

## **Memorandum on vaccination against smallpox.**

### **Contributors**

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MINISTRY OF HEALTH

# Memorandum on Vaccination Against Smallpox

LONDON

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Vaccination Against  
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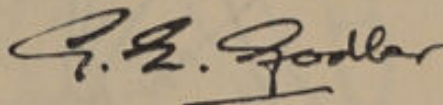
## PREFACE

Since the previous (1962) edition of the Memorandum on Vaccination against Smallpox was published a Joint Committee on Vaccination and Immunisation has been appointed by the Central and Scottish Health Services Councils to advise the Health Ministers on all the medical aspects of vaccination and immunisation. The present edition of this Memorandum by the Ministry of Health has been prepared with the advice and approval of the Joint Committee.

Among the principal changes are:

- (a) description of the new presentation of vaccine in plastic tubing,
- (b) inclusion of pregnancy (at any stage) and leukaemia among the contra-indications to routine vaccination,
- (c) recommendation to inspect the site of vaccination 'on or about the seventh day', irrespective of the previous vaccination history,
- (d) complete revision of the paragraphs on the inspection and recording of results.

Particular attention is directed to the new nomenclature for recording the results of vaccination and revaccination in consequence of the adoption of recommendations made by the World Health Organisation's Expert Committee on Smallpox.



Chief Medical Officer.



## MEMORANDUM ON VACCINATION AGAINST SMALLPOX

1. Vaccination may be done either as a routine immunising procedure, preferably in early childhood, or as an emergency measure in the presence of smallpox.

2. The present freedom of this country from endemic smallpox does not diminish the importance of routine primary vaccination *in the first two years of life*. (See para. 11). Not only should this provide protection at least until the age of school entry but it also makes it likely that subsequent re-vaccination will result in a rapid revival of immunity with a diminished risk of severe local reaction.

3. In this memorandum the practical aspects of vaccination techniques have first been set out and then their application to various vaccination procedures i.e.

- (a) routine primary vaccination in early childhood,
  - (b) routine primary vaccination at later ages,
  - (c) routine re-vaccination,
  - (d) vaccination in the presence of smallpox,
  - (e) vaccination in relation to other immunising procedures.
- Notes are also included on inspection and recording of results.

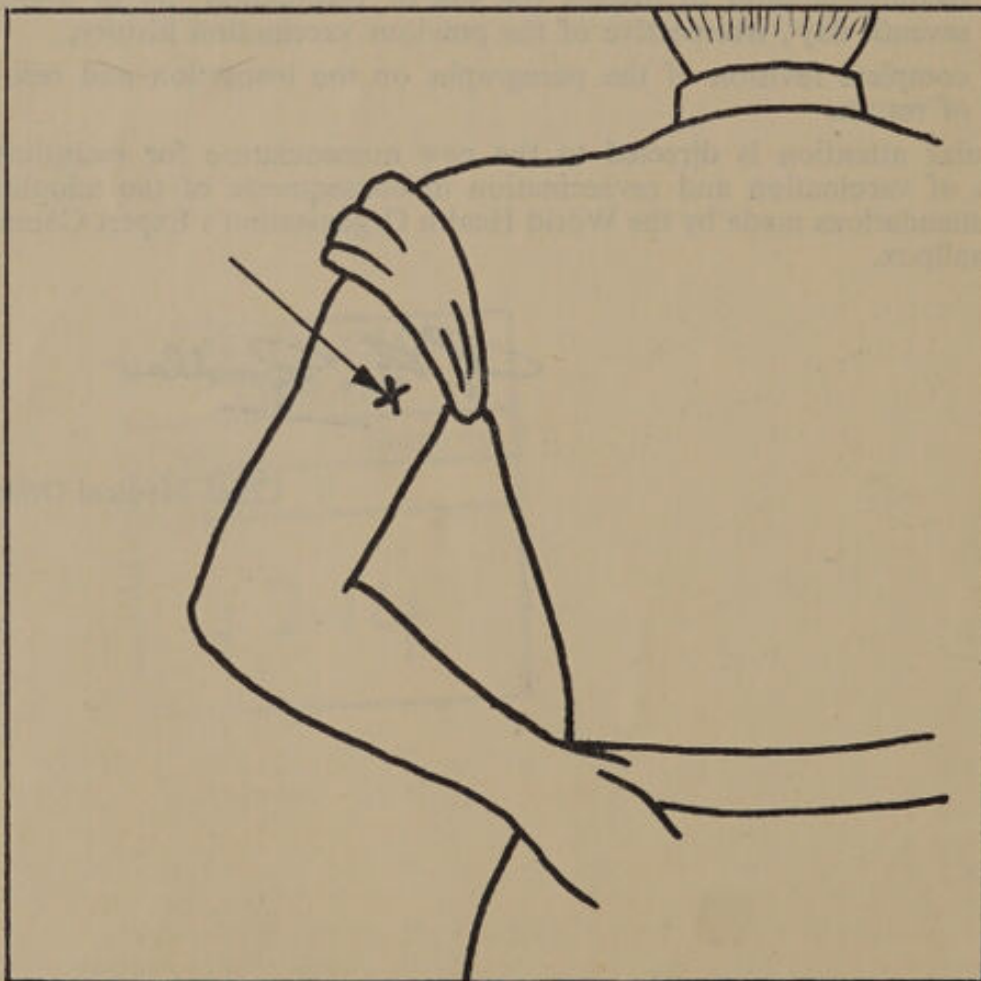


FIG. I



## Vaccination Techniques—Practical Aspects

4. *Site of Insertion.* It is generally agreed that vaccination, especially of infants, is best done on the arm. The site of election is at the junction of the upper and middle thirds of the humerus behind the midline. (See Fig. I). Here scarring will be less noticeable and the lesion is protected naturally from trauma. Vaccination on the leg tends to lead to severe local and general reactions so that choice of this site entirely for aesthetic reasons is unwise.

5. *Preparation of the skin.* Chemical agents, such as ether, acetone or spirit, should not be used. If the skin is dirty it should be cleansed gently with plain soap and water and wiped dry. Vigorous rubbing is inadvisable.

6. *Application of vaccine.* Liquid smallpox vaccine, stained with brilliant green, is now supplied in plastic tubing. The vaccine can be expressed after snipping the tubing with scissors and applied with a needle by one of the two methods described below. Alternatively it may be more convenient to pierce one end of the tube with a sterile, disposable, hypodermic needle, which can also be used for applying the vaccine.

If scissors are used it is inevitable that they will become contaminated and appropriate precautions are necessary. It may be wise to keep a special pair of scissors solely for this purpose. After use, the scissors should preferably be boiled or else wiped with a swab thoroughly soaked in surgical spirit. Alcohol should not be allowed to come into contact with the vaccine before or during the vaccination procedure.

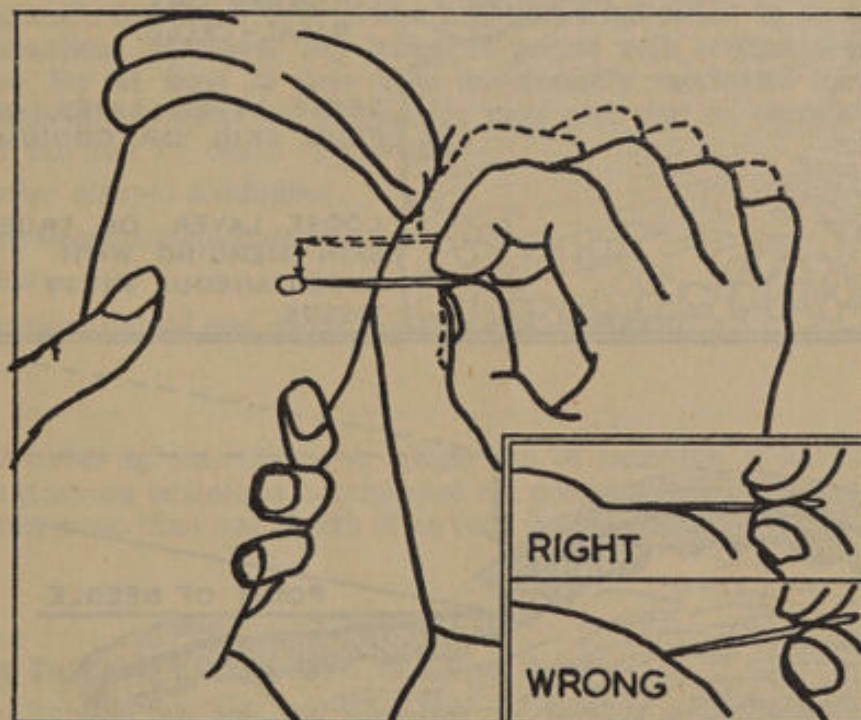


FIG. II. The "multiple pressure" method of vaccination, showing the rapid up and down motion of the side of the needle, held by the hand at the right, against the drop of vaccine on the arm at the left.



7. *Method of vaccination.* The multiple pressure technique and the scratch technique are both satisfactory. It is for the practitioner to choose the method he prefers. With either method it is important that the practitioner should wash his hands with soap and water before and after performing the vaccination.

8. *Multiple pressure technique.* For this method a straight needle, flat sided or triangular in section (e.g. a Hagedorn) is required. It should be large, sharp and sterile. It is held parallel or tangential to the arm. One side of the needle point is pressed firmly and rapidly into the drop of vaccine the requisite number of times (see paras. 13, 16, 19 and 21) within an area of skin not more than one eighth of an inch in diameter, the needle being lifted clear of the skin each time. The rapid up and down motion of the needle is in a plane perpendicular to the skin surface (see Fig. II). The needle point is not driven into the skin but at each pressure the elasticity of the skin pulls a little of the epidermis over the point of the needle (see Fig. III), so that the vaccine is carried into but not below the deeper epidermal layers. If the skin has not been unduly irritated during preparation and the needle has been properly aligned no pain or bleeding should occur. As soon as the pressures have been completed the excess vaccine lymph should be gently wiped away with sterile, (*not antiseptic*), gauze or cotton wool and the remainder allowed to dry.

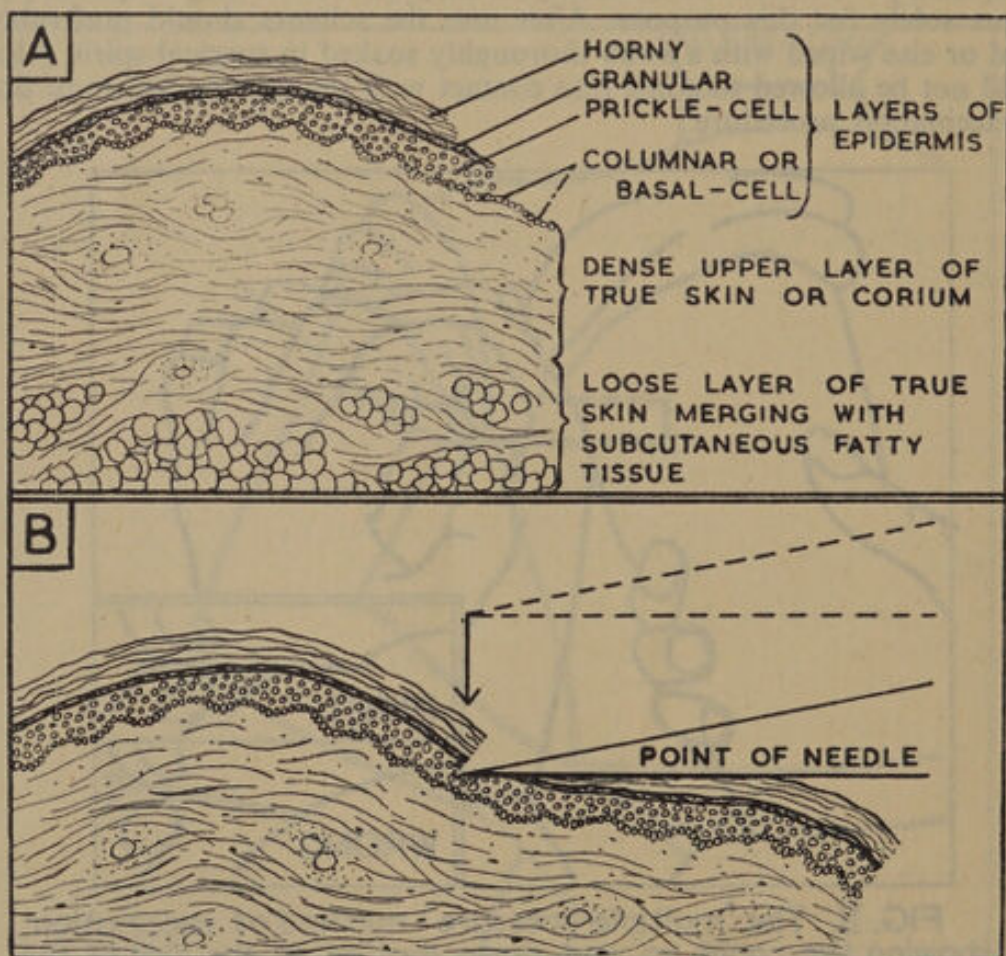


Fig. III (A) Diagrammatic section of the skin of the arm. (B) Same showing the motion of the needle from its first position above and parallel to the skin (indicated by the dotted outline) to its final position pressing against the surface of the skin and entering it slightly.



9. *Scratch technique.* A single linear scratch, not more than a quarter of an inch long, is made through the vaccine with a sterile needle. The needle should not draw blood but the scratch should be deep enough so that slight oozing of serum occurs after a few seconds. The vaccine is rubbed gently into the scratch with the side of the needle.

10. *No dressing* is normally required. If a dressing is thought necessary to protect the lesion it should be of sterile, but not antiseptic, gauze.

### Vaccination Procedures

#### ROUTINE PRIMARY VACCINATION IN EARLY CHILDHOOD

11. *Optimum Age.* Routine primary vaccination is not advisable during the first few weeks of life. It should be carried out at some time before the age of two years, preferably during the second year.

12. *Specific contra-indications.* These are:—

- (a) *failure to thrive;*
- (b) *exposure to infectious disease;*
- (c) *septic skin conditions;*
- (d) **infantile eczema.** This is an absolute contra-indication to routine primary vaccination. Moreover any infant or person with eczema should be kept away for at least 21 days from any recently vaccinated member of the household. Neglect of this advice may give rise to *eczema vaccinatum* and the risk of death therefrom.
- (e) *other allergic conditions;*
- (f) *hypogammaglobulinaemia;*
- (g) *leukaemia;*
- (h) *cortico-steroid and immuno-suppressive treatment.*

13. *Number of insertions.* A single site of insertion is sufficient. If the multiple pressure technique is employed *ten* pressures are made within an area of skin not more than one eighth of an inch in diameter.

#### ROUTINE PRIMARY VACCINATION AT LATER AGES

14. Although at any age the risk of serious complications following vaccination is much smaller than the risk of death run by those exposed to smallpox while unvaccinated, primary vaccination is not advised as a routine after early childhood. But, if not performed in early childhood, primary vaccination at a later age may eventually become necessary, e.g. when serving with the armed forces, as a condition of employment and before undertaking foreign travel.



15. *Contra-indications.* Consideration must be given to

- (a) *septic skin conditions;*
- (b) *a history of or the presence of eczema or any other allergic condition;*
- (c) *hypogammaglobulinaemia;*
- (d) *leukaemia;*
- (e) *cortico-steroid and immuno-suppressive treatment;*
- (f) *pregnancy.*

16. *Number of insertions.* A single site of insertion is sufficient; when the multiple pressure technique is employed at these later ages, the number of pressures should be *ten*.

#### ROUTINE RE-VACCINATION

17. *Object.* The object of re-vaccination is to maintain or to revive the immunity against smallpox conferred by a previous vaccination or re-vaccination.

18. *Frequency.* The frequency with which routine re-vaccination should be performed varies with circumstances, e.g.:

- (a) *Children primarily vaccinated in early childhood—at 8-12 years of age.*
- (b) *Those at Special Risk.* Doctors, nurses and others liable to serve on the staff of smallpox hospitals, and any persons (e.g., ambulance crews earmarked for smallpox duties) who are likely to have to deal at short notice with smallpox cases or to handle infected material, should be re-vaccinated regularly at not more than yearly intervals. At general, children's and infectious disease hospitals, the staff should be offered re-vaccination as a routine at least once in every three years.

19. *Number of insertions.* A single site of insertion is sufficient; if the multiple pressure technique is employed *thirty* pressures are advised.

#### VACCINATION IN THE PRESENCE OF SMALLPOX

20. *Object.* The object in these circumstances is, by primary vaccination or re-vaccination as soon after exposure as possible or, at most, within three days, to enable the individual to acquire resistance to smallpox within the normal incubation period of that disease. The more rapid evolution of vaccinia infection relative to that of smallpox makes this possible in most instances. To do this effectively it is probably necessary in a primary vaccination to produce by the eighth day the equivalent, in aggregate, of a pustule at least one half inch in diameter; and it is clearly important to be confident that the technique used will produce this result.



21. *Number of insertions.* Two areas of insertion are essential and they should be placed at least one inch apart. If the multiple pressure technique is used, thirty pressures at each area are necessary; if the scratch technique is preferred, two scratches each at least one quarter inch long are required.

22. *Contra-indications.* In the presence of suspected smallpox there are no absolute contra-indications to the immediate vaccination or re-vaccination of all close contacts.

23. *Anti-Vaccinial Gamma-Globulin.* This should be given into the opposite arm, when vaccinating contacts with any of the following contra-indications:

- (a) *Pregnancy;*
- (b) *Eczema, or a definite history of eczema;*
- (c) *Leukaemia;*
- (d) *Hypogammaglobulinaemia;*
- (e) *Cortico-steroid or immuno-suppressive treatment.*

It can be obtained from Public Health Laboratories at Birmingham, Bristol, Cambridge, Cardiff, Colindale (London), Leeds, Liverpool, Manchester, Newcastle, Oxford and Sheffield. Advice as to dosage can be sought from the Directors of these laboratories.

#### VACCINATION IN RELATION TO OTHER IMMUNISING PROCEDURES

24. (a) In general, it is preferable that other immunising procedures should not be carried out at the same time as primary vaccination. When such procedures are judged to be essential the injection should be given into the arm other than that used for vaccination.

(b) An interval of at least two weeks should normally be allowed to elapse after an injection of diphtheria, tetanus, pertussis, or of any inactivated virus vaccine, and of at least three weeks after administration of live measles or oral poliomyelitis vaccine, before undertaking primary vaccination against smallpox. When primary vaccination against smallpox precedes any other immunising procedure it is desirable to allow at least three weeks to elapse.

(c) Tuberculin testing or B.C.G. vaccination should not be carried out until three weeks have elapsed after vaccination against smallpox. Following B.C.G. the vaccinated arm should not be used for smallpox vaccination (or any other immunising procedure) for six months.

25. *Yellow Fever Vaccination.* Here there are special considerations.

(a) When yellow fever vaccine and smallpox vaccine are to be given to the same person it is generally advisable that vaccination against yellow fever should be done first and at least four days before a primary vaccination against smallpox; if primary vaccination against smallpox is done first, there should be an interval of twenty-one days before vaccination against yellow fever.

(b) When, for special reasons, an infant under nine months is to be vaccinated against both yellow fever and smallpox, there should be an interval of twenty-one days between the vaccinations, no matter which is done first.

(c) Re-vaccination against smallpox may be done at the same time as yellow fever vaccination but, if time permits, yellow fever vaccination should precede re-vaccination against smallpox by at least four days.



## INSPECTION OF RESULTS

26. The site of vaccination should be inspected *on or about the seventh day*. The primary vaccination or re-vaccination is considered to be successful if a *major reaction* has occurred.

On inspection after the interval stated above, a "*major reaction*" after primary vaccination is a typical Jennerian vesicle; after re-vaccination a "*major reaction*" is (a) a vesicle or pustule, or (b) an area of definite palpable induration or congestion surrounding a central lesion, which may be a scab or an ulcer.

Any other local reaction is termed an "*equivocal reaction*".

27. *Routine Primary Vaccination and Re-vaccination.* If a "*major reaction*" has not been obtained one week after the first attempt, the procedure should be repeated with fresh vaccine and the method of storage checked.\*

28. *Vaccination after Exposure to Smallpox.* Here a second vaccination is essential if no local reaction is visible on inspection *three days* later.

## RECORDING OF RESULTS

29. *Classification.* Results may be classified as follows for reporting purposes:

- A — Major reaction.
- B — Equivocal reaction.
- C — No local reaction.

30. *No local reaction.* The complete absence of local reaction on inspection following primary vaccination or re-vaccination should be regarded in the first place as an indication for at least one further attempt with fresh vaccine with a check on vaccine storage methods and not necessarily as an indication of immunity to smallpox. A similar result on a second such occasion might be recorded as "*no local reaction to repeated vaccination (or re-vaccination)*" and letter *C* on the report form could be ringed.

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\* Storage of smallpox vaccine. If kept consistently below freezing point (0°C.) vaccine may be expected to maintain its potency unimpaired for at least six months. If vaccine is stored below 10°C, it should maintain its potency for at least fourteen days. If, however, vaccine is kept at ordinary room temperature its potency cannot be assured for more than seven days. Vaccine should be stored in the dark and exposure to any source of heat should be avoided.

Dried smallpox vaccine (of which there are reserve stocks in the United Kingdom, but which is not normally issued for use in this country) should retain its potency for at least six months without refrigeration in temperate climates, or for at least one month at tropical temperatures. When opened, this vaccine should be used at once; any surplus should be discarded, unless it can be kept in a refrigerator at a temperature below 10°C. when the potency may be maintained for a week.



31. *Equivocal reaction.* This has already been defined as any local reaction other than a "major reaction" (see para. 26). After two attempts to obtain a "major reaction" have failed but there has been some local reaction, the result is recorded as 'equivocal' and letter *B* on the report form could be ringed.

32. *Major reaction.* Where there is a "major reaction" the result is so recorded and letter *A* on the report form could be ringed.

33. *Chronic progressive vaccinia.* In rare instances this condition (also known as *vaccinia gangrenosa* or *vaccinia necrosum*) develops. It should be considered as a possible diagnosis whenever involution of the lesion at the site of vaccination has not begun by the fifteenth day. In this event consultation should be sought with a view to appropriate treatment.

34. *International Requirements.\** These are dealt with in a special Notice to Travellers issued jointly by the Ministry of Health and the Scottish Home and Health Department.

35. It should be noted that vaccination is not obligatory if a medical contra-indication exists. The following is a quotation from the Official Records of the World Health Organisation 56, 54. "If a vaccinator is of the opinion that vaccination is contra-indicated on medical grounds, he should provide the person with written reasons underlying that opinion, which the health authority of arrival may take into account. Decision on a claim for exemption from the requirement to be in possession of a certificate lies solely with the health authority of arrival."

36. Persons intending to travel to countries where smallpox is prevalent who show no vaccination scars and who fail to give a local reaction to vaccination or re-vaccination cannot be presumed to have any immunity to smallpox, and, if time permits, further attempts should be made to obtain a major reaction

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\* Vaccination and re-vaccination are defined in Annex IX to the International Sanitary Regulations (World Health Organisation 1966) as follows:—

*Vaccination:* Cutaneous inoculation of smallpox vaccine into a person not previously successfully vaccinated (synonym: primary vaccination).

*Re-vaccination:* Cutaneous inoculation of smallpox vaccine into a person who has a vaccination scar or convincing documentary evidence of previously successful vaccination or re-vaccination.

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