

In England, forty-four years after Jenner's first vaccination, variolation was declared a felony by Act of Parliament.

It is thus hardly to be expected that the North American Indians were at any time immunized against smallpox by variolation to an extent worth mentioning, even though in Europe, Asia, Africa, and even in America the method was practised with varying extensiveness and with considerable success between 1721 and 1798, and, even now, is resorted to when vaccine is not available.

In South America, a Carmelite missionary, seeing his flock dying about him during a severe epidemic, and having read in newspapers from Europe of the success of variolation, inoculated the remaining members of his mission in 1728. He seems to have been the first to immunize any of the Amerindians, and that with complete success.

Certain official attempts to introduce variolation into Latin America were made prior to 1779. At the time of the smallpox epidemic of that year the method proved to be of some value, but was not extensively used until the big epidemic of 1797 in southern Mexico and Guatemala. During this epidemic some sixty to seventy thousand natives were inoculated in the kingdom of New Spain (1). This, however, was accomplished primarily through the efforts of the clergy. In order to prevent the spread of the epidemic northward through Mexico and into California, it was ordered by the Viceroy that inoculation should be put into effect. It was thus given official sanction and support, and it is certain that more Mexican Indians were given protection by means of variolation than were Indians elsewhere.

The Indians, however, resisted the gratuitous efforts to protect them. In June 1796 (as quoted by Cook) Father J. M. Palacios wrote of the Mexican Indian: "These people are the most stubborn in the world. No reasons are sufficient to convince them of the benefits of inoculation. Some say God sent the disease into the town, but they will not permit the Spaniards to give it to more of their children" (2). This resistance to the efforts of the white man to protect the Indian from the scourge he most feared, and which, during the early years of conquest and settlement, was definitely the chief factor in the rapid decline of the native population, was difficult to meet.

Variolation was replaced by vaccination after Jenner's announcement in 1798 that cowpox, naturally or artificially transmitted to man,

5. Report of the Commissioner of Indian Affairs, *l. c.*, pp. 249-250.
6. Hanna, William: *Studies in Smallpox and Vaccination*, New York, 1913, p. 7.
7. *Madrid Gazette*, Oct. 14, 1806 (as given in *Calif. State Journal Med.*, May 1912), pp. 17-19.
8. Johnson, W. F.: *The History of Cuba*, New York, 1920, V. 2, p. 194.
- 9 de Humboldt, *op. cit.*, p. 113.
10. Twichell, R. E.: *The Spanish Archives of New Mexico*, 1914, pp. 500, 526, 528, 542.
11. Morse, Rev. J.: Report to Sec. of War on Indian Affairs, 1822, p. 67, app. 259.
12. James' Account of S. H. Long's Expedition, 1819-20, pt. 1 in *Early Western Travels* (R. G. Thwaites, ed.), v. 14, p. 14.
13. Pattie, James O.: *Personal Narrative 1831*, Cleveland, 1905, pp. 274-285.
14. Cook, S. F.: *Smallpox in Spanish and Mexican California, 1770-1845. Bull. Hist. Med.*, v. 7, 1939.
15. Father de Smets' Life and Travels among the North American Indians (H. M. Chittenden and A. T. Richardson, ed.), New York, v. 4, 1905, p. 1235.
16. Catlin, Geo.: *North American Indians*, London, 1876, v. 2, pp. 258-259.
17. Bancroft, H. H.: *History of Alaska*, San Francisco, 1886, p. 561.
18. Denig, E. T.: *Indian Tribes of the Upper Missouri*. U. S. Bureau Am. Ethn., Ann. Rep't. 46, Washington, 1930, pp. 130, 171.
19. Bancroft, *op. cit.*, p. 561.
20. *The Official Correspondence of James S. Calhoun*, Washington, Gov't. Printing Office, 1915, pp. 89-90.
21. Denig, *op. cit.*, p. 428.
22. Report of the Comm. of Indian Affairs for 1882-83, Washington, 1883, p. 123.
23. Report of Comm. of Indian Affairs for 1899-1900, Washington 1900, p. 529.
24. U. S. Office of Indian Affairs, Annual Report 1900-1901, Washington 1902, p. 229.
25. Schmeckebier, L. F.: *Service Monograph of U. S. Government*, No. 48, Baltimore, 1927, p. 518.
26. *Ibid.*, p. 229.

expended in suppressing the smallpox in the Indian Territory among those residents of said territory not members of any Indian tribe or nation therein, all accounts to be first carefully examined and approved by the Secretary of the Interior as just and reasonable" (23). At the same time the United States Bureau of Census estimated the Indian population at 237,196 (which number may be compared with 262,988, the estimate of the Indian Bureau), giving, for the above appropriation, even if it were all spent in vaccination, an average permitted cost of less than twenty cents per operation.\*

In 1909 \$40,000 was appropriated to relieve distress and to provide for "the prevention and treatment of tuberculosis, trachoma, smallpox, and other contagious and infectious diseases" (26). This, the first of a series of *general* appropriations for the control of infectious disease, was succeeded by others, yearly appropriations being made for this purpose beginning with 1911.

During 1926 the total expenditure for medical work was approximately \$1,300,000, of which \$638,545.90 was spent for the relief of distress and prevention of diseases (27). The survey of the economic and social conditions of the Indians of the United States, made in this year by the Institute of Government Research, showed that cases of smallpox were now found only occasionally; vaccination had been compulsory in Indian schools since 1907, though it was stated as probable that a fairly large number of adults and children were still not immune (28). However this may be, of the total of 5,078 Indian deaths in 1938 from all causes, only ONE was caused by smallpox.

#### REFERENCES

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2. Cook, S. F.: The Smallpox Epidemic of 1797 in Mexico, *Bull. History Med.*, VII, 1939, p. 962.
3. Report of the Commissioner of Indian Affairs, 1877, Washington, p. 584.
4. Original Journals of the Lewis and Clark Expedition (R. G. Thwaites, ed.), V. 7, 1905, pp. 248-250.

\* However, according to the Indian Agents Report for 1901, \$65,070.16 were spent for the control of smallpox among the Cherokee, Creek and Choctaw nations alone (24). In 1903, \$5,000. was appropriated for vaccine matter and vaccination (25).

always failed, or in the few instances of success the disease has assumed such a mild form that medicines were unnecessary. It generally takes the confluent turn of the most malignant kind (when the patient does not die before the eruption) which in 95 out of 100 is fatal. It appears to be the natural curse of the red man, and here we leave it perfectly willing others should do more. We have tried from year to year to introduce general vaccination with kinpox among them and have even paid them to vaccinate their own children, but they will not have it done to any extent, and the few who will, do it more to please us than to benefit themselves. Moreover, should any accident happen or should the Indian miss his hunt, or any casualty befall him or his family, the vaccination would be blamed for it, and the good hearted operator would find himself in a position of danger and expense" (21).

Treaties with the various tribes provided for physicians and, in some cases, for hospitals, but the extent and character of the medical work carried on among the Indians is difficult to determine. By the year 1880, seventy-seven physicians were employed by the Indian service, but there were only four hospitals. Not until the first decade of the present century was medical work among the Indians regarded as one of the major activities of the Indian service. Before this time the efficiency of the medical work depended on the character of the physician appointed. Traders and priests frequently dispensed medicines and vaccine to the Indians with whom they came in contact. Government records and other source material give little indication of vaccination having been extensively or successfully employed among the Indians prior to 1850-1855.

In 1882 the United States government spent \$1,430.35 for vaccination of Indians. Such a pittance was naturally not enough to secure vaccine material alone for over 300,000 Indians, many of whom had not been vaccinated or else needed revaccination. This inadequacy is shown by the 1883 epidemic in the Pueblo Agency in New Mexico, when thirty children at San Ildefonso and all of the unvaccinated children at San Juan died of smallpox (22).

In the May, 1900, Indian Legislation of the United States, an act was passed making appropriations of "\$50,000., or so much thereof as may be necessary, to be immediately available in payment of liabilities already incurred, and for the amount necessary to be

nating the Indians in the superintendency of Michigan, i. e., in bands at various points where the disease had appeared.

In the official correspondence of James S. Calhoun, Indian Agent at Santa Fe, there appears a letter written by two doctors, Drs. Robinson and Thomas, in 1849. This is here quoted because it gives not only a statement of the prevalence and mortality of smallpox among the pueblos of New Mexico, but also the status that vaccination as a preventive for smallpox had achieved at the time. It was sent to Colonel Calhoun, and reads: "It has occurred to us that humanity would be benefitted by a thorough vaccination of the Pueblos under your government. The fatal and loathsome scourge, for which vaccination is a specific, almost always in its periodical visits to this country makes its appearance in their villages, where as anyone will inform you the mortality is frightful. Their confined and ill-ventilated apartments nourish and propagate the poison to such an extent that it is unsafe for the unprotected citizen to go within their atmosphere. We have been informed on creditable authority that smallpox or varioloid had not ceased to exist in one or the other pueblos for the last twenty years. IN ADDITION to the IMMEDIATE benefit realized by the Pueblos and our people generally, we may be forgiven for mentioning the INCIDENTAL benefit to the WORLD, which a close observation of the effects of vaccination on varioloid or smallpox in so large a body of men as the Pueblos nation, must necessarily produce" (20). Such a study would, indeed, have been of great value, as it would have included results on nearly forty thousand Indians, who had, with the acquisition of New Mexico, fallen under the immediate superintendence of the United States government. However, not until the end of the 19th century did successful vaccination of the Indians curtail the appalling death rate from smallpox.

The general problem of the protection of the Indians at this time is probably most clearly stated by E. T. Denig, well known clerk of the Upper Missouri Outfit, who, about 1854, wrote: "It is hardly conceivable how the smallpox among the Indians could be cured by any physician. All remedies fail. The disease kills a greater part of them before any eruption appears. We have personally tried experiments on nearly two hundred cases according to Thomas' "Domestic Medicine," varying the treatment in every possible form, but have

visited Peru alone vaccinated fifty thousand persons. In reading this account of their travels, one is impressed by the vast territory of islands, as well as of Central and South America and Mexico which should have profited from this early program for vaccinating the natives. It is interesting to note that the expedition consisted not only of "members of the faculty and employees," but also of twenty-two children who were not immune to smallpox and who were destined to preserve the "precious fluid" by arm to arm transmission during the voyage. In this manner active vaccine was available, and this expedition had no such problem as the English encountered in carrying the pus in ships of the East India Company, which, on various occasions, arrived inert. Members of the Spanish expedition discovered cowpox in the valley of Atlixco, near the Pueblo de los Angeles, in Valladolid of Michoacan, and around Calaboza of the province of Caracas (in Venezuela). They discovered the disease on the udders of the cows. Thus a source of vaccine from cowpox was available to continue vaccination against smallpox (7).

The expedition was divided into two sections. One section went to South America, while the other visited Cuba and Mexico. The only part of the present United States territory touched was part of Texas, but the influence of the group was felt among the clergy of California.

Only gradually were the ravages of smallpox checked in Cuba, where, a few years later, Dr. Tomas Romay with the help of Bishop Espada succeeded in bringing about vaccination on an extensive scale (8). Even as late as 1898 there were three thousand cases of smallpox in Santiago (Holguin) alone.

De Humboldt states that the virus for vaccination was brought to Mexico from North America several times by Don Thomas Murphy, who introduced vaccination into Mexico. Its introduction there, he says, found few obstacles since the cowpox appeared as a trivial malady, and because "the smallpox inoculation had already accustomed the Indians to the idea that it might be useful to submit to a temporary evil for the sake of evading a greater evil." \* Though cowpox was known before the Balmis expedition arrived

\* This statement, like others of the same author, is somewhat too optimistic. It must be questioned in the light of our knowledge of the almost century long resistance of many Indians to vaccination.

is in itself harmless and protects the individual from smallpox. In July 1800, Dr. Benjamin Waterhouse received some vaccine virus from England and successfully vaccinated his own children. In 1801 he sent some of Jenner's vaccine to Thomas Jefferson, then President of the United States, who, in turn, used it with success on his children. President Jefferson, this same year, succeeded in having the first Indians vaccinated. From a letter written by Dr. Waterhouse to Dr. Spalding we find that the former had written to Jenner telling of the "diffusion of the blessings of his discovery among the tribes of Indians by the immediate agency of President Jefferson," for "a grand embassy of warriors were at Washington last winter (1801-02) when the President explained to them the precious donation which the Great Spirit had lately made the enlightened white man. He then caused all the warriors to be inoculated for the kinpox, and when they departed had the matter, with an abstract of the directions I had given to him, put into the hands of the interpreter, and told them that they would not only be secured by it from the smallpox, but that it would finally extirpate that disease from the earth" (3).

Convinced of the efficacy of vaccination, President Jefferson sent a letter on June 20, 1803, to Captain Meriwether Lewis of the First Regiment of Infantry, giving instructions as to how to foster friendship and understanding between the Indians and the United States government. The letter contained the following instructions: "Carry with you some matter of the kinpox. Inform those of them with whom you may be of its efficacy as a preservative from the smallpox; and instruct and encourage them (i. e. the Indians) in the use of it. This may be especially done wherever you winter." But in October 1803 Lewis writes to Jefferson, "I would thank you to forward me some vaccine matter, as I have reason to believe from several experiments made with what I have, that it has lost its virtue" (4). The Journals of Lewis and Clark make no further mention of vaccination, due probably to their inability to obtain vaccine. At the beginning of the 19th century this material was obtained either directly from Jenner or from the Vaccine Institution of London. The vaccine was sent on cotton thread which had been soaked repeatedly in eighth day virus. This vaccine was often worthless when available, due most likely to contamination, or possibly to improper methods of preservation and transportation. As late as 1898 the Indian Agent of

one of the New Mexico Agencies states that the whole history of the smallpox epidemic among the Zuni and other pueblos, which took place that year, "rests with the utter worthlessness of the vaccine points issued." He had used 9300 vaccine points on the Indians but had had only a few takes. He finally resorted to the purchase of vaccine crusts, and with them succeeded in vaccinating successfully, and in wiping the disease out of the pueblos (5). Arm to arm vaccination was practised widely during a large part of the 19th century due to the difficulty of obtaining effective vaccine. Waterhouse had to pay for the privilege of vaccinating children, which he did from time to time in order to keep the virus available.

According to Hanna, "no subject of medical or scientific interest has given rise to such controversy as that of the value of vaccination" (6) Thus it is nothing less than astonishing to find President Jefferson, less than five years after its discovery, so convinced of its efficacy that he makes serious efforts to protect, not the whites so much, but the troublesome indigenous population. This not only shows the good intentions of the government at that time, but is proof of the devastating effect of smallpox on the Indians and of its menace to their very existence.

The time was to come when, through the care of the government, the Indians were immune to smallpox, due to vaccination and revaccination at government expense, while the whites, often living adjacent to these immunized Indians, were victims of the disease, due to lack of effective public health laws and officials or to lack of means to be vaccinated. This difference between the unvaccinated whites and the vaccinated Indians is often mentioned by the Indian Agents and the medical officers of both the United States and Canada.

Others besides Jefferson were interested in the vaccination of the North American Indian in 1803. During this year, by order of his Catholic Majesty of Spain, an expedition under Dr. D. Francisco Xavier de Balmis travelled through New Spain and all the Spanish foreign possessions for the purpose of "propagating the vaccine." The account of this expedition, which appeared October 4, 1806, in the Madrid Gazette, states that the vaccine was established in every part of the northern hemisphere of America as far north as Sonora and Sinaloa. It is stated that that portion of the expedition which



in Mexico, this expedition greatly promoted the practice of vaccination. In the principal cities of the kingdom "vaccine committees were formed, composed of enlightened individuals who, by vaccinating monthly, preserve the miasma from being lost" (9).

About this time (1804), according to the Spanish Archives of New Mexico, vaccination was introduced into Chihuahua. In 1806 official order was given to vaccinate the Indians of Acoma, Laguna and Zuni. In 1808 we read of the transmission of a paper of dry vaccine with instructions for its use. In 1809 a list of children who had been vaccinated in Santa Fe was transmitted to the Comandante-General Salcedo (10). However, in spite of these precautions, smallpox continued for almost a century to cause terrible mortality among the Indian population of this region. In August 1818 in a letter to John C. Calhoun, Secretary of War, from W. A. Trimble, we find the recommendation that "vaccine inoculation" should be introduced among the Indians, a "course dictated by humanity." Trimble had been impressed by the dreadful ravages among the Indians residing along the waters of the Red River and the Rio del Norte, when the Comanches lost four thousand souls (11). Also in 1821 the Rev. J. Morse, after fulfilling his commission to investigate the condition of the Indian tribes, wrote a recommendation to the Secretary of War to vaccinate the Indians as extensively as possible, giving examples of the ravages that smallpox was causing among various tribes. This recommendation, however, was ignored.

When, in 1820, the Yellowstone Expedition, designed primarily to establish military posts on the upper Missouri River for protecting the fur trade, controlling the Indian tribes and lessening the influence of British trading companies, visited Pawnee villages on Loup River, an effort was made to introduce vaccination among the Pawnee who, in common with other tribes, had suffered heavily from ravages of smallpox. But the attempt proved unsuccessful because the vaccine had been drenched by the wreck of one of the keel-boats of the Yellowstone Expedition (12).

In 1828 when smallpox began in the northern part of California, then in Mexican hands, and spread southward to San Diego, killing large numbers of both Mexicans and Indians, the authorities became interested in extensively vaccinating the Indians. James Pattie was released from prison by the Mexicans on the condition that he vac-

ciate the Indians of the missions of California. In his "Personal Narratives" he claims to have visited, in 1829, the missions along the coast, San Diego, San Juan Capistrano, San Gabriel, Los Angeles, Santa Barbara, Santa Inez, San Luis Obispo, San Miguel, La Soledad, Monterey and San Juan Bautista. During this journey he claims to have vaccinated twenty-two thousand persons, most of them Indians (13). Pattie's claim must be read with some misgivings, since, as an adventurer and a novice without training, it appears to have been a sizeable task for him. Cook gives an excellent discussion of Pattie's mission (14).

The expenses for vaccinating the Indians was first met by an appropriation made by the twenty-second congress during the presidency of Andrew Jackson, in 1832. The Act of May 5 states: "Be it enacted. . . . That it shall be the duty of several Indian Agents and sub-agents under the direction of the Secretary of War to take such measures as he shall deem most efficient to convene the Indian tribes in their respective towns, or in such other places and numbers and at such seasons as shall be most convenient to the Indian population, for the purpose of arresting the progress of smallpox among the several tribes by vaccination." The Secretary of War was empowered to employ as many physicians and surgeons as necessary, and, if necessary, two competent persons to conduct the physicians to remote Indians who were infected or in immediate danger of infection. The compensation of the physician was to be \$6.00 per day. The Secretary of War was, furthermore, to supply all Indian Agents with genuine vaccine matter and was to use all proper means to persuade the Indians to submit to vaccination. All persons employed in the vaccination of the Indians were to give monthly reports to the War Department. To carry this act into effect the sum of \$12,000 was appropriated. This sum could cover the expenses of no more than a beginning of vaccinating the Indians, who, in the official United States reports were estimated as numbering over 290,000 in 1832.

It may be of interest here to note that "an act to encourage vaccination" had been passed in 1813, while James Madison was president. It authorized the president to appoint an agent to preserve the genuine vaccine matter and to furnish it to citizens whenever it was applied for. This act was repealed in 1822.

Besides the Act of Congress mentioned above, several other events of interest happened in 1832. Some of the Assiniboin and Indians of other tribes along the northern branches of the Missouri River were vaccinated by a surgeon escorted to these tribes by Major Bean. It is reported that a total of twenty-six hundred Indians were treated at this time. Many of them manifested mistrust, saying, "Now we are well. If we should become sick it will be time enough to submit to the operation."

In May of this year Secretary Cass informed the Indian Agent John Dougherty, that one doctor, Meriwether Martin, had been appointed and that another one would be, but that no effort would be made "under any circumstances to send a surgeon higher up the Missouri than the Mandans, and I think not higher than the Arka-rees." Vaccine matter with directions for its use was sent to Fort Pierre by the Upper Missouri Outfit during the summer of 1832. From the records of the 1836-40 smallpox epidemic among the tribes of the Missouri River as well as elsewhere on the continent, it is unlikely that large numbers of Indians had been vaccinated at this time. Vaccine was ordered by Fort Tecumseh in 1831. To what extent it was used, and what success attended its use, are not stated. However missionaries had vaccinated the Christian neophytes among the Skoyelpis at Kettle Falls of the Columbia River with the result that, during the 1838 epidemic, these suffered little while the Spokanes and other "unconverted" Indians were decimated in the epidemic (15).

Catlin states (16) that the government had succeeded in introducing vaccination in tribes which had already had a taste of the effects of smallpox, and that while he was on the upper Missouri River several surgeons had been sent with the Indian Agents into the country. He comments on the unsuccessful attempts which were made, and on how the confidence of the Indians in their own physicians rendered efforts ineffective until slaughter in their own tribe forced them to consent to submit to vaccination as at least a possible escape from the disease. The Indians found it hard to believe that so small a puncture in the arm was able to protect them from so fatal a disease. Besides, as "they see white men urging the operation so earnestly they decide that it must be some new mode or trick of the

pale face by which they hope to gain some new advantage over them," and so they stubbornly resist.

The treaty of 1836 between the United States and the Ottawas and Chippewas provided for the payment by the United States of \$300 a year "for vaccine matter, medicines and the services of physicians, to be continued while the Indians remain on their reservations."

The natives of Alaska were first vaccinated during the severe epidemic of 1836-40. Dr. Blaschke, a German in charge of the medical staff of the company, together with the entire medical staff of the company, visited, under orders of Governor Kuprianoff, all of the villages in the Unalaska district. Besides this some of the vaccinators were sent to the Alaska peninsula, to Bristol Bay and Cook Inlet. But Dr. Blaschke stated officially that three thousand natives died before any vaccination was attempted, and that any effect was only barely perceptible for nearly a year. The superstitious Aleuts consented to vaccination only after a most peremptory order had been issued by the commander of the district (17) (18). Later on, in the Russian possessions, vaccination was performed on all children after they had reached a certain age.

The problem of vaccinating the Alaskan Indians is illumined by the following account. It is the record, written by a Russian, of the experience of his father in 1836, during the attempt to vaccinate the natives of Alaska. He says, "When my father and a surgeon's apprentice who was doing the vaccinating had followed the old man a short distance into the woods, they found themselves surrounded by a crowd of men, including one of the most powerful shamans. The shaman was exhorting the people to save themselves and their families from certain death by killing the vaccinators and burning their bodies, and a large fire for that purpose had already been started. The surgeon's apprentice gave himself up for lost, knelt down, and began to pray . . . my father, however, began to talk to the men, showed them the marks of vaccination on his own arm and on that of his companion, and called upon some of the Khutznu men, who had been to Novo Arkhangelsk, to say whether they had seen any of the Russians or Creoles die of the disease" (19).

Under the Act of Congress of 1839, \$500.00 was spent for vacci-

## SMALLPOX IMMUNIZATION OF THE AMERINDIAN

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Unless one is familiar with the history of variolation and vaccination he will be unable to judge properly the delayed protection of the Indian tribes by immunization. The practice of making one or more incisions (at first rather deep but later surface ones) on the body, and transferring into the wound pus from one of the pustules of a smallpox patient, called inoculation or variolation, was first practised by Dr. Zabdiel Boylston in 1721. Cotton Mather, a close friend of Dr. Boylston, had urged the latter to try this method as a protection against smallpox after having learned of it originally from his negro slave, Onesimus. From other negro slaves in Boston and vicinity he had learned of its wide application in Africa.

After its initial introduction into Europe and America, variolation remained a highly controversial subject during the entire period up to 1798, when vaccination began gradually to replace it. Variolation was always used with many misgivings. The induced disease was true smallpox, though generally milder than when contracted in a natural manner, and, in experienced hands, practice of the method resulted in one death in eighty to one hundred inoculations without the use of mercury, and one death in eight hundred to one thousand inoculations when mercury was used.<sup>1</sup> It was difficult to maintain even an approximately uniform dosage. The percentage of deaths was higher when the inoculation was performed by a layman. Reference may be made to one experience, when, during an attempt to halt an epidemic, traders at Fort Union, in 1837, inoculated thirty squaws with fatal results to nearly all.

Another hazard attached to this practice was the likelihood of spreading the infection, an effect which could not be controlled unless the inoculated persons were confined. This danger was officially recognized quite early, and inoculation hospitals were provided where the patient remained until the danger of contagion had passed. In many places variolation was forbidden. As late as 1776, when the American army was severely scourged with smallpox, soldiers variolated themselves. It was finally forbidden in the General Army Orders.

<sup>1</sup> Usually three grains of calomel, with ten grains of rhubarb or jalap.