PROC (BAYL UNIV MED CENT)
2022;35(4):505–509
Copyright © 2022 Baylor University Medical Center
https://doi.org/10.1080/08998280.2022.2052478

Taylor & Francis
Taylor & Francis Group

An exploration of vaccination in the 19th century through the eyes of Dr. Albert Mackey

Jonathan Kopel, PhD

Texas Tech University Health Sciences Center, Lubbock, Texas

ABSTRACT

One of the first modern practitioners of modern vaccination was Edward Jenner, whose work constituted a significant advancement in smallpox prevention. Since his discovery, issues surrounding vaccine mandates have sparred against the greater American principles of self-reliance, independence, and autonomy over one's body. This paper examines medical training and practice during 19th century America through the letters of a well-known physician named Dr. Albert G. Mackey. These letters provide a glimpse into the attitudes and public health practices of 19th century medical professionals, most notably related to variolizations against smallpox. Furthermore, this exploration of Mackey's writings provides insights into early controversies on safety and government vaccine mandates, which resemble many aspects of the current debates surrounding the COVID-19 vaccine mandates.

KEYWORDS Albert Mackey; history; professionalism; smallpox; vaccination

To provide a glimpse into the attitudes and public health practices of 19th century medical professionals, this article examines the letters of a well-known physician, Dr. Albert G. Mackey *(Figure 1)*. Mackey was born on March 12, 1807, in South Carolina. He worked as a teacher before enrolling in the South Carolina Medical College in Charleston, where he graduated in 1832. In Charleston, he built a profitable practice, taught anatomy at the local medical college, and served as the city physician. When the Florida-Seminole War erupted, he volunteered and served in the Army. When he returned to Charleston in 1839, he was appointed physician of the Alms House. Around this time, anti-vaccination resentment was growing in both the United States and the United Kingdom.[1] During the 19th century, vaccinations against smallpox occurred through private networks, government mandates, or corporate enterprises.[2] In many instances, there was variation in public support of variolization efforts for smallpox, ranging from intense attempts to promote the technology to more ambiguous and diluted efforts. This was due to lack of a universal smallpox vaccine as well as variations in vaccination practices by country and region.[2] This article highlights how controversies from this early period are reflected in many current debates on COVID-19 vaccine mandates.

SMALLPOX VARIOLIZATION HISTORY

Smallpox impacted people at all levels of society for centuries. It killed over 400,000 people every year in Europe during the 18th century; one-third of those who survived became blind. The technique of artificially inoculating smallpox under controlled settings arose from the fact that smallpox conferred lifelong immunity after a person was exposed.[3] The technique known as variolization aimed to simulate this process by causing a mild form of a particular disease to confer immunity against a pathogen in the event of an outbreak. One of the first modern practitioners of variolization was Edward Jenner. Despite the fact that he was neither the first to hypothesize nor the first to undertake cowpox injection, Edward Jenner's work is widely considered to be one of the founding pillars of modern immunology.[4] Jenner's experiments were later published in a small book known as the *Inquiry*. Variolization constituted a significant advancement in smallpox prevention, producing cross-protection against smallpox without causing severe sickness or death in injected patients or causing smallpox outbreaks.[3]

Corresponding author: Jonathan Kopel, PhD, 4202 16th Street, Apt. 601, Lubbock, TX 79416 (e-mail: jonathan.kopel@ttuhsc.edu)
The author reports no funding or conflicts of interest.
Received December 27, 2021; Revised March 1, 2022; Accepted March 7, 2022.

Figure 1. Albert Mackey.

During the 18th to 19th centuries, variolization was the most effective technique of fighting smallpox before the development of modern vaccination techniques. The variolization process frequently used a lancet moistened with fresh materials extracted from a ripe pustule of a smallpox victim.[4] The substance was then applied subcutaneously to the nonimmune person's arms or legs. In 1721, Reverend Cotton Mather (1663–1728), a prominent New England Puritan clergyman, publicly introduced variolization to the United States. According to historic accounts, he learned about the process from a slave named Onesimus.[5] A century later, the United States passed the Vaccine Act of 1813, which instituted a government agent to monitor the use of smallpox vaccination and oversee its distribution across the country.[5] Dr. James Smith, a well-known physician and proponent of variolization, was one of the first chosen to perform this duty.

Despite the growing use of variolization among medical professionals, Smith was suspicious of assertions that variolizations should only be performed by well-trained physicians; he believed it was a straightforward operation that should be offered to all Americans.[5] In 1822, Smith made a catastrophic miscalculation that resulted in the deaths of 10 people in North Carolina in 1821, which became known as the Tarboro Tragedy. It was found that Smith had inadvertently mailed an envelope of live smallpox scabs instead of the smallpox vaccine to Dr. John Ward in Tarboro, North Carolina. As a result, Smith's professional career came to an end and the Vaccine Act of 1813 was repealed.[5] Furthermore, Smith's case brought to the forefront physicians' efforts to keep exclusive control of immunization as well as the public's distrust of social elites, professional authorities, and monopolies.

THE ANTIVARIOLIZATION MOVEMENT OF THE 18TH AND 19TH CENTURIES

Following Edward Jenner's discovery, variolization became widespread in the early 18th century.[1] In the United Kingdom, the Vaccination Act of 1840 offered free vaccines for the poor while the Act of 1853 made it mandatory for all newborns to be vaccinated for smallpox within the first 3 months of life. Parents who failed to comply were subject to a fine or imprisonment. In the guise of public health, these laws were considered a political innovation that expanded government authority into areas of traditional civic freedoms.[1] However, violent riots broke out in the United Kingdom after the 1853 statute was passed. A new law in 1867 extended the requirement for vaccination to those 14 and older. In the same year, the Anti-Vaccination League was founded in London, providing a nucleus for antivaccination activists.[1] Opponents centered their concerns on the violation of human liberty and choice. One early political commentary from 1807, called "The Vaccination Monster," warned of the dangers of vaccination:

> A mighty and horrible monster, with the horns of a bull, the hind of a horse, the jaws of a krakin, the teeth and claws of a tyger, the tail of a cow, all the evils of Pandora's box in his belly, plague, pestilence, leprosy, purple blotches, foetid ulcers, and filthy running sores covering his body, and an atmosphere of accumulated disease, pain and death around him, has made his appearance in the world, and devores mankind—especially poor helpless infants—not by sores only, or hundreds, or thousands, but by hundreds of thousands. This monster has been named vaccination; and his progressive havoc among the human race, has been dreadful and most alarming.[1]

Similar antivaccination sentiment was also growing in the United States near the end of the 19th century, after extensive vaccination had successfully suppressed smallpox epidemics and variolization had fallen out of favor.[1] However, due to the population's vulnerability, the disease became widespread in the 1870s. These antivaccination groups formed primarily in response to state legislatures expanding or creating new vaccination laws. Activists were successful in removing mandatory vaccination laws in California, Illinois, Indiana, Minnesota, Utah, West Virginia, and Wisconsin by using pamphlets, legal battles, and spirited arguments on the floor of state legislatures.[1]

JACOBSON V MASSACHUSETTS: A PRECEDENT FOR PUBLIC HEALTH

The antivaccination efforts eventually came to a head in *Jacobson v Massachusetts* in 1905, which litigated the ability of the government to preserve the public's health as well as the Constitution's guarantee of personal liberty.[6] *Jacobson v Massachusetts* occurred when infectious illnesses were the primary cause of mortality. Except for preventing illnesses like

yellow fever from entering the country's ports, the federal government had very little role in public health issues at that time. Epidemics of contagious illnesses, such as smallpox, remained a constant concern as the 20th century began.

During the early 20th century, the city board of health in Massachusetts had the ability to impose vaccination for public health or safety.[6] The case of *Jacobson v Massachusetts* occurred when smallpox cases were increasing in Cambridge during 1902. In response, the city's board of health issued an order requiring all adults to be vaccinated against the smallpox virus. A small monetary fee of $5 (about $100 now) was the statutory penalty for rejecting vaccination. However, there was no provision for someone to be forcibly vaccinated.[6] During this time, a man by the name of Henning Jacobson declined to be vaccinated, stating that previous vaccines had caused him and his children to have adverse responses. Jacobson was fined but later appealed his case to the US Supreme Court. After legal arguments, the Supreme Court upheld the state's right to provide the board of health authority to order a mass vaccination campaign during a public health crisis. As Justice Harlan summarized:

> There is, of course, a sphere within which the individual may assert the supremacy of his own will and rightfully dispute the authority of any human government, especially of any free government existing under a written constitution. But it is equally true that in every well-ordered society charged with the duty of conserving the safety of its members the rights of the individual in respect of his liberty may at times, under the pressure of great dangers, be subjected to such restraint, to be enforced by reasonable regulations, as the safety of the general public may demand.[6]

However, the US Supreme Court argued that the Constitution conferred powers on the federal government; it did not confer powers on states, particularly with regards to vaccinations. As a result, the question of the limitations of sovereign state power on the public remained an open question for future generations to delineate through advances in technology and the emergence of new infectious diseases.[6]

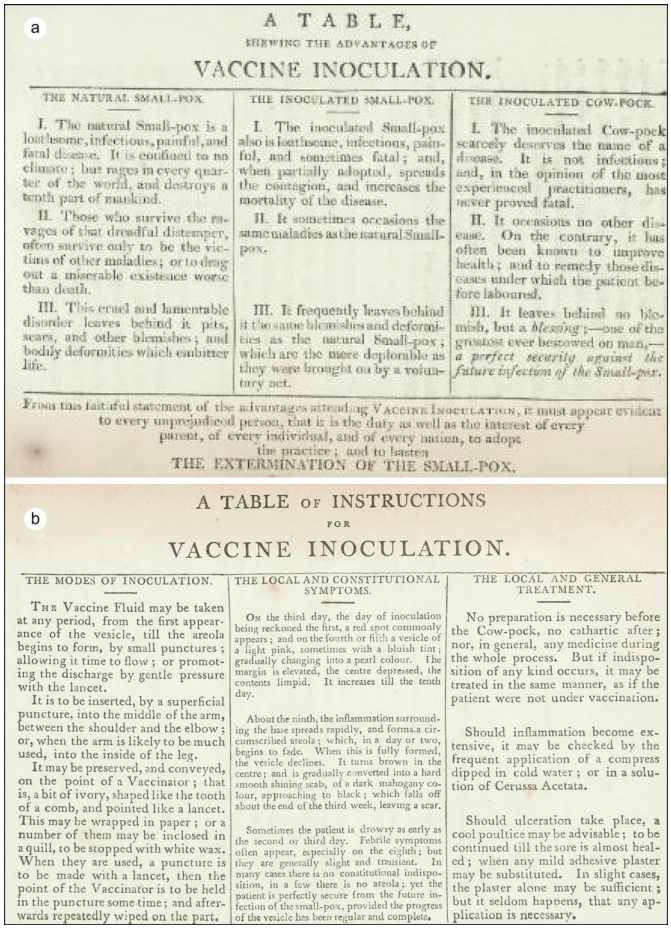
Overall, *Jacobson v Massachusetts* showed that the passage of public health programs is predicated on whether the public will support such measures if they believe that public health authorities will make sound recommendations based on evidence and that the public will be treated as a partner rather than a problem. This link between public trust and public health initiatives was illustrated through comments of Albert Mackey.

ALBERT MACKEY AND SMALLPOX VARIOLIZATION

Albert Mackey reflected on the smallpox vaccine and the public perceptions of variolization in a letter to Dr. Middleton Mitchel. In this letter, Mackey wrote:

> You [Dr. Middleton Mitchel] ask me concerning my father Dr. John Mackey. I have no knowledge or recollection of where or when he graduated. Before the revolution, such of our medical students as could afford it went to Edinburgh and a few to Leyden…. During the revolution he was an army surgeon having been appointed on examination and afterwards settled for practice in Charleston. My father was probably in this position. Removing with my grandfather from South Carolina into Georgia immediately after the close of the Revolution, he studied medicine at Louisville, Georgia and there commenced the practice of his profession. About the first or second year of the present century he established himself in Charleston and practiced there for some years, but mostly abandoned his profession for politics and became the proprietor and editor of a daily paper the "Investigator." I was too young to know anything previously of his career as a physician.
>
> I have always however been told that his most intimate brother practitioner was Dr. Joseph Johnson. There is however one circumstance connected with my father's professional life that I think it due to his memory that I should relate, and which may be deemed by you of some interest. About the commencement of this century vaccination [variolization] the recent discovery of Dr. Jenner was being introduced into this country but met here, as it did in England, with much opposition from the prejudices of the faculty and the superstition of the people. The former were reluctant to abandon the practice of inoculating from the virus of smallpox which nearly two centuries before had been introduced into Europe from the East through the edicts of Lady Mary Mobley Montague. My father had paid great attention to this subject and was a warm advocate of vaccination with the virus of the cow pox as a substitute for the more dangerous inoculation with the smallpox pustule. He devoted himself to the introduction of the pox pustule.
>
> He devoted himself to the introduction of the practice in Charleston and wrote on the subject a little book entitled a "Treatise on the Cow Pox," which was published about 1805. This work is now entirely out of print. A single copy was in my possession but was lost with many other books of my library during the bombardment of Charleston. I have, however, a recollection of the most important parts of its content. He compared the two nodes of prophylaxis, and showed that while vaccination was absolutely safe, inoculation was followed by about one death in three hundred. I have always understood during my childhood and youth from his contemporaries, that my father aided by his medical friends among whom was conspicuously Dr. Jos. Johnson, was mainly instrumental in getting the profession in our city to abandon inoculation and to adopt vaccination.
>
> For many years the operation of vaccinating children was in the hands of the profession. Great and intelligent care was employed in the selection of the virus and in the management of the subsequent sympathetic fever. Vaccination was at that time really a preventive. Vaccinated myself by my father, I have during my life subjected with entire immunity to the influence of the contagion and sixty-three years after the original vaccination, sought without result to produce any effect upon my arm from the introduction of virus, which I knew to be prime. But the practice fell into the hands of the inexperienced, especially ignorant women, and the prophylactic effects of vaccination began to diminish. It has always been a question with me whether we ought to trace the introduction of varioloid to this imperfect vaccination. But this is a problem which you are far better able to resolve than I am.[7]

Mackey's reflections on variolization reveal a progression in the development of vaccinations from the old variolization to safer methods of vaccination. The risks and benefits of vaccines were discussed among physicians, particularly with regards to reducing mortality and complications from administering the vaccines. It also appears from Mackey's writings that physicians were experimenting with different methods of



a

A TABLE,

SHEWING THE ADVANTAGES OF

VACCINE INOCULATION.

THE NATURAL SMALL-POX.	THE INOCULATED SMALL-POX.	THE INOCULATED COW-POCK.
I. The natural Small-pox is a loathsome, infectious, painful, and fatal disease. It is confined to no climate; but rages in every quarter of the world, and destroys a tenth part of mankind.	I. The inoculated Small-pox also is loathsome, infectious, painful, and sometimes fatal; and, when partially adopted, spreads the contagion, and increases the mortality of the disease.	I. The inoculated Cow-pock scarcely deserves the name of a disease. It is not infectious; and, in the opinion of the most experienced practitioners, has never proved fatal.
II. Those who survive the ravages of that dreadful distemper, often survive only to be the victims of other maladies; or to drag out a miserable existence worse than death.	II. It sometimes occasions the same maladies as the natural Small-pox.	II. It occasions no other disease. On the contrary, it has often been known to improve health; and to remedy those diseases under which the patient before laboured.
III. This cruel and lamentable disorder leaves behind it pits, scars, and other blemishes; and bodily deformities which embitter life.	III. It frequently leaves behind it the same blemishes and deformities as the natural Small-pox; which are the more deplorable as they were brought on by a voluntary act.	III. It leaves behind no blemish, but a *blessing*;—one of the greatest ever bestowed on man,—*a perfect security against the future infection of the Small-pox.*

From this faithful statement of the advantages attending VACCINE INOCULATION, it must appear evident to every unprejudiced person, that it is the duty as well as the interest of every parent, of every individual, and of every nation, to adopt the practice; and to hasten THE EXTERMINATION OF THE SMALL-POX.

b

A TABLE OF INSTRUCTIONS

FOR

VACCINE INOCULATION.

THE MODES OF INOCULATION.	THE LOCAL AND CONSTITUTIONAL SYMPTOMS.	THE LOCAL AND GENERAL TREATMENT.
THE Vaccine Fluid may be taken at any period, from the first appearance of the vesicle, till the areola begins to form, by small punctures; allowing it time to flow; or promoting the discharge by gentle pressure with the lancet.	ON the third day, the day of inoculation being reckoned the first, a red spot commonly appears; and on the fourth or fifth a vesicle of a light pink, sometimes with a bluish tint; gradually changing into a pearl colour. The margin is elevated, the centre depressed, the contents limpid. It increases till the tenth day.	No preparation is necessary before the Cow-pock, no cathartic after; nor, in general, any medicine during the whole process. But if indisposition of any kind occurs, it may be treated in the same manner, as if the patient were not under vaccination.
It is to be inserted, by a superficial puncture, into the middle of the arm, between the shoulder and the elbow; or, when the arm is likely to be much used, into the inside of the leg.	About the ninth, the inflammation surrounding the base spreads rapidly, and forms a circumscribed areola; which, in a day or two, begins to fade. When this is fully formed, the vesicle declines. It turns brown in the centre; and is gradually converted into a hard smooth shining scab, of a dark mahogany colour, approaching to black; which falls off about the end of the third week, leaving a scar.	Should inflammation become extensive, it may be checked by the frequent application of a compress dipped in cold water; or in a solution of Cerussa Acetata.
It may be preserved, and conveyed, on the point of a Vaccinator; that is, a bit of ivory, shaped like the tooth of a comb, and pointed like a lancet. This may be wrapped in paper; or a number of them may be inclosed in a quill, to be stopped with white wax. When they are used, a puncture is to be made with a lancet, then the point of the Vaccinator is to be held in the puncture some time; and afterwards repeatedly wiped on the part.	Sometimes the patient is drowsy as early as the second or third day. Febrile symptoms often appear, especially on the eighth; but they are generally slight and transient. In many cases there is no constitutional indisposition, in a few there is no areola; yet the patient is perfectly secure from the future infection of the small-pox, provided the progress of the vesicle has been regular and complete.	Should ulceration take place, a cool poultice may be advisable; to be continued till the sore is almost healed; when any mild adhesive plaster may be substituted. In slight cases, the plaster alone may be sufficient; but it seldom happens, that any application is necessary.

Figure 2. Information on cowpox variolization from John Ring's book, *A Treatise on the Cow-pox.* **(a)** The advantage of vaccine inoculation. **(b)** Instructions for vaccine inoculation.

smallpox variolization administration to improve its effectiveness and tolerability among their patients. A table from John Ring's book, *Treatise on the Cow-pox,* describes the process of administering the smallpox variolization. *Figure 2a* provides a summary of the research in the 19th century about the benefits and risks of variolization against smallpox. The method that Mackey's father used appears in *Figure 2b*, which stated:

> The vaccine fluid may be taken at any period, from the first appearance of the vesicle, till the areola beings to form, by small punctures; allowing it time to flow; or promoting the discharge by gentle pressure with the lancet. It is to be inserted, by a superficial puncture, into the middle of the arm, between the shoulder and the elbow; or, when the arm is likely to be much used, into the inside of the leg. It may be preserved, and conveyed, on the point of a vaccinator; that is, a bit of ivory, shaped like the tooth of a comb, and pointed like a lancet. This may be wrapped in paper; or a number of them may be inclosed in a quil, to be stopped with white wax. When they are used, a puncture is to be made with a lancet, then the point of the vaccinator is to be held in the puncture sometime; and afterwards repeatedly wiped on the part.[8]

As shown in *Figure 3*, the book also provided a diagram of the appearance of the vesicle as it healed after variolization was performed. John Ring's book described the process:

> On the third day, the day of inoculation being reckoned the first, a red spot commonly appears; and on the fourth or fifth a vesicle of a light pink, sometimes with a blush tine; gradually changing into a pearl colour. The margin is elevated, the centre depressed, the contents limpid. It increases till the tenth day. About the ninth, the inflammation surrounding the base spreads rapidly, and form a circumscribed areola; which, in a day or two, begins to fade. When this is fully formed, the vesicle declines. It turns brown in the centre; and is gradually converted into a hard smooth shining scab, of a dark mahogany colour, approaching to black; which falls off about the end of the third week, leaving a scar.[8]

Though Mackey's writing shows misogynistic attitudes toward women as "ignorant," his letter shows that a lack of consistency in medical training may have been a contributing factor to adverse outcomes with the smallpox vaccine during the early 19th century. Mackey's father and fellow physicians spent considerable effort to change the attitudes of their patients to use better vaccination methods instead of the original variolization. The description suggests a tension of physicians in addressing vaccine skepticism as well as challenging traditions regarding medical treatments among their colleagues and the public. Although information dissemination methods have evolved since the 19th century, antivaccination groups have remained mostly unchanged, especially toward vaccine mandates.

VACCINATION MANDATES: PAST AND FUTURE

Criticism of vaccine mandates has drawn inspiration from political ideologies throughout history. This link between politics and broader political factors (e.g., cultural trends, social movements, political parties) is important for antivaccination campaigns to flourish.[9] Most vaccination criticisms range from conspiracy theories to outright denials of the state's power to meddle in private persons' health. Moreover, vaccine skeptics on mandates have generally used conspiracy theories to attribute harmful intentions to unknown persons in conjunction with rhetoric denouncing state interference with an individual's medical autonomy.[9] More crucially, criticism of vaccination policy frequently reflects broader social worries about public authorities' ability to withstand corporate pressure and other lobbying efforts. These arguments typically cite flaws in early pharmacosurveillance systems, which have aided in the formation of vaccine injury compensation programs.

However, a core component of vaccine resistance to public vaccine mandates is related to the unequal treatment of the disadvantaged and minorities.[9] For example, the antivaccine riots of the 1900s in Brazil were a response to the poor's unequal treatment in the context of a massive drive toward modernization. In addition, vaccine hesitancy among African Americans and other minority groups in the United States has often been motivated by institutional racism and discriminatory policies. With any public health mandate, government coercion has the potential to increase political and social conflicts. The passage of additional mandates was critical in the establishment of several antivaccination movements in the United Kingdom, Brazil, and France during the 19th and 20th centuries.[9] Furthermore, vaccine resistance in

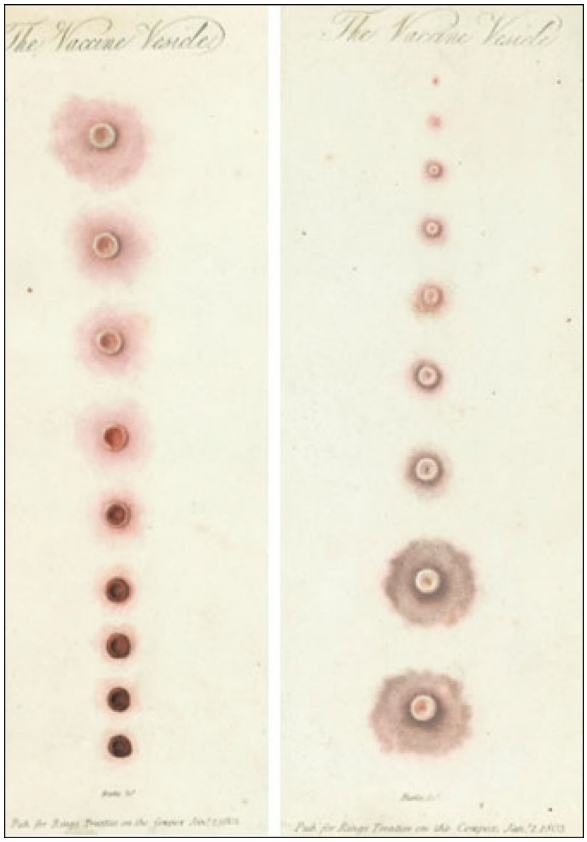


Figure 3. The stages of healing after successful smallpox variolization in John Ring's book, *A Treatise on the Cow-pox.*

low- and middle-income nations is correlated with cultural traditions, alternative health beliefs, and religion.

The World Health Organization Regional Office for Europe has identified three ways to confront vaccine-critical activists in public spaces in order to strengthen immunization efforts.[9] The first stage is to determine the vaccination critics' method of attack. The majority of the arguments use conspiracy theories, references to bogus experts, cherry-picking data, unrealistic expectations, misrepresentation of scientific data, or general misinformation *(Table 1)*.[9] Most vaccination arguments fall under one of five categories: mistrust in health authorities and health care professionals, low disease danger, vaccine ineffectiveness, hazardous vaccines, and vaccine alternatives.

CONCLUSION

Civilizations have been plagued with a variety of pandemics throughout history. In the modern era, the danger of epidemics and pandemics has increased with growing human populations, encroachment on the environment, and international travel. The lessons from prior pandemics, such as smallpox, provide insight into the common frameworks of antivaccination sentiments and resistance to vaccine mandates. These parallels highlight the importance of understanding antivaccinationists' profoundly held ideas, which are often spiritual, philosophical, or ideological in nature, regardless of how the medical community feels about them. The antivaccination movement includes a diverse group of people, ranging from conspiracy theorists to educated, well-informed health care customers who frequently have a complicated explanation for their ideas. Resistance to vaccination has always occurred, but these debates, together with occurrence of vaccine-preventable illnesses in unvaccinated or undervaccinated populations, have heightened awareness among public health officials that general vaccination acceptance cannot be assumed. In the context of SARS-CoV-2, it is more critical than ever to better understand the factors that influence vaccine resistance and hesitancy.

Table 1. Core components of past and present anti-vaccination arguments

1.	Conspiracy theories
2.	Reference to fake experts
3.	Selectivity in evidence used to criticize vaccines (e.g., cherry-picking data)
4.	Impossible expectations or misrepresentation of data
5.	Distrust in health authorities and health care providers
6.	Perceived low threat of disease
7.	Perceived lack of effectiveness or safety of vaccines and perceived alternatives to vaccines

1. Wolfe RM, Sharp LK. Anti-vaccinationists past and present. *BMJ*. 2002;325(7361):430–432. doi:10.1136/bmj.325.7361.430.
2. Bhattacharya S, Brimnes N. Introduction: simultaneously global and local: reassessing smallpox vaccination and its spread, 1789-1900. *Bull Hist Med*. 2009;83(1):1–16. doi:10.1353/bhm.0.0194.
3. Esparza J. Three different paths to introduce the smallpox vaccine in early 19th century United States. *Vaccine*. 2020;38(12):2741–2745. doi:10.1016/j.vaccine.2020.01.077.
4. Riedel S. Edward Jenner and the history of smallpox and vaccination. *Proc (Bayl Univ Med Cent)*. 2005;18(1):21–25. doi:10.1080/08998280.2005.11928028.
5. Lanzarotta T, Ramos MA. Mistrust in medicine: the rise and fall of America's First Vaccine Institute. *Am J Public Health*. 2018;108(6):741–747. doi:10.2105/AJPH.2018.304348.
6. Mariner WK, Annas GJ, Glantz LH. Jacobson v Massachusetts: it's not your great-great-grandfather's public health law. *Am J Public Health*. 2005;95(4):581–590. doi:10.2105/AJPH.2004.055160.
7. Mackey AG. Letter from Albert G. Mackey, M.D., to Dr. Middleton Michel [undated]. Toner Collection, Library of Congress, Washington, DC.
8. Ring J. *A Treatise on the Cow-Pox; Containing the History of Vaccine Inoculation, and an account of the Various Publications Which Have Appeared on That Subject in Great Britain, and Other Parts of the World*. Philanthropic Reform; 1801–1803. Philadelphia Society, St. George's-Fields.
9. Dubé È, Ward JK, Verger P, MacDonald NE. Vaccine hesitancy, acceptance, and anti-vaccination: trends and future prospects for public health. *Annu Rev Public Health*. 2021;42:175–191. doi:10.1146/annurev-publhealth-090419-102240.