## *Papers and Originals*

# DEVELOPMENT OF SMALLPOX VACCINE IN ENGLAND IN THE EIGHTEENTH AND NINETEENTH CENTURIES

BY

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*3 and 4 Victoria XXIX. 23rd July, 1840.*
*Whereas it is expedient to extend the Practice of Vaccination*

"Be it therefore enacted by the Queen's Most Excellent Majesty by and with the Advice and Consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled and by the Authority of the same, That from and after the passing of this Act it shall be lawful for the Guardians of every Parish and Union . . . to contract with the Medical Officer of their several Union or Parish respectively . . . for the vaccination of all Persons resident in such Unions or Parishes respectively . . .
"And Be it further enacted, That any person who shall from and after the passing of this Act produce or cause to produce in any Person, by Inoculating with Variolous Matter, or by wilful exposure to Variolous Matter, or wilfully by any other Means whatsoever produce the Disease of Smallpox in any person shall be liable to be proceeded against . . . and shall, upon Conviction, be imprisoned in the Common gaol, or House of Correction for a Time not exceeding one Month."

With this traditional preamble to English legislation the First Vaccination Act was passed by Parliament and received the Royal Assent on July 23, 1840. Thus 17 years after Edward Jenner's death in 1823 the country in which vaccination had first been developed gave belated recognition to its success, and was one of the last European countries to do so. The development of smallpox vaccination in England took just on 100 years from the time of Jenner's first observations in 1798 until 1898, when the comprehensive Vaccination Act came into force. The Act of 1840 is an important milestone in this period of development. Until this time, "variolation," or inoculation smallpox, introduced into this country in 1721 as a result of the influence of Lady Mary Wortley Montagu, wife of the British Ambassador in Turkey, was still being practised on quite a wide scale in England. This undoubtedly held back the early acceptance of the new method of "cowpoxing," or vaccination.

After the 1840 Act, which made variolation illegal, the country gradually came to accept vaccination, but with no great enthusiasm. At this time human lymph was virtually the only source of vaccine, and as the practice of vaccination grew the disadvantages of human beings as vaccinifers became increasingly apparent. By the end of the century these difficulties had largely been resolved by the development of animal vaccine lymph, and under the Vaccination Act of 1898 glycerinated calf lymph was introduced into England as the standard vaccine. This Act marked the end of the beginning of the development of smallpox vaccine. But it did more than this; it recognized the need for an all-round improvement in vaccination procedure, and in doing so paved the way for a new era of research and development in the twentieth century.

The literature on smallpox vaccine is already voluminous, and the only reason for adding to it is the fact that some of the details do not appear to be well known, others are incomplete, and many unfortunately are missing altogether. In these notes an attempt has been made to put some of these facts on record before they drift for ever into obscurity.

### Vaccination: Development and Legislation

Edward Jenner was born in 1749 at Berkeley, in Gloucestershire. It was a common belief in the West Country that those who had had cowpox, an endemic infection of milch cows, were resistant to smallpox. While in practice in Berkeley, Jenner put these theories to the test and proved to his own satisfaction that there was some substance to this belief. On May 14, 1796, Jenner "selected a healthy boy (James Phipps, Case XVII) about 8 years old for the purpose of inoculation for the cow-pox. The matter was taken from a sore on the hand of a dairymaid (Sarah Nelmes, Case XVI)." When the lesion on the arm had healed Jenner proceeded to test the effect by inoculating the boy with variolous material. This was done on July 1, 1796, and repeated several months later. The boy remained well on both occasions, as did three other patients similarly treated (Jenner, 1798).

Jenner first communicated his observations to the Royal Society in London in 1797, but, according to Baron, the President returned the manuscript, suggesting "that he be more cautious and prudent." In June, 1798, Jenner's monograph was published in London entitled *An Inquiry into the Causes and Effects of the Variolae Vaccinae, A Disease discovered in some of the Western Countries of England particularly Gloucestershire and known by the name of Cow Pox* (Jenner, 1798).*

The immediate reaction in London was not enthusiastic, but one or two leading doctors took notice of Jenner's work. Mr. Henry Cline, surgeon to St. Thomas's Hospital, vaccinated a young boy (Richard Weller) with lymph supplied by Jenner and later inoculated the boy with variolous matter in three places. The boy remained well (Jenner, 1799). As a result Cline became a supporter of Jenner and a great advocate of vaccination. In 1799 Dr. Woodville, physician to the Smallpox and Inoculation Hospital in London, and Dr. Pearson, also physician to St. George's Hospital, started a series of public vaccinations at the Smallpox Hospital. Their enthusiasm was not entirely helpful to the cause of vaccination. Many of their patients developed severe reactions, and this led to a bitter controversy with Jenner and also to doubt in the public mind as to the value of this new form of prophylaxis. In January, 1800, Dr. Pearson started the first vaccination station in Warwick Street and later in Golden Square, where he practised vaccination for a number of years.

*Jenner considered cowpox to be smallpox of the cow, hence the name variolae (smallpox) vaccinae (Latin vacca, a cow; Latin deriv. vaccinus, hence also to "vaccinate").

In 1802 a Select Committee of the House of Commons* heard evidence from Jenner and many others, as a result of which Parliament voted Jenner the sum of £10,000, a motion to increase the grant to £20,000 being lost by only three votes (Jenner, 1805). The same year the Royal Jennerian Institution was inaugurated in London with Jenner as president, and 13 vaccination stations were started in London to provide information and teach the method of vaccination, but trouble soon arose between Jenner and his assistant, Dr. Walker, who then proceeded to set up a rival Vaccine Institution in London.

In July, 1806, the Chancellor of the Exchequer moved that a humble address be presented to the King "praying that he be pleased to direct the Royal College of Physicians to enquire into the state of vaccine inoculation in the Kingdom, and to report their opinion as to the progress which has been made. . . ." The motion was passed without dissent. The College of Physicians acted with extraordinary promptitude. Having corresponded with the Colleges of Physicians in Dublin and Edinburgh and with the Colleges of Surgeons of London, Dublin, and Edinburgh, and with other societies established for vaccination, they published their report nine months later, in April, 1807: ". . . the College of Physicians feel it their duty strongly to recommend the practice of vaccination. . . ." On June 9, 1808, a central institution, the National Vaccine Establishment (see Appendix), was set up in London by Royal Warrant under the Privy Council, from which it received an annual grant for the collection, supervision, and distribution of vaccine lymph, and "for the purpose of rendering vaccine inoculation generally beneficial to His Majesty's subjects" (Hansard, 1808).

The N.V.E. was directed by the National Vaccine Board, consisting of senior members of the Royal Colleges of Physicians and Surgeons. Jenner was the first president, but he resigned after a short time. This system continued to operate until 1861, when, following the death of Dr. Hue, the registrar and treasurer, the Privy Council took the establishment under its own control and reorganized the vaccine stations in London and the provinces (Hutchinson, 1947). After the initial enthusiasm a certain amount of opposition arose. This was natural enough when one recalls the strong connexion between Jenner's theory and simple folklore, and, moreover, there was still a formidable body of opinion in favour of variolation. Fears were expressed that this bestial procedure would lead to new and foul diseases, and that children vaccinated with cowpox would develop horns and the human character would undergo transformation. A vocal minority of the medical profession, particularly those who were advocates of variolation, formed itself into a powerful opposition in order to demonstrate "the failure and mischief of the cowpox." Among these was Mr. John Birch, surgeon to St. Thomas's Hospital. At St. Margaret's Patten Church in the City† a tablet erected by his sister commemorates that "the practice of cowpoxing which first became general in his day, undaunted by the overwhelming influence of power and prejudice, And the voice of Nations, He uniformly and until Death (1851) perseveringly opposed."

*Admiral Berkeley, M.P. for the constituency in which Jenner lived, in the chair.

†This church is in Rood Lane, in Eastcheap; north of Pudding Lane. Built in 1067, it was destroyed by fire in 1666. Rebuilt by Sir Christopher Wren.

### The Vaccination Acts

Jenner's discovery aroused great interest in Europe and in the New World. Numerous requests for lymph were made, and many countries, such as Sweden, Denmark, and the German States, introduced legislation at an early date making vaccination compulsory. In Sweden, following the introduction of vaccination in 1801, there was a dramatic fall in the incidence of smallpox, and for a time the disease virtually disappeared. But in England the change was less spectacular. Indeed, it was largely due to the stimulus to public opinion made by a report of the Provincial Medical and Surgical Association‡ in 1839 that the first Vaccination Act was introduced the following year. The action taken by Parliament was prompt. Two days after the Association's Petition was presented in the House of Lords in March, 1840, a Bill was introduced which became law in July (3 & 4 Vict. 1840). The 1840 Act did not work well in practice, and after a few years apathy on the part of the population was again evident.

During the ensuing years several further inquiries were held which in turn led to further legislation. In 1853 the Epidemiological Society, after an extensive inquiry, came to the conclusion that the risk from smallpox resulted from public apathy, which could only be remedied by compulsory vaccination. On August 20, 1853, an "Act to Extend the Process of Vaccination" was passed which made vaccination compulsory (16 & 17 Vict. 100). Objections and propaganda against compulsory vaccination followed, and, as was to be expected, many of the facts relating to the ill effects of vaccination were distorted, as can be seen from Fig. 1. Possibly influenced by this reaction, the General Board of Health, which had been created in 1848, conducted a further inquiry on the state of smallpox and vaccination (Simon, 1857). This report contained the answers to a questionary sent out to over 500 physicians throughout the country. One of these was from Dr. Charles West, physician accoucheur to the Middlesex Hospital and to St. Bartholomew's Hospital, and physician and founder of the Hospital for Sick Children in Great Ormond Street. He pronounced himself fully satisfied with the effect of vaccination, but drew attention to the complications that might arise from vaccinating a child with eczema. He also recalled having seen one case of gangrene following vaccination, which was probably the first recorded case of vaccinia gangrenosa. Dr. William (later Sir William) Jenner, the second physician to the Hospital for Sick Children, expressed himself in favour of compulsory vaccination. Several years before, in June, 1852, at a meeting of the medical committee of the newly formed Hospital for Sick Children in Great Ormond Street, it had been considered expedient to vaccinate all children before discharge from the hospital, and "the house-surgeon was instructed accordingly."

Between 1858 and 1874 further Acts (21 & 22 Vict. and 30 & 31 Vict.) were passed which modified the law both in regard to compulsory vaccination and to the system of penalties. Administration and control of vaccination passed from the Poor Law Guardians to the newly formed Local Government Board. On account of the continued uncertainty about vaccination, and more especially on account of the undoubted risk of transmitting infectious disease with human lymph, a Royal Commission was set up in 1889 to inquire into the state of vaccination. The Commission published its

‡Later the British Medical Association.

final report in August, 1896, and many of its recommendations were subsequently incorporated into the Vaccination Act of 1898 (61 & 62 Vict. 49). This formed the basis of legislation for vaccination for a further 50 years until compulsory vaccination was abolished in 1947.

Section C of the Report (Royal Commission, 1898) made specific recommendations ". . . for preventing or lessening the ill-effects, if any, resulting from vaccination." They recommended " the use of calf-lymph for vaccination but do not preclude the use of humanized lymph if parents desire to have it for their children " (para. 437). They also reported that " we think that safety would be increased by preserving the lymph in tubes instead of on ' dry points' . . . and our attention has been drawn to the experiments recently made by Dr. Copeman as to the effects of the storage of vaccine lymph in glycerine . . ." (para. 448).

These recommendations were accepted; and from then until the 1914–18 war glycerinated calf lymph was the only form of smallpox vaccine to be used in this country.

### Development of Vaccine Lymph: Humanized Lymph

From 1798 to 1881 humanized lymph was the main source of vaccine in this country except for a limited period in the 1840's, when a small amount of calf lymph was used. Jenner's original strains were unquestionably derived from true cowpox, but these were only used on a small scale in his own part of the country, and, for instance, by Mr. Cline at St. Thomas's. The next stage was the development of the London strains of lymph. In January, 1799, Dr. William Woodville started his own supply of lymph with material from an outbreak of cowpox in a dairy in Gray's Inn Lane. This was collected in the presence of the President of the Royal Society and many other distinguished people. This lymph was used to vaccinate seven inmates of the London Smallpox Hospital.* " Woodville's lymph " became the main source of vaccine in London and indeed in Europe at this time. Many of Woodville's cases, however, developed a diffuse pustular eruption quite unlike anything recorded by Jenner. The consensus of opinion is that Woodville's lymph became contaminated with variola virus. This could have arisen in several ways. Vaccinations were carried out at the Smallpox Hospital, which also catered for cases of smallpox, and Woodville frequently variolated his cases on the fifth day as a test of immunity. Vaccination was performed by arm-to-arm transfer, often with the same lancet used for variolation.

In the Report of the Royal Commission (1898) are two tables (pages 320 and 367) showing the family tree of Woodville's lymph from the Gray's Inn Lane cow, through patient Collingridge and Sarah Price (the dairymaid) and back through Mr. Coleman's cow. From one patient, Ann Bumpus, who had 310 pustules, lymph was sent to Jenner, but it produced a variolous effect. The conclusions drawn by the members of the Commission and the two dissentients to the Report differ materially from each other. By this time Jenner's lymph had apparently failed (Jenner, 1801). In addition to the lymph received from Woodville Jenner obtained a new supply from Mr. Clark's farm in Kentish Town which he apparently used quite extensively. Pearson also appears to have been a great distributor of lymph, which he obtained from the Marylebone Road dairies and from the Smallpox Hospital. Thus in 1800 at least three different strains of lymph were being used in England, and from these same sources the first supplies were sent abroad.


FIG. 1

Vaccination with humanized lymph required a regular supply of fresh lymph. This was maintained by serial arm-to-arm transfer and was the responsibility of the National Vaccine Establishment from 1808. Three classes of vaccinators were recognized—honorary, extraordinary, and corresponding. The honorary vaccinators were probably laymen. It was the practice to hold vaccination sessions once a week in London and less frequently in the country. Vaccinated individuals were encouraged to return on the eighth day for inspection and collection of lymph. A copy of one of the circulars sent out by Dr. Hue is shown in the appendix. In addition to direct transfer it was also the practice to keep stocks of lymph for short periods on ivory points (Fig. 2) or on

*Then at Battle Bridge, a site now occupied by King's Cross Railway Station.

squares of glass. Another method was to cover the lymph, when placed on glass and perfectly dry, with a thin coat of mucilage of gum arabic (Jenner and Woodville, 1800).

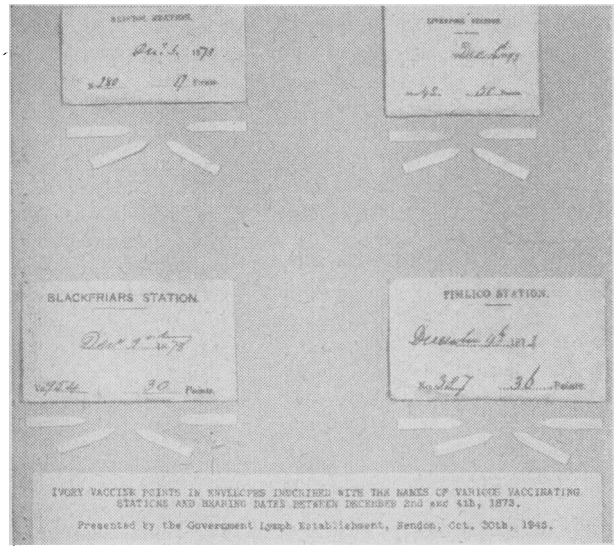


FIG. 2

Apart from the inconvenience of using human beings as vaccinifers, there were two more serious objections to this procedure. First there was risk of transmitting infectious disease, such as syphilis, erysipelas, and of course smallpox. The possibility of transmitting syphilis by vaccination had been considered by the Board of Health's Inquiry in 1856, but it was rejected as unlikely (Simon, 1857). However, the Royal Commission accepted the evidence, and it was mainly for this reason that they recommended that the change be made from humanized to calf lymph (Royal Commission, para. 421). A second reason for looking for an alternative source of vaccine was the fact that many strains of humanized lymph showed a progressive loss in potency on repeated arm-to-arm transfer. By the middle of the eighteenth century there was quite a lot of evidence to support this view (Ballard, 1868). In 1836 Dr. Gregory, at the London Smallpox Hospital, decided to replace Woodville's strain, which by then had had over 2,000 human passages, as the number of "takes" had declined. Similar evidence was obtained by Steinbrunner with the Passy strain; and in Württemberg an ordinance was passed making it compulsory for vaccine lymph to be transferred annually back to calves (Ballard, 1868).

### Development of Animal Vaccine Lymph

The first attempts to establish vaccine strains in animals were made on the Continent. As early as 1805 vaccinations were carried out in Italy with vaccine lymph derived from cows inoculated with human lymph. This method, consisting of a single animal passage, was called "retro-vaccination." By 1842 Negri, in Naples, had worked out a method for the serial propagation of vaccine virus in calves. From there the practice spread to France, Belgium, Switzerland, and Germany. The exact origin of these strains is not known. Most of them were probably derived from natural cowpox, as was the case with Negri's strain; but attempts were made, and were reported as being successful, in propagating variola virus in the cow. Many of these claims are open to question as variolation of the cow or calf is not readily achieved, and, furthermore, many of these animal inoculations with variola virus were carried out in buildings in which vaccinia virus was being handled. As Copeman observed, there was ample opportunity for contamination to have occurred (Copeman, 1899). The view that most strains were probably derived from cowpox virus is upheld by Downie (1959). In this country Ceely (1840) and Badcock (1845) both claimed to have developed strains of virus in calves from variolous material, but their claims are open to question for the same reason. Both Ceely and Badcock supplied a large amount of calf lymph at this time, but no further attempts seem to have been made along these lines.

In 1879, following a visit by Dr. George Buchanan, Chief Medical Officer to the Local Government Board, to animal vaccine stations in Europe, the Government decided to set up an Animal Vaccine Station under the National Vaccine Establishment. The site chosen for this station was 95 Lamb's Conduit Street, which runs from Great Ormond Street to Guilford Place. The station started to operate in the summer of 1881, and according to the Annual Report of the Local Government Board 500 doses of calf lymph were issued in the first year (Rep. Loc. Gov. Bd., 1881). The following notice was issued by the National Vaccine Establishment: "The Animal Vaccine Establishment is at 95 Lamb's Conduit Street where Dr. Cory and Mr. S. F. Murphy attend for the vaccination of children on Tuesdays and Thursdays from 10.30 to 12 noon."

The first director of the Animal Vaccine Station was Dr. Robert Cory, physician in charge of vaccination and lecturer at St. Thomas's Hospital. While the building in Lamb's Conduit Street was being prepared, Cory carried out preliminary trials at some stables next to the Almshouse of St. Mary Abbots, in May Place, Notting Hill. A strain of lymph obtained from Dr. Carsten in The Hague was successfully established in calves, and the lymph was issued later from Lamb's Conduit Street. It was also used with success to vaccinate six children at St. Thomas's Hospital. After a time The Hague strain, like many others, gave indifferent results and a fresh one had to be obtained. A good source of lymph from true cowpox was reported from the village of Lafôret, near Bordeaux; and in November, 1881, Dr. Dubreuilh, of Bordeaux, sent Cory a strain of virus from the seventeenth calf passage. By March, 1882, the work was transferred to the Lamb's Conduit Street Station as there were no facilities for vaccination at Notting Hill. It was then the practice to inoculate one calf every week from which lymph was produced by grinding the scrapings from the vaccinial lesions on the calf in a pestle and mortar. It was not issued if an excess of blood was present.

### Development of Glycerinated Calf Lymph

The final stage was the introduction of glycerinated calf lymph at the end of the nineteenth century, for which much of the credit is due to Dr. Sydney Monckton Copeman, F.R.S., the centenary of whose birth fell last year. According to Copeman (1899) glycerin had first been used as a preservative for lymph as early as 1850. In 1853 Mr. R. Cheyne demonstrated a case at the Royal College of Physicians of a child vaccinated with glycerinated lymph. In 1869 Müller, in Berlin, showed that glycerin could be added to lymph without loss of potency, a finding of great practical importance, as it meant that supplies of lymph went further. This was

made use of by Mackenzie during the 1871 smallpox epidemic in London. In 1891 Copeman presented his findings on the bacteriology of calf lymph and the bactericidal properties of glycerin at the International Congress of Health in London. A few years later Copeman and Blaxall (1896) showed that after a few months' storage glycerinated lymph was virtually free from contaminants and showed no loss in potency. Glycerinated calf lymph was used to vaccinate 65 children at Lamb's Conduit Street Station. Primary takes were obtained in all children with Cory's five-point insertion method (Copeman, 1899).

Copeman also made a number of observations on the bacteriology of lymph. In 1893, with Klein at the Brown Institute, he described the presence of minute organisms in stained films prepared from early vesicle fluid. These may have been the same as the elementary bodies described by Buist in Edinburgh in 1887, but the final identification of the "elementary bodies" of variola and vaccinia by Paschen was not made until several years later. Copeman also tried to culture the organism of variola and vaccinia. Variolous and vaccinial fluids obtained from patients in the Smallpox Hospital ships anchored in the Thames were inoculated into hen's eggs, which were incubated for one month at 37° C. This suggests that the eggs were infertile, otherwise they would have hatched. Surprisingly, the fluids removed from the eggs were sterile on culture and produced vaccinial lesions in calves at the Animal Vaccine Station. But, as Copeman (1899) points out, there was a risk of cross-infection from vaccinia virus despite the precautions taken to guard against this.

In 1897 Drs. Thorne Thorne and Copeman prepared a memorandum for the president of the Local Government Board which made four specific recommendations: That all vaccinations, both primary and secondary, were to be carried out with calf lymph; that the distribution of calf lymph was to be limited to glycerinated lymph in airtight tubes, but that calf-to-arm vaccination should be retained for a time for purposes of comparison of results; finally, that the Animal Vaccine Station in Lamb's Conduit Street should be reorganized in a properly equipped laboratory under a bacteriological expert. It was now clear that the Vaccine Station could not cope with the demand for calf lymph, and new laboratory accommodation was made available at the British Institute of Preventive Medicine,* on the Chelsea Embankment. The new Government Lymph Establishment started to operate in January, 1899, under the direction of Dr. F. R. Blaxall. In the accompanying Table the record of distribution of lymph is shown.

*Record of Lymph Issued by the National Vaccine Establishment*†

| | 1881 | 1882 | 1898 | 1899‡ |
|---|---|---|---|---|
| Human lymph: | | | | |
| Ivory points .. .. | 10,260 | 8,195 | 0 | 0 |
| Squares of glass .. | 440 | 40 | 0 | 0 |
| Capillary tubes .. .. | 21,118 | 25,572 | 3,759 | 0 |
| Calf lymph: | | | | |
| Ivory points .. .. | 470 | 975 | 20,317 | 0 |
| Capillary tubes .. .. | 30 | 95 | 105 | 125,038 |

† From the Annual Reports of the Chief Medical Officer to the Local Government Board.
‡ From January to March, 1899, only.

In 1881 most of the lymph issued was human. In 1898 there was a marked increase in the supply of calf lymph, and from 1899 onwards the supply of human lymph ceased.

*Now the Lister Institute.

The last entry of the Animal Vaccine Station at 95 Lamb's Conduit Street is in the Post Office Directory of January, 1900, but it is clear from Hutchinson's (1947) account and from the Annual Report of the Local Government Board that it continued to function until January 30, 1908 (Rep. Loc. Gov. Bd., 1908). Its main function was to supply crude vaccine pulp for processing at the Government Lymph Establishment, but vaccination sessions were continued every Tuesday and Thursday, presumably to put into effect the recommendation of Thorne and Copeman that calf-to-arm vaccination should continue. There is little doubt that during the first 16 years of its existence the Animal Vaccine Station played a notable part in the development of smallpox vaccine. The building, which is now occupied by a firm of printers, is immediately adjacent to the Province of Natal Centre and the site of the new building for the Institute of Child Health. In it can be seen several of the quarantine stalls and other evidence of its former use for housing animals.

After some years at Chelsea, the vaccine strain failed (presumably the one obtained from Bordeaux), and a new strain was obtained from Cologne. This is supposed to have come from a Prussian soldier with smallpox in the war of 1870 (Hutchinson, 1947). Blaxall (1930) stated that when it was received in 1907 in the form of calf lymph it was well adapted to the calf The Government Lymph Establishment moved to Colindale in 1907 and in 1946 to its present site at the Lister Institute at Elstree. The production of vaccine lymph in calves continued until the 1914–18 war, when sheep were introduced as vaccinifers by the Lister Institute. This was mainly on account of the wartime shortage of calves, but in 1946, when the Lister Institute took over the responsibility of vaccine production, a complete change was made from calves to sheep as vaccinifers (McClean, personal communication).

The development of smallpox vaccine continues. In recent years vaccines have been prepared in fertile eggs and in tissue culture. The development of a freeze-dried vaccine at the Lister Institute for use in tropical areas is a major step forward, and recently the development of a killed vaccine was announced from the same institute (Kaplan, 1962). Against this background of modern technical development the achievements of the early pioneers of smallpox prophylaxis in the eighteenth and nineteenth centuries are even more remarkable when it is remembered that their work was accomplished before the cause of the disease was known.

I should like to thank Dr. E. Ashworth Underwood, Director of the Wellcome Historical Medical Museum, for permission to publish the photograph shown in Fig. 2. I should also like to thank the Librarians of the Public Records Office in Chancery Lane and of the London County Council for valuable assistance, and I am particularly indebted to Professor A. W. Downie, F.R.S., and to Dr. Douglas McClean for their comments and helpful advice.

## APPENDIX

### Circular of the National Vaccine Establishment, No. 8 Russell Place, Fitzroy Square, London

Medical practitioners, in all parts of the Empire, may be supplied with vaccine lymph, without any expense, from the National Vaccine Establishment.

You are particularly requested, as soon as you can after the receipt and use of this Lymph, and whenever you repeat, at any time, your application for Lymph, to report to the

Establishment the number you have vaccinated from each supply, and with what result.

*Pray have the kindness to attend to the above request.*

(Signed) C.H.

Surgeons are advised to employ recent liquid Vaccine Lymph, whenever it is in their power; and with this view, to vaccinate their patients in succession, for the purpose of keeping up a supply.

Letters of application for Lymph, and communications respecting Vaccination, are to be addressed *unsealed*:

"To Dr. HUE, Registrar of the N.V.E., Russell Place, Fitzroy Square."

To the Clerk in Waiting,
Privy Council Office,
London.

National Vaccine
Establishment.

*As inoculation of the small-pox is altogether unjustified, the Board have resolved, that if any Vaccinator of this Establishment shall so inoculate, his name be erased from the List.*

*** It is proper that it should be known, that Persons exposing patients affected with the small-pox, and Medical Practitioners and others who inoculate that disease and concur in such exposure, are liable to a criminal prosecution for the offence.*

*See the cases of *The King v. Sophia Vantandille, 4th Maule* and Selwyn's Reports, p. 73: *The King v. Burnett, 4th Maule* and Selwyn, p. 292;—and see the Judgment of Lord Denman, Chief Justice in the *Queen v. Squires*, tried at the Dorchester Assizes, March, 1849, on passing sentence on the prisoner, who had been convicted of manslaughter, for inoculating the deceased with smallpox: "He hoped it would be made generally public, that if a party ventured to inoculate another, he was not only liable to imprisonment under the statute, but in case death ensued he was liable to be indicted for the crime of manslaughter." *Times' Newspaper, 19th March, 1849.*

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# PARACERVICAL NERVE BLOCK

## A SIMPLE METHOD OF PAIN RELIEF IN LABOUR


BY

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The use of regional anaesthesia to relieve pain in the first stage of labour has generally been restricted to caudal and lumbar epidural anaesthesia. Excellent though these methods may be, technical difficulties detract from certain success in every case. A much simpler and more direct means of interrupting pain sensation from the uterus is to inject the anaesthetic solution into the loose cellular tissue at the side of the cervix. It may seem surprising that this obvious method of paracervical nerve block has not hitherto been more fully exploited. There are two reasons. One is the difficulty of exposing the lateral vaginal fornix during the course of labour. The other is the seeming impossibility of inserting a needle—which of necessity is long and pliable—in the correct anatomical position without injuring the foetus or damaging the uterine vessels and ureter.

Similar, if lesser, difficulties were foreseen when the transvaginal method of performing pudendal-nerve block was first advocated. These were overcome by devising a bulbous-ended guard-tube which could be manipulated into the desired position, and through which the injecting needle could be safely directed to its correct anatomical location. With this success, it was natural to turn again to the method of paracervical nerve block which, until that time, had been a theoretical concept rather than a practical procedure. The essential requirement was a rigid tube which could be manipulated by touch into the lateral vaginal fornix and through which a needle of a precise length could be introduced and made to penetrate no more than a few millimetres into the tissues of the broad ligament. Such a device was described by Freeman *et al.* (1956) and by Davis *et al.* (1962). Our work has followed a similar line.

*Anatomical Basis.*—Autonomic nerve fibres from the uterus form an ill-defined plexus lying in the pelvic cellular tissue at the base of the broad ligament, only a short distance from the lateral vaginal fornix. Pain sensation is carried in these autonomic fibres, which traverse the plexus and, via the "presacral nerves," reach the lumbar and thoracic roots of the spinal cord.

### Technique

A specially constructed guard-tube and needle is required. The essential feature is found in the injecting