallpox, in the hope that those who read or listen to it will understand that it is a great blessing. This method has only been able to arrive in this land owing to the power of Jesus Christ,[68] who is the lord of all mankind. His heart is full of compassion for all mankind. Myself and all the other doctors who have come to reside in this land by the grace of the king,[69] are all His disciples. We prayed to God to help mankind and were thus able to bring cowpox here. He received our prayers and graciously allowed it to be so, making it possible for me to inject it successfully. Each and every day that great blessing spreads far and wide among the Thai people, so that mothers, fathers, and noblemen[70] could come and request that their children receive the injection. The cost of a strain of cowpox is greater than any of the medicines in this land of the Thais, but if one weighs the merits of cowpox against those of all other medicines they will see that the virtues of all other medications are 100 times less than those of cowpox. If cowpox are injected according to the American custom, they will have a benefit for

(ก็หาเปนอีกไม่), but it could also mean that when he injected them for a second time they did not produce any pox.

[66] *Ja tit kan muean phit fi dat rue mai tid* (จะติดกันเหมือนพิศม์ฝีดาษหฤๅไม่ติด).

[67] This is an important passage for what it reveals about the limitations in Bradley's understanding of the disease. Bradley was aware that cowpox injections were not communicable in the same way as smallpox infections. He attributes this difference, however, not to the characteristics of the disease but to the beneficial properties of cowpox lymph versus the harmful poisons contained in smallpox lymph.

[68] *Phra Yesujao* (พระเยซูเจ้า).

[69] *Phra photthisamphan* (พระโภทธิสมภาร; sic: พระโพธิสมภาร).

[70] *Jao khun mun nai* (เจ้าขุนมุนนาย).

this land greater than anything else arriving on any junk or steamship.[71] This is because it provides genuine protection against smallpox, snuffing out future outbreaks of the disease in this land, and saving many thousands of lives each year. It will also spare the people of the various dangers that accompany the disease, which are so numerous as to defy counting or even estimation. Cowpox has been a greater blessing to America and England each year than a vast treasure. It will likewise be a great blessing to the people of this continent in the same way as it has been in America and England. After having conducted two trials with this strain of cowpox already, I have seen that it protects against smallpox just as certainly [as it does in America and England]. The supposed difference in [bodily/metaphysical] constitution [between Siamese and Westerners] has no effect whatsoever [on its efficacy].[72]

I have cared for people in this land wishing only to be of benefit to people in this kingdom. I have therefore worked diligently to inject pox to protect against smallpox in people's homes, in some cases traveling far and wide at the cost of great difficulty and exhaustion. I plan to persevere in this way until I have exhausted my physical and mental energies. I have a heartfelt desire to convince both the royal doctors and doctors of the people, so that they might help one another in following this method in the future. I wish to make all the people abandon their suspicions that [this method] cannot protect against smallpox, and to make them believe with certainty in the merits of this method, to put them utterly at ease so that they will rush to bring their children and relatives to be injected as soon as possible in order to protect them against smallpox. Those who would read this book and still not believe [in this method] are like people who do not recognize gold: I have brought them many *hap*[73] of gold and given them away for nothing, but they do not take them. People mistake[74] it for mere copper or brass, and therefore no one comes to take the gold that I am offering. Just as if one brought many buckets of fake diamonds of no value whatsoever, people would recognize that they were fake gems and would not want them. Today I bring a miraculous thing[75] to this land of the Thais, which if it were adopted would eradicate an epidemic disease, but it is up to all the people—lords, leaders, people, and slaves—to decide whether they want it or not. But if you should decide not to act and do not use it, it is just as if you have taken this beneficial method that we have brought and tossed it into the middle of the ocean, where its blessings amounted to nothing. I implore you to come and accept [this blessing] now. I have made all the arrangements. I will be offering injections at my home every Monday morning. I will offer injections at Wat Samplueom every Thursday

[71] *Mak kwa khong thi ma nai samphao lae kampan thang mot* (มากกว่าของที่มาในสำเภาแลกำปั่นทั้งหมด). Here Bradley is either elevating vaccination above all other types of medicine—'traditional' Asian or Western—or making a more general statement about the sources of innovative and beneficial goods in Siam, namely the junks that carried goods from China or the more recently arrived steamships bringing Western goods.

[72] [*Mai*] *Chai wa that nan ja phit kan ha mi dai* (ใช่ว่าธาตุนั้นจะผิดกันหาหมีได้).

[73] A *hap* is a Chinese measure of weight equivalent to a *picul*, which is equal to 100 Chinese catties, or 50 kg.

[74] *Samkhan wa* (สำคัญว่า).

[75] *Khong di wiset* (ของดีวิเสศ).

starting at four in the afternoon, but [I will no longer be offering them at] at Wat Thusing. But this work far exceeds my mental and physical strength to be able to accomplish it alone. I would like to invite all doctors to help me as well, and it is appropriate that Thai doctors should be paid two or three *salungs* as a service charge.[76] If Thai doctors will not cooperate, then I would ask fathers and mothers to help inject according to the method that I have described.

Even if one does not have a knife such as the one described above, I encourage them to use a sharp and pointy pin, and gently scratch the skin just enough for a small flow of blood to emerge. Then take fresh lymph and apply it to the wound as I previously described. Then use Apple Wood resin and white cloth to dress and cover the wound. If Apple Wood resin is not available, you can use paste and cloth to dress and cover the wound. The wound must be covered in this way to prevent air from entering and contacting the pus that was placed there, out of fear that it will dry before it has had a chance to mix with the child's blood. If fresh lymph is unavailable, one should procure the pox scabs of one who was already injected, especially the center of the scab where it is thickest, which is the first pus that dried, the dark head that is the best. If the head of the scab is too white, it is no good and should not be used. Take the pox scab and dissolve it in rainwater until it reaches the consistency of a sticky resin, then dip a feather into it enough to allow it to stick to the end. Take the pus on the end of the feather and inject it into the wound as I have already described. If one is unable to obtain fresh lymph or a scab as described here, I invite them to come and see me, Doctor Bradley, the author of this treatise. I will supply it to you; we have large reserves and we ask nothing whatsoever in return.

If you are able to successfully inject it, I ask each and every one of you to carefully extract the pus from the pox that appears after eight days and use it as a strain to inject others. After another eight days, prick that person and inject another person continuously. Do not let the strain go to waste. If you wait nine or ten days after the injection the pus will already have spoiled, so continue to inject it on in every village: do not let it go to waste. This thing is a great blessing; do not allow it to vanish. Just as with rice for planting one must preserve the seeds in order to be able to plant rice and survive each year. Without rice seeds to plant, where could we find food in the future? So with strains of pox: if we throw them away, how will we ever be able to inject it into others? True, it is a common thing, but it is also similar to a rare thing in that the strain of pox circulating at this time is genuine cowpox, which traveled all the way from America. That is why I insistently urge you all not to let it go to waste. Pass it on through injection just as you would the rice seeds used in paddy farming.

Traditionally, there have been three ways of injecting pox in America and England. The first is for father and mothers to inject their children themselves by inviting a doctor to come to their home. Afterwards, if the injections were successful, they would pay the doctor three *salungs*. That is the first way. The second way is to bring one's children

[76] *Kha nueai* (ค่าเหนื่อย). Here Bradley seems to be engaging in the practice of "enrollment" by encouraging the participation of Siamese doctors in the practice of vaccination and suggesting the institution of financial incentives that would presumably be paid by the Siamese state (Callon, "Some Elements").

and relatives to be injected at a large building where doctors perform injections by appointment. Finally, in large cities there are places dedicated to doctors who perform injections for free, and it is normal for poor people to go and be injected in such a place. But these three traditional ways of injecting cowpox have been going on each and every year to the point where there are almost no children remaining in those countries—save a very few—who have not been injected. But those few will still succumb to smallpox for want of being injected, and therefore traces of the smallpox still remain. The remaining smallpox in those lands is a reminder to all people to protect themselves through injection. If smallpox were to be completely eradicated, people everywhere would pass one another carelessly without giving any thought to the merits of cowpox.

If someone should read this treatise but still have lingering doubts, I invite that person to investigate further into those people who have been injected since the second month of the year of the pig [February 1840], as I noted on page twelve above, about the doctor who realized that although cowpox can protect [against smallpox], and the conditions under which it is effective or ineffective. They should investigate people I have injected [since] that time, for example at the homes of the Minister of Finance and of *Chao Phraya* Phonthep, the palace of *Krom khun* Itsaretrangsan, the palace of *Krom muen* Wongsa[thiratsanit], at [the monastic residence of] Prince Mongkut (*thun kramom phra*), at the palace of *Phaya* Viset [near] Wat Samorai, and numerous other people among the Thai, Chinese, Cambodian [*khanem*, sic: *khamen*] and Malay communities. Those who have been injected at this time with genuine cowpox number about 100 cases, but there remain about 200 people who were injected unsuccessfully. I ask that you investigate those people that I have personally judged to have been injected with genuine pox, and not those who have not yet been injected or who have been injected with spurious matter, or those for whom it is too soon to tell. If one investigates those who have already been injected but who I remain suspicious [of the efficacy of the injection], some of them may very well succumb to smallpox afterwards. You should not disparage the method of injecting cowpox to protect against smallpox on account of such cases, because in those cases it may not have been [genuine] or it may not have been successful, and those people might therefore succumb to smallpox. If you investigate those people in whom I have judged the injection to be successful and find that they have not succumbed to smallpox, then I ask that you help to encourage the spread of this method of injecting cowpox to protect against smallpox. Praise and extol the merit and blessing of cowpox as is appropriate because genuine cowpox can indeed protect against smallpox. But if it is spurious it will not offer any protection. I invite you to investigate further—and not to be suspicious for no reason—so that you might realize the blessing that I have attested to here.

For those in whom the injection is not successful, inject that person again. If after two times it is still not successful, then repeat the injection another two or three times until it takes.

Thus is the method of injecting pox to protect against smallpox.

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