

## The discontinuation of routine smallpox vaccination in the United States, 1960-1976: an unlikely affirmation of biomedical hegemony

A descontinuação da vacinação de rotina contra a varíola nos Estados Unidos, 1960-1976: uma afirmação improvável da hegemonia biomédica

Miriam Rich<sup>1</sup>

**Abstract** *This article seeks to understand the discursive context of the cessation of routine smallpox vaccination in the United States in the early 1970s. The United States has a long tradition of opposition to compulsory smallpox vaccination, usually expressed in terms of concerns about personal liberties, the extent of state authority, and challenges to the hegemony of orthodox biomedicine. The practice of routine smallpox vaccination continued in the United States until its termination in the 1970s, following a 1971 recommendation against the practice issued by the United States Public Health Service. This history investigates the ways in which opposition to compulsory smallpox vaccination in the 1960s and 70s was articulated and understood by contemporaries through an analysis of the rhetoric used in leading medical journals and popular newspapers. It finds that this ultimately successful movement to end routine smallpox vaccination drew upon the language of biomedical authority rather than political protest.*

**Key words** Vaccination, Smallpox, History, United States, Anti-vaccination movements

**Resumo** *Este artigo procura entender o contexto discursivo da cessação da vacinação de rotina contra varíola nos Estados Unidos no início dos anos 70. Os Estados Unidos têm uma longa tradição na oposição à vacinação compulsória contra a varíola, geralmente expressa em relação ao que se refere à liberdade pessoal, à extensão da autoridade estadual e desafios à hegemonia da biomedicina ortodoxa. A rotina de vacinação contra varíola continuou nos Estados Unidos até a extinção da doença nos anos 70, seguida de uma recomendação em 1971 contra a prática emitida pelo Serviço de Saúde Pública dos Estados Unidos. Essa história investiga as maneiras pelas quais a oposição à vacinação compulsória contra a varíola nos anos 60 e 70 foi articulada e entendida por contemporâneos através da análise da retórica utilizada pelos principais periódicos médicos e jornais populares. Descobriu-se que esse movimento bem-sucedido de eliminar a rotina de vacinação contra a varíola explorou a linguagem da autoridade biomédica em vez de protesto político.*

**Palavras-chave** Vacinação, Varíola, História, Estados Unidos, Movimentos antivacinação

<sup>1</sup> Swarthmore College, 500 College Ave., Swarthmore, PA 19081, USA. mrich2@swarthmore.edu

## Introduction

In 1961, the *New York Times* ran a brief news story about two New Jersey couples who had refused to allow their children to be inoculated against polio. The local school district was threatening to obtain a court order for the vaccinations. “If this was something you could leave up to the parents’ discretion,” the school superintendent Patrick A. Boylan was quoted as saying, “You’d soon have people coming around telling you they didn’t believe in smallpox vaccinations”<sup>1</sup>.

Less than one decade after Boylan summoned the specter of ending childhood smallpox vaccination as the ultimate example of dangerous and unscientific absurdity, the United States Public Health Service issued its 1971 recommendation that “the practice of routine smallpox vaccination is no longer indicated in this country”<sup>2</sup>. By January 1976, not a single state required that children be vaccinated against smallpox as a precondition for entry into school<sup>3</sup>.

How, in the course of ten years, had opposition to compulsory smallpox vaccination transformed from the epitome of irrational delusion to the official position of the Public Health Service?

The simplest and most conservative answer might be that the World Health Organization (WHO) campaign to eradicate smallpox, underway in the intervening decade, had rendered vaccination against smallpox unnecessary. Going to the opposite extreme, one might posit instead some sort of revolution in the epistemology of medical knowledge, a radical political overhaul of America’s relationship to compulsory vaccination and the state.

In reality, the answer is neither so simple as the first theory would suggest nor so radical as the second. While it is true that the WHO campaign was making great strides during the 1960s, the global eradication of smallpox was not officially declared by the World Health Assembly until 1980<sup>4</sup>. In fact, the reasons the Center for Disease Control offered in justification of its 1971 Public Health Service recommendation were almost identical to those outlined in an editorial published in *The Journal of the American Medical Association* over six years earlier<sup>5</sup>. If the policy change was merely a matter of common sense, one might be compelled to ask, not why did it happen so quickly, but why did it take so long?

Clearly the dramatic policy change represented something more complex than an automatic and straightforward response to an unambiguous change in epidemiological circumstance. But

neither, I will argue, was it indicative of any categorical shift in political or cultural mores. An examination of the articles published on the topic in both scholarly and popular media reveal that the 1960s and 70s campaign to discontinue smallpox vaccination originated from within the biomedical community itself, an internal push that accomplished its aim without upsetting the hegemony of biomedicine. The discontinuation of smallpox vaccination was argued for and accomplished in a way that reaffirmed rather than challenged the cultural privileging of the scientific discourse and biomedical community.

## The tradition of anti-vaccinationism in U.S. history

The U.S. has a long history of antagonism to compulsory smallpox vaccination: Robert Johnston characterizes this opposition as emblematic of a “vigorous tradition of medical dissent”<sup>6</sup>.

Historically, such dissent has been characterized by concerns with personal liberties, democracy of choice, the role and extent of state authority, and challenges to the principles and assumptions of orthodox biomedicine. Though, as Nadav Davidovitch notes, *those opposed to vaccination have generally been portrayed in monolithic terms as irrational groups, tied primarily to the radical fringes of alternative medicine*<sup>7</sup>, objection to compulsory vaccination, and even specifically smallpox vaccination, has been a tradition of U.S. life since the eighteenth century, when Cotton Mather’s efforts to introduce inoculation to Boston in the midst of a smallpox epidemic led to an attempt against his life. Resistance to vaccination has often been intimately bound up with class and race issues, with lower-class New Englanders rioting against forced inoculation in the years leading up to the Revolution, and free blacks refusing to be vaccinated during an epidemic in 1827<sup>8</sup>.

Writing on anti-vaccinationist phenomena in a broader global context, Sanjoy Bhattacharya and Niels Brimnes implicate “day-to-day economic considerations” of civilians as well as “questions of religious, social, and class-based concerns, and alternative interpretations of scientific research”<sup>9</sup> in their explication of popular opposition to state-sponsored vaccination drives. In the United States, opposition to vaccination continued to build into the late nineteenth century, with many viewing compulsory vaccination as a hazardous state invasion into the individual’s

private body and an insult to democratic doctrines of medical freedom, as well as more specific religious or personal objections to the idea of introducing disease material into a healthy body. This tradition of opposition survived into the twentieth century, despite an overall increase in public support for vaccination during this time<sup>6</sup>. Davidovitch asserts that opposition to compulsory vaccination was *quite often embedded in a network of dissent against the hegemonic Establishment, whether in politics or medicine. Calls for medical freedom and the right for individual choice in health matters were part of a broader battle for preserving the private sphere out of reach of the state*<sup>7</sup>.

The challenge to the hegemony of the biomedical state is a feature that remains characteristic of anti-vaccinationist sensibilities to this day, and as such still possesses great power to rankle those who would defend the state's authority – in a *New Yorker* article discussing the “widespread fear of vaccines that... persists to this day” specifically in the context of the 2009 outbreak of the H1N1 virus, Michael Specter referred disparagingly to those who opposed vaccination as “the anti-vaccine, anti-government, and anti-science crowd”<sup>10</sup>. In the past several decades, the advent of new communication technologies, in particular the Internet, have allowed this “crowd” to meet, organize, and disseminate information on previously unfeasible scales, leading to what Anna Kata views as a recent “re-emergence of anti-vaccination sentiments.” Kata identifies the prominence of “arguments around the themes of safety and effectiveness, alternative medicine, civil liberties, conspiracy theories, and morality”<sup>11</sup> in these sentiments, highlighting the remarkable continuities between the objections of modern-day Internet commentators and those of Americans in centuries past.

### **The movement to end routine smallpox vaccination: 1960-1976**

This pronounced political perspective – interpreted as “anti-government” and “anti-science” by its detractors, understood as a defense of essential personal liberties by its proponents – was conspicuously absent from the mainstream scholarly and popular articles documenting the debate over smallpox vaccination in the 1960s and '70s. In this way, the ultimately successful push to discontinue compulsory smallpox vaccination marked a significant departure from the

historical trends of anti-vaccination movements in the U.S. The voices challenging routine vaccination were internal to the biomedical community, and they did not challenge the vaccination on political or philosophical grounds. Their opposition to routine smallpox vaccination was not argued or explained in terms of political, religious, or medical freedoms; rather, they stayed within a language of scientific rationality and quantifiable biological risk. They did not question the right of medical and state institutions to intervene in the bodies of their subjects; they only questioned whether it was being done in the most beneficial way. The policy change in routine smallpox vaccination was accomplished relatively quietly through legal, mainstream channels – a Public Health Service recommendation and the ensuing repeals of compulsory vaccination laws by state legislatures – rather than any political or civic revolt or even disobedience.

The most prominent advocates of discontinuing smallpox vaccination could not have been any further from the disparaging stereotype of anti-vaccinationists as “unorthodox medical practitioners under the influence of ‘irrational and unscientific arguments’”<sup>9</sup>. Instead, the men (female voices were in general absent from this debate as recorded in scholarly and popular articles) who led this campaign were institutionally respected and well-established physicians. Dr. C. Henry Kempe, the earliest voice questioning the net benefit of routine smallpox vaccination in the ultimately successful movement to discontinue it, was an eminent virologist and pediatrician responsible for the development of an attenuated strain of smallpox vaccine for use on children with eczema, as well as a member of WHO's Expert Committee on Smallpox. He had treated over 10,000 cases of smallpox around the world, a third of which, he said, were fatal<sup>12</sup>; he could not be accused of naivete regarding the disease's effects. Drs. J. Michael Lane, J. Donald Millar, and John Neff all worked in the Smallpox Unit of the National Communicable Disease Center. Nowhere in the literature do these men challenge the value of vaccines in general, or the right of state and medical establishments to intervene in the bodies of their subjects. On the contrary, they prefaced their objections to routine smallpox vaccination in the U.S. with praise for the practice in other contexts: in raising the issue, Kempe noted that “[s]mallpox vaccination on a worldwide scale continues to be of infinite importance as a public health measure,” and was careful to acknowledge that “there is little doubt that universal vaccina-

tion has stamped out smallpox in this country”<sup>13</sup>. Kempe and the others objected to routine smallpox vaccination not on the basis of a broader political or philosophical principle, but only on the basis of the vaccine’s biomedical danger to the general U.S. population, which due to unique historical circumstances they felt now outweighed its biomedical benefit.

In 1960, Kempe gave an address presenting his concerns about the problematic side effects of smallpox vaccination, including mortality and significant morbidity<sup>13</sup>. He greatly expanded on the implications of these concerns in two 1965 articles published in prominent medical journals. In these, Kempe first proposed that the practice of routine smallpox vaccination in childhood was no longer justifiable. He felt that the vaccine’s rate of serious complications was unacceptable in a population with a negligible risk of ever encountering the disease it protected against: since 1948, he noted, not a single person in the U.S. had died of smallpox, whereas he estimated that in this same time period 200-300 individuals had died as a direct consequence of the vaccination, with countless more suffering severe though non-fatal side effects<sup>12</sup>. Kempe found little support among his colleagues at this time: in a discussion section appended to his proposal in *Pediatrics*, Dr. Samuel Katz charged that “Dr. Kempe has opened Pandora’s box deliberately,” while Dr. Joel Alpert was anxious to “avoid the headline tomorrow morning that will say ‘Pediatricians against vaccination.’” With few exceptions, Katz seemed to sum up the general reaction in his assertion that “I do not believe that many of us are prepared to go along with you in abandoning what we now have”<sup>13</sup>. *Time* magazine was more receptive to Kempe’s ideas than were many of his fellow pediatricians: in two articles entitled “The two faces of smallpox” and “Eczema and vaccination,” the magazine devoted a significant amount of space to Kempe’s ideas, quoting his projected figures at length and without rebuttal<sup>14,15</sup>.

In the second half of the 1960s, numerous articles on the subject began to appear in medical journals. In 1967 and 1969, the *New England Journal of Medicine* published the results of two national studies undertaken to ascertain the frequency of complications associated with smallpox vaccinations<sup>16,17</sup>. Accompanying the 1969 report were two contrasting editorials: the first, by Lane and Millar, outlined the case for discontinuing routine smallpox vaccination using much the same line of reasoning Kempe had, and the second, by Katz and Dr. Saul Krugman, argued

against discontinuation<sup>18,19</sup>. Within the next few months, both *Time* and *Science News* ran pieces intended for popular audiences summarizing the debate between these medical professionals<sup>20,21</sup>. *JAMA*, in early 1970, published an article about deaths attributable to smallpox vaccination<sup>22</sup>. The article received immediate coverage in major newspapers, including the *New York Times* and *Washington Post*<sup>23,24</sup>. In the year that followed, Lane, Millar, and Neff were given extensive space in medical journals to outline their arguments for discontinuation, publishing a lengthy article in *The Annual Review of Medicine*<sup>25</sup> and two in a single issue of *The American Journal of Epidemiology*<sup>26,27</sup>; in the same issue of this latter journal, Katz once again wrote an article opposing Lane, Millar, and Neff’s suggestions<sup>28</sup>.

By now, however, the tide of official opinion had turned in favor of those advocating discontinuation. In September of 1971, the Public Health Service issued its historic recommendation to discontinue routine smallpox vaccination in the U.S. In embracing this recommendation, however, the medical community was careful to stress that smallpox was a unique case: its vaccine was particularly virulent; its epidemiological profile favored vaccination of contacts rather than herd immunity as a strategy of containment; and, due to the tremendous efforts of the WHO campaign, the disease was on its way to total global eradication, its exclusively human reservoir shrinking by the month. Routine vaccination, all these articles were careful to stress, was being recommended against in this particular instance but not as a general strategy<sup>29-33</sup>. Even with these caveats, there was some internal opposition within the medical community to the Public Health Service recommendation: doctors who felt discontinuation was premature flooded the *The American Journal of Public Health*, state medical journals, and *JAMA* with letters expressing their dismay<sup>34-37</sup>. Overall, however, the policy change was embraced by the medical community at large, and the state legislatures followed suit: by 1976 not a single state retained a compulsory smallpox vaccination law.

### **The end of smallpox vaccination in perspective: an affirmation of biomedical authority**

Vaccination has long been a cornerstone tool of the biomedical state; thus, on its surface, arguing to discontinue a program of routine vaccination might seem like a radical stance. In actuality, how-

ever, this movement for discontinuation was in most essential ways of a fundamentally conservative character. Kempe, Millar, Lane, and Neff all spoke the language of orthodox biomedicine. They framed matters in terms of scientific rationalities, logic, and clinically collected data. Kempe and Benson spoke of “objectively assessing the costs and gains” and “deciding whether the benefit of production thus produced outweighs the dangers associated with the procedure”<sup>5</sup>; Lane and Millar asserted an intent to “quantitate and weigh” various factors and “thereby to define a rational vaccination policy”<sup>18</sup>. Their arguments, dealing in the concrete and quantifiable, worked within the biomedical paradigm. They sought not to question the legitimizing power of scientific validation, but instead to secure it for their own cause.

Perhaps as a defensive posture against the stigma of unscientific irrationality associated with a position of anti-vaccinationism, the doctors in favor of ending routine vaccination repeatedly reinforced their status as scientific experts through a heavy emphasis on the language and ideas of scientific rationality. That these men girded their arguments in densely scientific prose is not necessarily remarkable in and of itself, since they were writing for their peers in the biomedical community. What is remarkable is that, in attempting to claim the legitimizing force of science for themselves, they in subtle ways denigrated pro-vaccinationists as irrational, ascientific, backwards, ruled by emotion rather than reason – the very charges typically leveled at *anti*-vaccinationists. Neff decried the “many *emotional* factors that perpetuate our old practices [emphasis mine]”<sup>27</sup>; *Time* quoted a doctor’s explanation that “changes in vaccination policy are resisted... because of ‘an emotional investment in the traditional role of smallpox vaccination’”<sup>20</sup>, and not, was the implication, because of any scientifically legitimate reason. In articulating opposition to routine smallpox vaccination, there was a heavy investment in words such as “reasonable,” “rational,” “logical,” “legitimate,” and “scientific.” In this, it is clear that the attempt was not to subvert or challenge the biomedical paradigm, but rather to work within it.

In contrast to nineteenth and early twentieth-century arguments against compulsory vaccination, the doctors’ arguments did not contest or even engage with the implications of institutional custodianship of subjects’ bodies. Rather, in issuing their recommendations as experts within the biomedical community, they reaffirmed the authority of the medical state to decide and implement programs in the best interest of the laity.

Lane and Millar, while recommending discontinuation of smallpox vaccination, acknowledged several legitimate objections to their suggestion, including the risk that “if public-health agencies cast doubt upon the need for routine smallpox vaccination, some laymen may question other immunizations as well”<sup>18</sup>. Lane and Millar were willing, in other words, to entertain the possibility that it might be preferable to continue to administer what they themselves deemed a dangerous and unnecessary vaccine to patients rather than to risk inciting the laity to question the legitimacy and authority of biomedicine in general. Lane and Millar may have been advocates for patients’ health, but, unlike anti-vaccinationists of the past, they were certainly not advocates for patients’ medical freedom. In an article designed to explain the Public Health Service’s 1971 recommendation, the California Department of Public Health concluded by stressing that *it must be strongly emphasized that immunizations which are routinely given in this country for other endemic infectious diseases cannot be de-emphasized... as these diseases continue to pose an individual and public health threat if efforts to eliminate them through immunization are allowed to slacken*<sup>38</sup>. All this discourse worked within the bounds of an assumption that the government (and governmentally-sanctioned medical institutions) had the right and the power to intervene in its subjects’ bodies, and that laypeople ought to comply with whatever the medical community determined was best for them.

This was a debate in which biomedical voices were highly privileged, both on the pages of medical journals where they might be assumed to be, but also in the popular coverage of the issue. The medical community set the terms of the printed debate: the newspapers and magazines covered it as a medical issue, a debate internal to the medical community, rather than a political one for which lay opinion might be sought after and relevant. Popular articles quoted medical experts and doctors, eminent figures in the biomedical community; the articles do not reveal any significant vocal presence of those outside of it. This does not mean that such outside voices did not exist, of course, but the tenor of the public discourse, the mainstream media legitimization, strongly privileged the voices of biomedical insiders. These articles treated the question of vaccination policy as a strictly medical issue, to be negotiated and resolved among professionals; the questions of political freedoms, of religious or personal objection, of any agency on behalf of the vaccinated, did not appear in the discourse.

### Concluding comments

Despite the long history of popular political dissent to smallpox vaccination in the U.S., the ultimately successful drive to discontinue smallpox vaccination did not portray itself as the heir of this discursive tradition: instead, it attempted to depoliticize its implications by deploying only the language and logic of the biomedical paradigm. In fact, opponents of routine smallpox vaccination made a pronounced effort to distance themselves from what was perceived as “emotional” and “irrational” in the cultural image of the anti-vaccinationist. Whereas in the past, those decrying compulsory smallpox vaccination had often drawn upon a vocabulary of civil liberties and democracy of choice, men such as Kempe, Millar, Lane, and Neff framed their opposition in terms of assessing quantifiable medical costs and gains.

In this way, despite the dramatic policy reversals and law repeals it effected, the successful campaign to discontinue smallpox vaccination reinforced the biomedical status quo more than it altered it. Ultimately, while routine smallpox vac-

ination did not continue, the paradigm of compulsory vaccination did. Because it originated from within and was legitimized by the biomedical community, the policy change affirmed rather than challenged the authority of the medical profession to dictate what was best for the health of the populace. In the end, the discontinuation of routine smallpox vaccination was accomplished in the name of scientific rather than political progress.

This episode contributes to an interesting portrait of the polymorphous nature of anti-vaccinationism in U.S. history. Though historically opposition to vaccination has often been associated with countercultural challenges to the hegemony of the biomedical state, discontinuance of routine smallpox vaccination, as this article has sought to demonstrate, was agitated for and realized within a framework of biomedical authority and scientific legitimization. Indeed, opposition to vaccination has been, and continues to be, a complex issue with a remarkable ability to draw support from a wide range of political orientations and ideologies.



## References

1. Inoculation order defied by parents. *The New York Times* 1961; Oct 7. p. 15.
2. Centers for Disease Control. Public Health Service recommendation on smallpox vaccination. *MMRW Morb Mortal Wkly Rep* 1971; 20(38):339.
3. Altman LK. All states drop smallpox vaccinations. *The New York Times* 1976; Jan 29. p. 30.
4. Eradication of smallpox to be announced today. *The New York Times* 1980; May 8; Sect. A:21.
5. Kempe CH, Benenson AS. Smallpox immunization in the United States. *JAMA* 1965; 194(2):161-166.
6. Johnston RD. Contemporary anti-vaccination movements in historical perspective. In: Johnston RD, editor. *The politics of healing*. New York: Routledge; 2004. p. 244-271.
7. Davidovitch N. Negotiating dissent: homeopathy and anti-vaccinationism at the turn of the twentieth century. In: Johnston RD, editor. *The politics of healing*. New York: Routledge; 2004. p. 9-26.
8. Johnston RD. *The radical middle class*. Princeton, New Jersey: Princeton University Press; 2003.
9. Bhattacharya S, Brimnes N. Simultaneously global and local: reassessing smallpox vaccination and its spread, 1789-1900. *Bull Hist Med* 2009; 83(1):1-16.
10. Specter M. The fear factor. *The New Yorker* 2009; Oct 12.
11. Kata A. A postmodern Pandora's Box: anti-vaccination misinformation on the Internet. *Vaccine* 2010; 28:1709-1716.
12. Kempe CH. An evaluation of risks of smallpox vaccination in United States. *J Pediatr* 1965; 67(5P2):1017-1022.
13. Kempe CH. Studies on smallpox and complications of smallpox vaccination – E. Mead Johnson Award address. *Pediatrics* 1960; 26(2):176-189.
14. Two faces of smallpox. *Time* 1966; May 20.
15. Smallpox and eczema. *Time* 1967; May 12.
16. Neff JM, Lane JM, Pert JH, Moore R, Millar JD, Henderson DA. Complications of smallpox vaccination – I. National Survey in the United States, 1963. *N Engl J Med* 1967; 276(3):125-132.
17. Lane JM, Ruben FL, Neff JM, Millar JD. Complications of smallpox vaccination, 1968 – national surveillance in United States. *N Engl J Med* 1969; 281(22):1201-1207.
18. Lane JM, Millar JD. Routine childhood vaccination against smallpox reconsidered. *N Engl J Med* 1969; 281(22):1220-1222.
19. Krugman S, Katz SL. Smallpox vaccination. *N Engl J Med* 1969; 281(22):1241-1242.
20. The dangers of vaccination. *Time* 1970; Jan 5.
21. Bockel J. Vaccine controversy. *Sci News* 1970; 97(5):129-130.
22. Lane JM, Ruben FL, Abrutyn E, Millar JD. Deaths attributable to smallpox vaccination, 1959 to 1966, and 1968. *JAMA* 1970; 212(3):441-444.
23. Article reports some risk in smallpox vaccination. *The New York Times* 1970; April 20.
24. Vaccinations for smallpox called risky. *The Washington Post* 1970; April 20; Sect. A:3.
25. Lane JM, Millar JD, Neff JM. Smallpox and smallpox vaccination policy. *Annu Rev Med* 1971; 22:251-272.
26. Lane JM, Millar JD. Risks of smallpox vaccination complications in the United States. *Am J Epidemiol* 1971; 93(4):238-240.
27. Neff JM. The case for abolishing routine smallpox vaccination in the United States. *Am J Epidemiol* 1971; 93(3):245-247.
28. Katz SL. The case for continuing “routine” childhood smallpox vaccination in the United States. *Am J Epidemiol* 1971; 93(4):241.
29. Centers for Disease Control. Routine smallpox vaccination. *JAMA* 1971; 218(6):876-877.
30. Dukelow DA. Is routine smallpox vaccination still recommended? *JAMA* 1971; 218(9):1442.
31. Foege WH, Lane JM. End of routine smallpox vaccination in childhood. *Ann Intern Med* 1972; 76(2):324-325.
32. Kempe CH. The end of routine smallpox vaccination in United States. *Pediatrics* 1972; 49(4):489-491.
33. Karzon DT. Smallpox vaccination in United States – end of an era. *J Pediatr* 1972; 81(3):600-608.
34. Tizes R, Huntley AC. Discontinuance of routine smallpox vaccination. *JAMA* 1972; 219(7):908-910.
35. Bumbalo TS. Should smallpox vaccination be discontinued? *N Y State J Med* 1972; 17(12):1645-1646.
36. Tizes R, Zaki MH. Discontinuance of routine smallpox vaccination. *JAMA* 1972; 221(13):1521.
37. Tizes R. Continue smallpox vaccination! *Am J Public Health* 1973; 63(12):1022.
38. Hodges FB. Change in smallpox vaccination policy. *Calif Med* 1972; 116(3):108-111.

---

Artigo apresentado em 21/4/2010

Aprovado em 2/9/2010

Versão final apresentada em 17/9/2010