

the usual phenomena of the vesicle, by causing its rupture or irregular appearance, and these phenomena may be aggravated if the garment is colored with poisonous dyes. It is a matter of necessity that proper instructions should be given to parents or guardians for the protection of the vesicles, that they may remain uninjured.

With reference to the general question of irregular phenomena, it may be taken as a rule of practice that any vaccination which presents a deviation from the perfect character of the vesicle, and the regular development of the areola, should not be relied upon as protective against smallpox, nor should lymph be taken from such a vesicle for further use in vaccination.

Effect of Climate.—In temperate climates the utmost effect of season, either hot or cold, is only to accelerate or to retard (and that exceptionally and seldom beyond a few hours) the usual course of vaccination. According to the best authorities, the excessive heat and moisture of certain seasons in the tropics interfere considerably with the regular progress of vaccination. In India vaccination is less successful after the advent of the hot season, and it is peculiarly so in the rainy season in Bengal, "so much so that vaccination must necessarily be suspended for a time" (Report of Smallpox Commissioners in 1850. Indian Government).

In other parts of India these precautions are not found to be necessary. In the cooler parts of India vaccination may be performed at any time, but in the hotter portions the best season for vaccination is from October to March.

REVACCINATION.—In some people the regular phenomena of vaccination can be produced but once in a life-time. A subsequent introduction of vaccine virus either fails to produce any effect whatever, or it produces a modified effect, like that of spurious vaccination. Revaccination is desirable in all cases of imperfect vaccination, and in all persons at the end of ten or twelve years after a primary vaccination in infancy; and also, in case of immediate exposure to smallpox, it is advisable in those who have not been vaccinated within five years. It should be understood, however, that the human body is not subject to mathematical rules and limitations, and hence, like many other principles of medicine, no precise limit of safety can be stated. The writer has vaccinated persons successfully, who had been successfully vaccinated within a year previous, and has also found many in whom vaccination with fresh lymph was unsuccessful after twenty years or more from the date of a previous vaccination.

Under no circumstances should the lymph from a vesicle of revaccination be employed for further use in vaccination.

As revaccination is a preventive measure, like vaccination, it should not be left until the occurrence of an epidemic. In the United States, where public vaccination is imperfectly carried out, it is a common custom to await the outbreak of smallpox, at which time it is more likely to be done with less care, and in consequence of individual fear rather than according to the discretion of the physician.

The immediate results of revaccination may be either the development of a typical umbilicated vaccine vesicle or of a modified vesicle, or entire failure.

The claim once made by the earlier vaccinators, that a single primary vaccination was absolutely protective for life against smallpox, is no longer tenable, since experience in severe epidemics in large communities has shown abundant proof to the contrary. After several years had elapsed from the date of the introduction of vaccination, it was observed that cases of smallpox occasionally occurred in the persons of those who had been vaccinated; such cases, however, being of a mild type and rarely fatal. It was therefore urged that the protective power of vaccination was only temporary, gradually becoming less as the individual grows older. By some, the occurrence of such cases was attributed to an improper or an inefficient performance of the primary vaccination. Early observations in support of such belief were made in Copenhagen, and also in London.

In every community a certain proportion of the inhabi-

tants will take smallpox, if they rely merely on the protection which is afforded by a single vaccination performed in early life.

The great standing armies of Europe afford conclusive evidence as to the need of revaccination. It was introduced into the Russian army in 1831, and for the ensuing years from 1831 to 1857, the number of revaccinations was 733,332, of which number 391,574, or 56 per cent., were successful, and 228,848, or 31 per cent., were unsuccessful; the remainder were imperfect.

Seaton lays down the rule that carelessness in primary vaccination should not be excused on the ground that revaccination will supply its defects. "It has too often happened," he says, "that vaccination has taken, but has taken badly; either at once or at some not distant period it has been repeated, and has perhaps been performed a third time, but ineffectually (for it will constantly happen that spurious vaccination will prevent subsequent vaccination from taking effect properly); then no more is thought about it, or the child is declared 'insusceptible'; it grows up, gets smallpox, and very likely dies. Take it at its best, an originally imperfect or incomplete vaccination is a very great misfortune."

Age at which Revaccination Should be Performed.—There are circumstances which would call for its performance in childhood, as when the primary vaccination is found to be spurious, imperfect, or irregular in character. If, however, the child's health appears to be such as to account for the irregularities and imperfections, the vaccination should be deferred until its health is corrected. Especially should children having imperfect cicatrices be revaccinated, if there is danger of immediate exposure to infection from smallpox.

Revaccination should be performed with the same care as primary vaccination and always, when possible, with fresh lymph.

It should not be left to periods when smallpox becomes epidemic, and its performance upon persons arriving at a certain age, say twelve years, should be as systematically carried out as in the primary vaccination of infants.

From the results observed as to the performance of revaccination in the armies of Great Britain and of Württemberg in 1831, 1835, and 1861, it was concluded that the local results obtained by the revaccination of any individual gave absolutely no information whatever as to the constitutional condition in which the revaccinated person was with regard to his liability to contract smallpox.

Dr. R. Gerstäcker, in a paper entitled "The Hygienic Significance of Revaccination,"⁴ gives some valuable data compiled from the reports of the Imperial Board of Health, and also from the report of the Vaccination Commission. From their tables it appears that the mortality from smallpox in Prussia, formerly differing but little from that of other countries, has fallen to a minimum under the operations of the vaccination law, so that smallpox may now be regarded as having disappeared, except in some frontier districts; while Austria, with her defective regulations as to vaccination, and still more so as to revaccination, suffers severely from smallpox. Dr. Gerstäcker presents the following table as to the mortality from smallpox in London and in Berlin, with the comment that, while London enforces vaccination of the children, it has not enforced revaccination. He attributes the difference in the relative mortality from smallpox in the two cities to these facts.

DEATHS FROM SMALLPOX, PER 100,000 INHABITANTS.

	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.
In London	1.3	20.8	71.0	38.8	12.1	12.5	61.9	11.1	3.4
In Berlin	5.2	1.8	.4	.8	.7	.8	4.7	.4	.3

Dr. Gerstäcker further agrees with the conclusions of the earlier observers, as to the immunity against smallpox produced by primary vaccination in childhood being of limited duration, and as to the possibility of renewing

EXPLANATION OF
PLATE LVIII.

EXPLANATION OF PLATE LVIII.

The vaccinations shown in this plate are those of three infants, from four to ten months old, at different stages of vaccination. Figs. 2 and 3 are from the same child on different days. Four insertions were made in each case, according to the usual practice of official English vaccinators. These insertions are usually made by light parallel scratches, two or more in number, and about 3-5 mm. in length.

FIG. 1 presents the appearance on the fifth day. The linear depressions in the vesicles indicate the location of the insertions of lymph. A faint flush is appearing around each vesicle.

FIG. 2 shows the appearance on the eighth day.

FIG. 3 presents the appearance at the end of twelve days. In this and in Fig. 2 some supplementary vesicles are shown, a matter of common occurrence. The course of development has been more than usually rapid in this case from the eighth to the twelfth day, desquamation being active around the vesicles and the brownish coloration of crusts appearing.

FIG. 4.—Appearance on sixteenth day. Shows typically the usual method of desiccation of the vesicle.

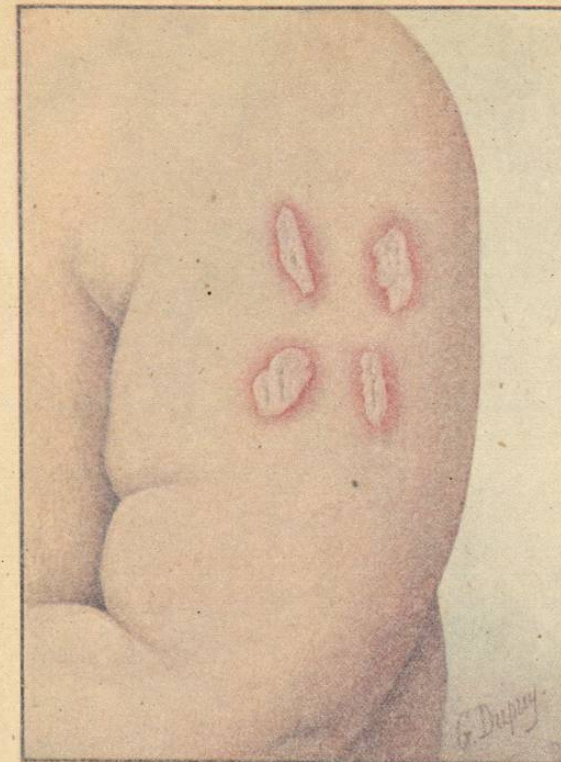


FIG. 1. FIFTH DAY.

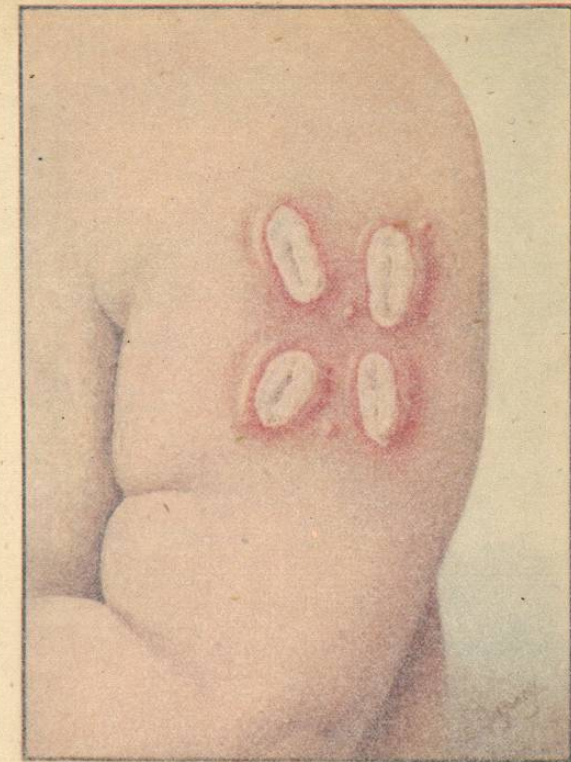


FIG. 2. EIGHTH DAY.

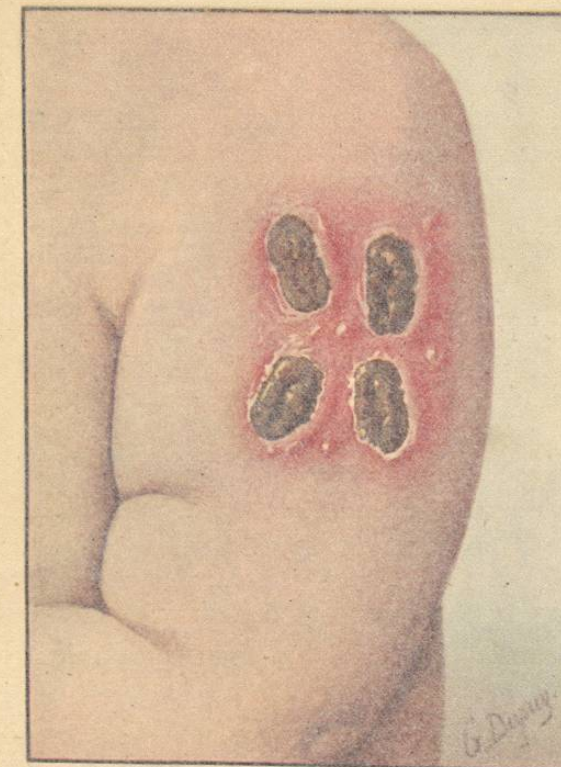


FIG. 3. TWELFTH DAY.

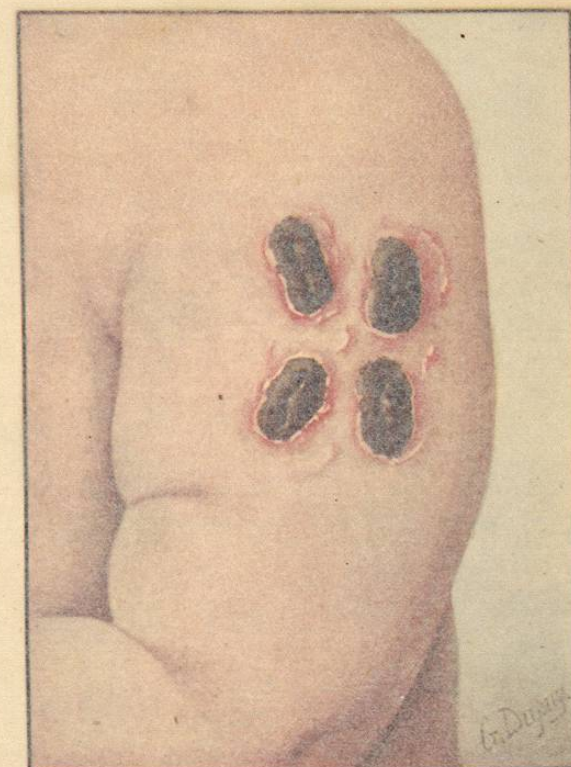


FIG. 4. SIXTEENTH DAY.

PRIMARY VACCINATION.

(Redrawn with corrections from Plate shown in British Medical Journal, July 1902.)

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FIG. 2 shows the appearance on the eighth day.

FIG. 3 presents the appearance at the end of twelve days. In this and in Fig. 2 more secondary vesicles are shown, a matter of common occurrence. The course of development has been more than usually rapid in this case from the eighth to the twelfth day, inflammation being active around the vesicles and the brownish coloration of crusts appearing.

FIG. 4.—Appearance on sixteenth day. Shows typically the usual method of disiccation of the vesicle.

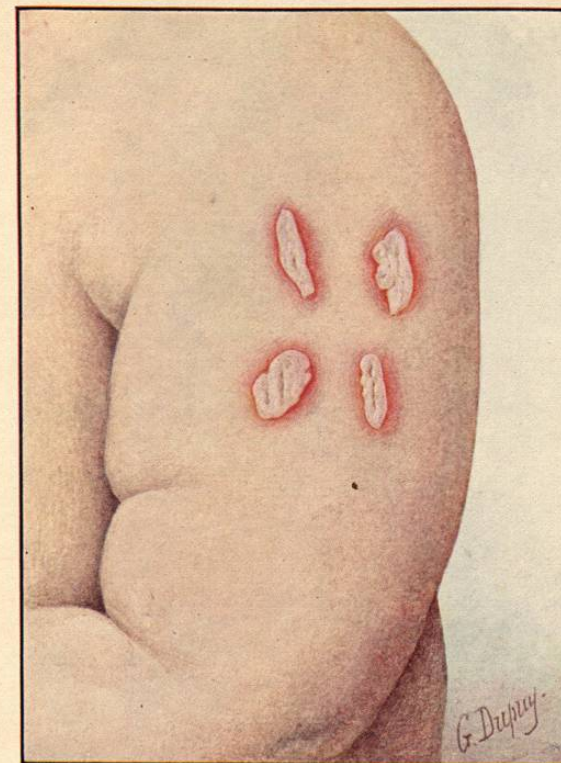


FIG. 1. FIFTH DAY.

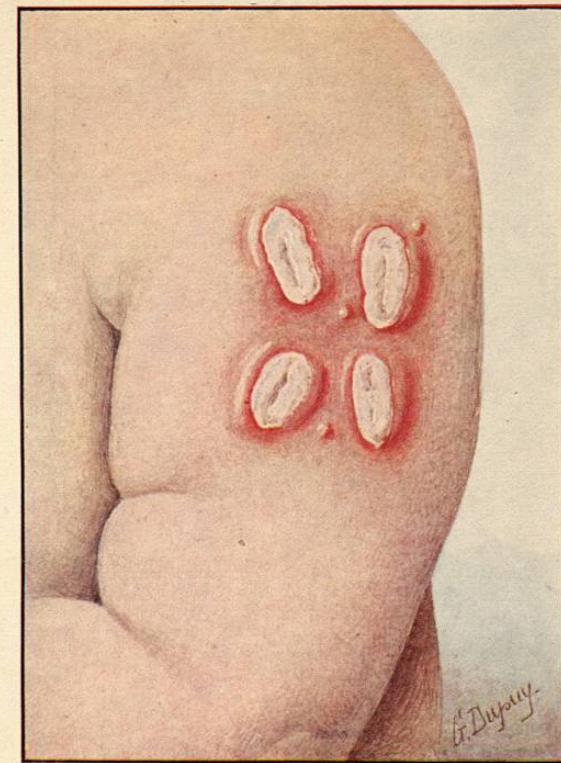


FIG. 2. EIGHTH DAY.

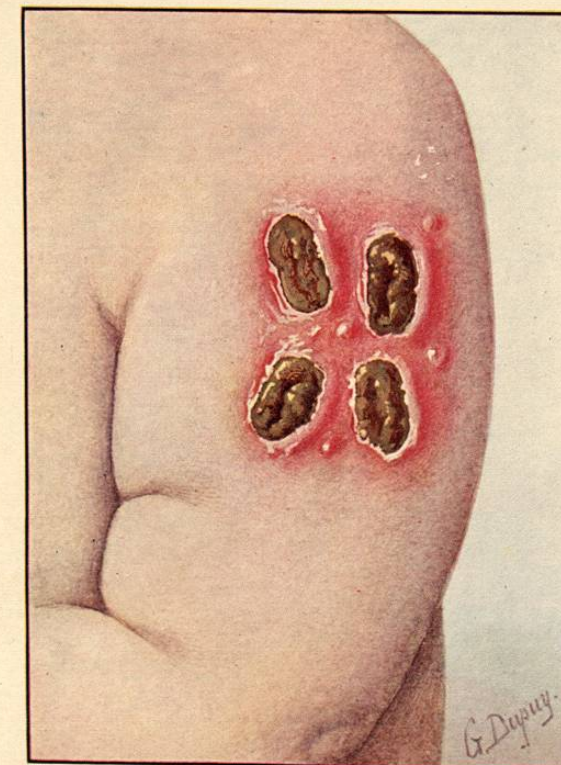


FIG. 3. TWELFTH DAY.

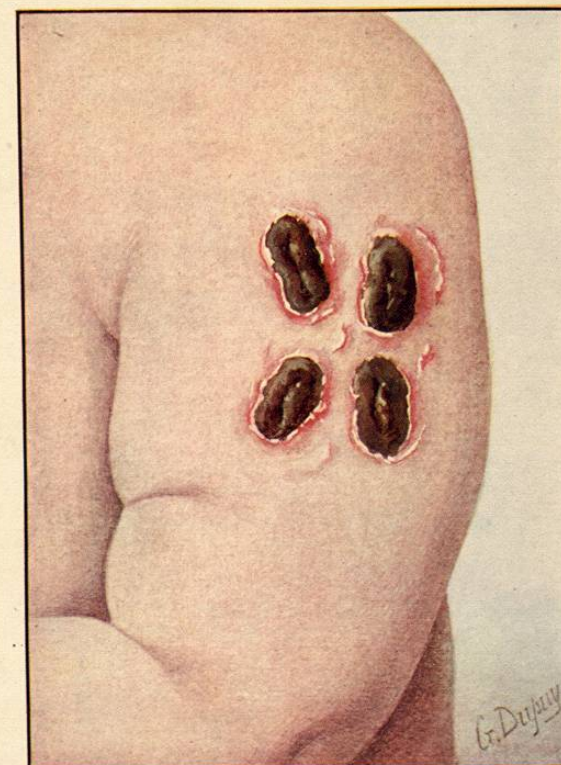


FIG. 4. SIXTEENTH DAY.

PRIMARY VACCINATION.

(Redrawn with corrections from Plate shown in *British Medical Journal*, July 1902.)

its influence by repetition. Revaccination, therefore, as he expresses it, forms an essential part of the measures of prevention against smallpox, and its hygienic importance extends not only to the individual, but also to society, the relative immunity of which is warranted only by the immunity of the individual from smallpox. He reckons the protective period of primary vaccination at an average of ten years, and therefore believes the revaccination of school children in the later years of school life to be essential to complete immunity.

Dr. Seaton sums up the purposes of revaccination as follows:

1. To repair whatever was irregular in the course of a primary vaccination.
2. To supply what was imperfect in the amount of infection, in cases in which the course of the disease was regular.
3. To extinguish the susceptibility to smallpox which may remain, or may rearise, in an indeterminate number of persons whose primary vaccinations may have been complete as well as regular ("Seaton's Handbook," p. 300).

Autovaccination.—By this term is meant the reinsertion of fresh vaccine lymph upon the same person from whom it is taken, either by the vaccinated person himself or by some other person, and also either intentionally or by accident.

Vaccinization.—In a paper published by the Belgian Academy of Medicine, entitled "La Pratique de la Vaccine; ce qu'elle est, ce qu'elle devrait être" (1885), the author, Dr. Titeca, concludes that the principles of vaccination should be raised to the state of an axiom; in other words, that it may be made perfectly protective. Dr. Warlomont has expressed a similar belief.⁵ They have crystallized this belief under the name of the school of vaccinization (*école vaccinatrice*), wherein they are in accord with the views of many others, both in America and in Europe.

The author concludes that vaccination is in many cases nothing but a deceptive operation performed with a hypothetical virus.

The following questions are also discussed by the same author:

1. *No vesicle follows a given vaccination.* We are not therefore to infer that the subject is wholly insusceptible and abandon the attempt to secure a successful result.
2. *One or more vesicles are developed.* The subject, therefore, *ipso facto*, should not be regarded as having acquired immunity from smallpox. An old regulation of the German army required twenty insertions, ten in each arm.

In Holland, a modified vaccination has been practised for a long time, ten insertions being made upon each subject, and the results classified in accordance with the number of good resulting vesicles, certificates being given to such as have more than five good vesicles. All others are submitted to a supplementary, or an auto-vaccination.

Dr. Titeca gives the results of twenty-three primary vaccinations of children of various ages from three months to five years: twelve boys and eleven girls, showing the possibility of exhausting the susceptibility of the subject by means of repeated vaccinations.

From a general review of the subject the author concludes that vaccination, to be perfectly protective, should be practised under the following conditions:

1. The employment of a vaccine virus which has lost none of its vitality.
2. The number of inoculations should be in accordance with the individual vaccinal receptivity, even to the extent of the exhaustion of that condition.

The first of these conditions is fulfilled by the use of living (*vivant*) vaccine, collected at the time of the operation; the second by the operation to which Dr. Warlomont gives the name of vaccinization.

Every vaccination made in default of these conditions is deceptive, and to such faulty methods the antivaccination school owes its existence. Its faults and griev-

ances will cease when the school of vaccinization is recognized.

The author recommends the following practice:

1. Vaccinization of infants within six months of birth.
2. Revaccination every ten years, when no epidemic is prevailing, and general revaccination in time of epidemic.

Insusceptibility.—It is quite probable that under the most favorable circumstances for vaccination (absolutely fresh lymph in each instance), insusceptibility in primary cases does not exist.

Dr. Robertson says, in the twenty-fifth "Report of the Registrar-General of Scotland": "Constitutional insusceptibility, as expressed in the returns, is virtually a confession from an operator that he has made three unsuccessful attempts to vaccinate a child without ascertaining the cause of his failures, and the fact that a child has a certificate of insusceptibility does not absolve its guardians from the duty of having the reality of the conditions tested from time to time."

Dr. Eory says⁶ upon this point: "Of my own vaccinations, I may say that I have in my time performed over thirty-eight thousand primary operations with human or with calf lymph, and that it has only once fallen to my lot to fail twice at an attempt at vaccination. This subject was a ten-year-old child, in whom, as stated by its mother, vaccination had been attempted on previous occasions without result. My operation failed at the second attempt, and I did not get the opportunity to try a third time."

Dr. Thorne, chief medical officer of the Local Government Board, says⁷: "I would point out that the number of consecutive primary vaccinations by the board's own officers, without the occurrence of a single instance of so-called insusceptibility, now reaches 107,180."

THE TECHNIQUE OF VACCINATION.—Since vaccination with humanized lymph has been generally superseded by the use of vaccine from the calf it is unnecessary to present detailed instructions for collecting lymph from the arms of infants. Direct vaccination from arm to arm, with fresh fluid lymph, is superior to any other form of humanized vaccination, and should be performed when it is impracticable to obtain bovine virus.

Methods of Inserting Lymph.—The methods of insertion of either form of vaccine material are the same. The essential characteristics of a successful insertion are that the vaccine collected at the proper period of maturity should penetrate the superficial layer of the skin and be brought in contact with the rete Malpighii, or mucous layer. Bousquet states that smallpox was thus inoculated by Eastern nations in early periods.

The part usually selected for insertion is the outer part of the arm, at or near the lower insertion of the deltoid muscle, the left arm being usually preferred. Successful vaccinations may be made upon any part of the body. Among females it is quite a common practice to make insertions upon the thigh. In the case of young infants there are decided objections to this method.

Number of Insertions.—At least two insertions should be made in every case, and there can be no valid objection to a greater number. Heim recommends six, three on each arm; Bousquet, six; and Steinbrenner ten, five on each arm. Warlomont recommends six, three on each arm, and that they be arranged triangularly in boys, and in a horizontal line in girls, at the distance of a thumb's-breadth apart. He adds: "If one desires to please the mothers and spare subsequent reproaches, he will ask the mothers to point out where they wish the insertions to be made; the horizontal arrangement allows concealment by a short sleeve."

The Age for Primary Vaccination.—In all cases vaccination should be performed in early infancy, health permitting. Young unvaccinated children are the chief sufferers from smallpox. (Statistics relative to this point will be introduced later on.) There is great risk in delaying the operation, especially in the cities and large towns. Seaton advises that plump and healthy children living in large towns should be vaccinated when they are

a month or six weeks old; and in more delicate children the operation might be postponed until they are two or three months of age; but all whose health does not offer some positive contraindication should be vaccinated by the age of three months.

The writer has, under conditions of special exposure to smallpox, vaccinated several infants within the first forty-eight hours after their birth, with perfect success, and with typical vesicles resulting.

Health of the Individual to be Vaccinated.—It is not essential that the persons who are to be vaccinated should be in robust health. They should, however, be free from any acute disease, and also from any severe chronic disease which would be likely to interfere with the regular course of the vaccine vesicle. Many diseases do not interfere at all with the progress of vaccination.

In many countries, and also in some of the United States, vaccination is made a statutory prerequisite to school attendance, and the important question occasionally arises, "Shall exception be made in the case of scholars suffering from ill health?" From the standpoint of public hygiene, it must be urged that such scholars constitute a public danger, and a constant menace to the community, and it may also be added that a scholar whose health is not sufficiently good to permit of vaccination is not, as a general rule, in a condition of health to endure the routine of school attendance, and should remain out of school until recovery will permit of both school attendance and vaccination.

Methods of Insertion.—For precautions to be taken at the time of vaccination see No. 6 of the following instructions of the Local Government Board of England.



FIG. 4921.

1. One of the best methods, and also one most commonly employed, is the method of *scarification*. The arm of the person to be vaccinated should be grasped by one hand of the vaccinator, so as to put the skin upon the stretch. With a sharp lancet several fine parallel scratches, or incisions and cross incisions, should then be made upon the skin in the following manner (see Fig. 4921):

These incisions should be carried only to such a depth that the surface becomes slightly reddened by the appearance of blood. They may often be made upon sleeping children by means of a sharp lancet, without awakening them.

Several such scarifications should be made, never less than two, preferably of a smaller size than that which is shown in the cut, at a distance of about 1 in. (2-3 cm.) apart. Upon these should be applied the fresh lymph, rubbed lightly into the scarifications from the point of a lancet, and if preserved lymph is used, the contents of the tubes, points, or other appliances upon or in which it is stored should be transferred to the scarifications. If there is a free oozing of blood or serum, it is not necessary to moisten the dried lymph.

2. **Scraping.**—The outer skin may be scraped away with the edge of a sharp lancet over a surface 5-8 mm. in diameter, until a slight redness appears, but not sufficiently to induce a free oozing of blood. The lymph may be applied to this slightly reddened surface.

3. **By Puncture.**—By this method a sharp lancet is inserted obliquely to a depth of about one-eighth of an inch (2-3 mm.) or more. From two to five such punctures should be made at a distance of at least three-fourths of an inch apart. A common sharp-pointed lancet is best adapted to the purpose. The fresh lymph may be introduced into these punctures.

4. The method by puncture may be modified by making a considerable number of small punctures close together, or, in other words, a tattooing in several spots, the lymph being spread upon these spots.

The following are the revised instructions given by the Local Government Board of England to vaccinators under contract:

1. Except so far as any immediate danger of smallpox

may require, the public vaccinator must vaccinate only subjects who are in good health. As regards infants, he must ascertain that there is not any febrile state, nor any irritation of the bowels, nor any unhealthy state of the skin, especially no chafing or eczema behind the ears, or in the groin, or elsewhere in folds of skin. He must not, except of necessity, vaccinate in cases in which there has been recent exposure to the infection of measles, scarlatina, or diphtheria, nor in which erysipelas is prevailing about the place of residence.

2. A certificate of postponement must be given by the public vaccinator in the form prescribed by the Local Government Board or to the like effect: (a) If in his opinion the child is not in a fit and proper state to be vaccinated, or (b) if in his opinion the child cannot be safely vaccinated on account of the condition of the house in which it resides, or because there is or has been a recent prevalence of infectious disease in the district; and in any such case the public vaccinator is required forthwith to give notice of such certificate to the medical officer of health for the district in the proper form.

3. All public vaccinations are to be performed with glycerinated calf lymph or with such other lymph as may be issued by the Local Government Board. If the parent or other person having the custody of the child requires that it shall be vaccinated with lymph issued by the Local Government Board, the vaccination must be performed with such lymph.

4. The public vaccinator must keep such record of the lymph he uses for vaccinating as will enable him always to identify the origin of the lymph used in each operation. He must not employ lymph supplied by any person who does not keep an exact record of its source.

5. The public vaccinator must keep in good condition the lancets or other instruments which he uses for vaccinating, and he must not use them for any other purpose whatever. When he vaccinates he must cleanse and sterilize his instrument after one operation before proceeding to another, and must always, when vaccinating, have with him the means of doing this. When once he has unsealed a tube of lymph he must never attempt to keep any part of its contents for the purpose of vaccination on a future occasion. Under no circumstances should the mouth be applied directly to the tube in which the lymph is contained for the purpose of expelling the lymph. In the case of ordinary capillary tubes an artificial blower may properly be employed for this purpose.

6. Vaccination should at every stage be carried out with aseptic precautions. These should include: (1) The cleansing of the surface of the skin before vaccination; (2) the use of sterilized instruments; and (3) the protection of the vaccinated surface against extraneous infection both on the performance of the operation and on inspection of the results. Advice as to the precautions to be taken in this respect until the scabs have fallen and the arm has healed should always be given to the person having the custody of the child.

7. In all ordinary cases of primary vaccination the public vaccinator must aim at producing four separate good-sized vesicles, or groups of vesicles, not less than half an inch from one another. The total area of vesiculation resulting from the vaccination should not be less than half a square inch.

8. The public vaccinator must enter all cases in his register on the day when he vaccinates them, together with all particulars required in the register up to and including the column headed "Initials of the Person Performing the Vaccination." The results of the vaccination, which must be attested by the initials of the person who inspects the case, are to be entered upon the day of inspection. In cases of successful primary vaccination the public vaccinator must record the number of separate scarified areas, punctures, or groups of punctures made, and the number of separate normal vaccine vesicles or groups of vesicles which have been produced. In cases of revaccination, he must register as "successful" only those cases in which either vesicles, normal or

modified, or papules surrounded by areolæ have resulted. When any operation (whether vaccination or revaccination) has to be repeated owing to want of success in the first instance, it should be entered as a fresh case in the register.

Instruments Employed.—1. The common *lancet*, with a sharp point and edge, is undoubtedly the best instrument that has been devised for vaccination. It is simple, easily



FIG. 4922.—Vaccine Scarifier.

cleaned, easily sharpened, and may be used either for puncture or for scarification, the point being used for the former, and the edge for scarification.

2. **Needles.**—Steel needles or pins answer the same purpose, and may be easily cleansed either by heat or by disinfectants, or may be destroyed after each use.

3. Another instrument which proves quite efficient for scarification has the following shape. The only objection to this instrument is the greater difficulty in cleaning the spaces between the points (see Fig. 4923).

4. **Ivory Points.**—One of the advantages claimed for ivory or bone points is that they may serve two purposes: first, for the storage of lymph; and second for use in scarification, the edges near the point being sharpened or chamfered for the purpose (see Fig. 4923). They are poorly adapted for such use, it being impossible to give them a hard cutting edge as sharp as that of a lancet. In consequence of the porous quality of ivory and bone, and its consequent liability to retain pathogenic germs,



FIG. 4923.—Ivory Point for Vaccine.

an enterprising American firm has introduced a glass point with smooth surfaces, which may be used both for storage and for scarification.

Various other instruments have been devised, many of them more or less complicated, and therefore not so well adapted for vaccination, in consequence of the greater difficulty in cleaning them, a point which deserves most careful attention in a matter of such great importance as that of vaccination.

Dr. Sagrandi, a surgeon of the Eleventh French Dragoons, has recently invented for use in vaccinating large numbers of people vaccinostyles or small metallic lances, one for each person vaccinated, which are sterilized by placing them to the number of fifty or more in racks in a small metallic cylinder, which is put into a larger cylinder containing a two-per-cent. solution of borate of soda, which is kept at the boiling point by a spirit lamp. This method has the advantage of rapidity and complete sterilization.

Dr. Burdon Sanderson employs a gauge for measuring vaccine vesicles (which is of the following shape), and estimates their protective value by the aggregate area of surface foveated in a characteristic manner. (Sixth Report of the Privy Council of England, p. 205.) (See Fig. 4924.)

Lymph which has been stored upon points for a month or more will often produce small vesicles, not more than 4-6 mm. ($\frac{1}{4}$ - $\frac{1}{8}$ inch) in diameter, with very slight areola, but otherwise characteristic. The protective power of such a vaccination would presumably be but slight, and the vaccination should be repeated with fresh lymph.

Care of Instruments.—In consequence of the importance of this operation, it should invariably be performed with scrupulous regard to cleanliness. The instruments employed should be used for no other purpose, and if lancets are used, they should be cleaned with the greatest care after each use, and when several persons are to be vaccinated at once the instrument employed should be thoroughly sterilized after each operation. The use of a disinfecting solution for such purpose is desirable, such

as a five-per-cent. solution of carbolic acid, or the flame of a spirit lamp.

Circumstances Calling for the Immediate Performance of Vaccination.—Under certain conditions it may be prudent to vaccinate at a very early age. When smallpox is prevalent in any locality, and especially when it exists in the same house where unvaccinated persons or such as have not been recently vaccinated are living, vaccination should be immediately performed. Repeatedly, for want of such precaution, have the lives of infants been sacrificed. The loss of a single day may sometimes prove to be the loss of a life.

Since the incubative period of vaccinia is shorter than that of smallpox by about three days, it is found that if vaccination is performed at any time within the first three days of exposure the vaccination will cause a certain degree of modification of the smallpox, and consequent protection. If it is postponed to a later day no protection is afforded. An illustration of the latter condition has come under the writer's observation. An unvaccinated child was exposed to smallpox on a certain day. Vaccination was delayed until ten days afterward. On the third day after the vaccination was performed, a well-marked eruption of smallpox appeared and the child died. Singularly enough the appearance of smallpox was attributed by some to the vaccine virus employed but two days previously.

The only safe rule under all such circumstances is to vaccinate immediately.

In all such cases it is of the utmost importance that accurate observations should be made and recorded as to the date of exposure, the date of vaccination, and also the date of the first symptoms of smallpox, should they occur.

Seaton also urges with propriety that the word "vaccinated" should not be used in certificates of death in which vaccination was merely attempted, but without any result. He also condemns in the strongest terms the practice of vaccinating after symptoms of smallpox have actually appeared in any given case presented for vaccination.

EXTENT TO WHICH VACCINATION IS NOW PRACTISED.—Jenner stated in 1801 that about six thousand persons had been inoculated with cowpox in England. In the

previous year the practice of vaccination had been introduced into several other countries, and gradually won its way into public favor. At the present day a fair estimate of the annual number of vaccinations performed throughout the world (including revaccinations) may be stated to be at least thirty millions, which would amount to sixty per cent. of an estimated annual number of births of fifty millions. The ratio, however, has been constantly increasing, as the practice of vaccination has spread to countries where it had not been introduced.

In the accompanying table the statistics of vaccination of several countries are presented, as compiled from such official sources as are accessible. It is to be regretted that the relative figures in the statistics of Scotland, England, Austria, and India have so little relation to each other. This fact is due to the lack of uniformity in the methods of reporting such statistics in different countries.

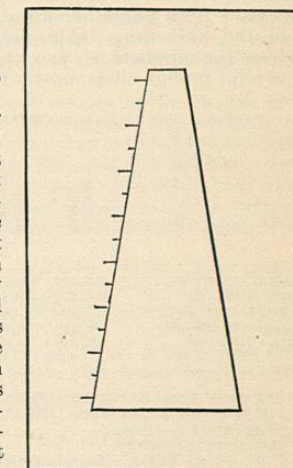


FIG. 4924.—Burdon Sanderson's Gauge for Measuring Vaccine Vesicles.