REFRESHER COURSE FOR GENERAL PRACTITIONERS

THE PROS AND CONS OF IMMUNIZATION—II

BY

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In the previous article I discussed the principles of artificial immunization, and, despite the attendant risks, it was thought that, whenever immunization was safe, practicable, and effective, prevention was preferable to cure. In this paper the procedures and indications for inducing active or passive immunity in individual infections are discussed.

Diphtheria

Protection against diphtheria may be produced by passive or active immunization or by a combination of the two methods. Passive immunization used to be practised frequently when a case of diphtheria occurred in a family and it was necessary to protect the other susceptible children as quickly as possible. Nowadays, when most children are actively immunized in infancy, passive protection is rarely needed. When the need does occur in a family or residential nursery or school, all contact children are given an intramuscular injection of 500 units of refined diphtheria antitoxin contained in 0.5 ml. or less, while active immunization of children up to the age of 7 years is begun immediately, or after two weeks when the temporary protection from the antitoxin has been largely lost. Any contact children over 7-8 years who have not been immunized within the past two years should be Schick tested 12 hours or so before receiving the antitoxin. If they are Schick-positive and give a history of previous immunization they should be given one dose of a suitable prophylactic, or two doses at a month's interval if there is no such history. If a child gives a pseudo-positive response (an erythematous reaction with the control material as well as with the Schick toxin) he should not be injected with any diphtheria prophylactic, as he may react severely to it; instead, he should be retested after three to six months.

Active immunization is best carried out in infancy, preferably around 6 months of age, when antibody derived from the mother will have disappeared and the child is less likely to suffer from psychological trauma as some older children do when given repeated injections. Probably the best diphtheria prophylactic for use in this country is P.T.A.P. (purified toxoid aluminium phosphate precipitated), which has a uniformly good antigenic potency and produces the minimum of local reaction. It is not yet, however, generally available as a free issue, whereas A.P.T. (alum-precipitated toxoid), another very good prophylactic, is. Two doses of these prophylactics should be given into the deep subcutaneous tissue in amounts of 0.3 ml. of A.P.T. or 0.5 ml. of P.T.A.P., with an interval of not less than four weeks between the two injections. This interval may be extended to six months or more. The resulting immunity lasts for two to four years in most children, and if this primary immunizing course has been given in the first year of life a further injection should be given about the age of 5 years, when the child goes to school, or earlier if convenient. For this booster dose one of the less powerful prophylactics

like T.A.F. (toxoid-antitoxin floccules), 0.5 ml., may be used. Some authorities recommend a second booster dose towards the end of school life, but this is not essential unless the individual is likely to be going to a country where diphtheria is still uncontrolled.

It is most desirable that a high proportion, around 70-80%, of pre-school- and school-children be protected against diphtheria if this infection is to be effectively controlled. Many parents know the disease only by name and may require a good deal of persuasion to have their children immunized against what is to them a rather hypothetical danger. The family doctor must therefore be prepared with good reasons to persuade the doubters of the value and safety of immunization against diphtheria. Even so, we must admit that certain of the more invasive strains of *Corynebacterium diphtheriae*—for example, the gravis and intermedius types—may break through some degree of antitoxic immunity. It is therefore advisable that throat swabs should be taken for bacteriological examination from any patients with exudative tonsillitis or pharyngitis.

Smallpox

Smallpox in its typically virulent form has not occurred as an epidemic disease in this country for many years, although a modified form called alastrim was prevalent in the years between the two great wars. However, localized outbreaks of smallpox occur from time to time and often cause great alarm and much administrative anxiety and expense before the public can be assured that the danger is past. The main worries about such sporadic outbreaks are that the primary case, arriving perhaps by air from the Middle or Far East, may be so mild and atypical as to be missed, that the disease can be highly infectious in the early stages, and that only a small proportion of our population have any degree of immunity against the infection. The tragic deaths from smallpox in recent years of student nurses and others who had never been vaccinated, the upheavals in communities where outbreaks have occurred, and the risks of primary vaccination during school or adult life are part of the arguments that may be used to convince parents of the advisability of having children vaccinated in the first year of life, when severe reactions or complications are very rare.

Vaccine lymph may be obtained from the nearest public health laboratory by sending the appropriate request form, or, if there is urgency, by telephonic request. The potency of the lymph deteriorates quickly if it is kept at room temperature, and therefore the vaccination should be done as soon as possible after the lymph has been received; failing this, the lymph should be stored in a refrigerator and used within two weeks. Primary vaccination may be done at 3-6 months of age, either by scarification or by the multiple pressure technique. In the former method the skin is cleaned with soap or ether and a single linear scratch $\frac{1}{4}$ in. (0.6 cm.) long is

made on the epidermis with a Hagedorn needle or other suitable instrument through a drop of lymph. In the multiple pressure method the lymph is first spread over an area of about $\frac{1}{4}$ in. (0.3 cm.) square, and with a large flat-sided needle a series of some 20–30 pressures are made on the skin through the lymph (for details, see *Any Questions?** 1951, p. 139). The upper arm or in girls the ankle area are the sites of choice; the thigh should not be used.

Opinions vary about the advisability of covering the vaccination immediately with a dressing; the important point is that the lymph should be allowed to dry before the vaccination site is covered in any way. A dressing may be applied after four to five days, when the vesicles begin to appear, and in the later stages the lesion may be dusted with an antiseptic powder. In older children or adults, in whom the reaction may be more severe, the arm should be rested in a sling. If there is no response the vaccination should be repeated after a week, and it may be repeated a second time if there is still no reaction. Natural immunity in a child of 3–6 months is very rare.

In those who have been vaccinated before, one or other of two reactions different from typical vaccinia may occur. In the "accelerated reaction" vesicles appear early (within two to three days), and the lesion reaches its maximum intensity in four to five days, indicative of some degree of immunity. In the "immune reaction"† a raised itchy reddened lesion, without vesiculation, appears within one to two days, and fades quickly; this reaction, regarded as an allergic phenomenon, may or may not indicate a good degree of immunity. If in doubt the vaccination should be repeated a week later with fresh lymph.

Primary vaccination gives immunity to smallpox for a period of seven to ten years, and ideally every person should be vaccinated in the first year of life and again about the tenth year of life. It is essential that any individual who may run the risk of intimate exposure, such as hospital staff and emigrants to certain countries, should be vaccinated or revaccinated before they are exposed to this risk.

Whooping-cough

Whooping-cough, or pertussis, comes next to measles in its high incidence in the child community. About 40–50% of children have been attacked by the age of 5 years, and about 70% by the age of 10–12. The infection, caused by *Haemophilus pertussis*, is most severe in infancy. Nearly half the deaths occur in the first six months and about two-thirds within the first year of life, but whooping-cough may be serious in any child up to 3 years of age, causing a protracted debilitating infection with the risk of secondary lung complications. If prophylactic vaccination is to be used, therefore, it should be given to children as early as possible, and preferably within the first six months of life. With an effective antigen the antibody response is apparently as good in infants aged 3–6 months as in older infants. Recent experience in America and the results of controlled vaccine trials in this country indicate that a considerable degree of protection can be given to young children by two or three injections of pertussis vaccine.

*Obtainable from the Publishing Manager, B.M.A. House, Tavistock Square, W.C.1, price 7s. 6d. (postage 6d.)

†It is suggested that this term be discarded and replaced by "maximum local reaction (non-vesicular) on second/third day."

There may, however, be considerable variation in the protective value of different vaccines, and unfortunately there is as yet no generally accepted animal test by which pertussis vaccines can be assayed. Pharmaceutical firms preparing pertussis vaccine are now well aware of the requirements for the production of good vaccines, and if a doctor is in doubt about the particular brand of vaccine to use he may be able to obtain advice from his medical officer of health. British vaccines are usually prepared in strengths of 10,000 to 20,000 million organisms per ml., and it is customary to give three deep subcutaneous injections of 0.5 ml. at intervals of three to four weeks. Immunization should be begun, if possible, about the second or third month of life, and at present should probably not be offered to children over 3–4 years unless there are special indications. Injections of pertussis vaccine should not be given to a child with a history of convulsions or within three weeks after vaccination. With effective vaccines immunity lasts for at least two years, and a booster dose need only be given if there are special indications for it—for example, a child aged 3 vaccinated in infancy and intimately exposed to the risk of infection.

Combined Diphtheria and Whooping-cough Immunization

It would be an obvious advantage to combine diphtheria and pertussis immunization so as to reduce the number of injections to be given to the infant. Diphtheria toxoid and pertussis vaccine have been combined as one prophylactic and the evidence indicates that the specific antibody response to each of these prophylactics is not thereby impaired. If the pertussis vaccine is known to give good protection the combined prophylactic may be given in three doses, beginning about the sixth month of life. If, however, there is doubt about the protective value of the pertussis vaccine it is wiser not to give combined immunization, since failure of the pertussis vaccine may antagonize parents against immunization in general. There is the further risk of post-inoculation poliomyelitis, which is particularly associated in this country with injections of combined diphtheria and pertussis prophylactic.

Measles

As the virus of measles has not so far been cultivated artificially, there is no method of producing active immunity to this infection by injection of a virus vaccine. Human serum containing antibody to the measles virus may, however, be used either to give complete protection or to modify the attack in a child who has been exposed to the risk of infection. Serum from a convalescent case would be most suitable but is difficult to obtain, since measles is not often seen in young adults who might be asked to donate blood for this purpose. Adult serum, prepared from small pools of donors to reduce the risk of homologous serum jaundice, has been mostly used, but cannot be guaranteed to give complete protection unless injected in very large doses. However, if adult serum is fractionated so as to obtain the antibody-containing globulin (gamma-globulin) in concentrated form, attenuation or complete protection may be obtained with doses of 1–3 ml.

Gamma-globulin is not generally available in this country and the practitioner will usually have to aim at producing a modified attack by giving to the exposed child 10 ml. of adult serum, obtainable from the nearest public health laboratory, as early as possible after

exposure. When it is remembered that the rash in measles does not appear until the fourth day of the disease, a child who has been in contact with an unsuspected case during the previous two to three days may already be incubating the infection for four to five days before any serum can be given. Attenuation can only be expected if serum is given before the sixth or seventh day of incubation, counting the rash as the fourth day. Modified measles, characterized usually by a discrete or sparse rash without catarrhal symptoms, minimizes the risk of complications, and will give the affected child considerable, but perhaps not complete, protection against subsequent attack.

Whole citrated blood from one of the parents is sometimes used. The blood (10–15 ml.) is drawn into a syringe containing 1–2 ml. of 2.5% sodium citrate, and is immediately injected intramuscularly into the child. Apart from the large amount of blood, which causes an unsightly haematoma, there may be some risk in this procedure of producing rhesus sensitization unless rhesus typing can be done beforehand.

Rubella, Mumps, and Poliomyelitis

Practitioners often ask about the possibility of protecting contacts against these infections by the use of convalescent serum or gamma-globulin. In the case of rubella a woman in the first two to three months of pregnancy who is exposed to attack may, if she develops the infection, give birth to a child with serious congenital defects such as deafness or blindness. The only protective measure that has so far proved effective is the injection of a large dose of gamma-globulin prepared from the serum of convalescent cases of rubella; such material is not likely to be available. Similarly, gamma-globulin prepared from mumps convalescent serum has given some protection against secondary orchitis in young male adults. Convalescent serum gives no protection against poliomyelitis or against paralysis in a case in the pre-paralytic stage.

Tuberculosis

The possibility of using a vaccine of tubercle bacilli to give some protection against tuberculosis to susceptible members of a family or a community exposed to the risk of infection has in recent years become a practical proposition. Killed vaccines were found to be ineffective, but the use of a living attenuated and practically non-virulent bovine strain, called B.C.G. (Calmette-Guérin bacillus) after the French originators, has now become accepted in many countries as a method of protection against tuberculosis. The vaccine may be given, by intradermal injection or scarification, to infants born into a tuberculous family, to susceptible adolescents about the time they leave school, and to medical students and student nurses who may be unduly exposed to the risk of infection.

In the older groups a tuberculin test should first be done to find out whether or not the individual has already latently acquired an infection, and only if the test is negative should B.C.G. vaccine be given. As it is a culture of living organisms the vaccine must be used within 10 days or so of its preparation, and the inoculated individual should be tuberculin tested six to eight weeks after vaccination to find if he or she has now become tuberculin-positive. The positive reactor has ordinarily a greater resistance to tuberculous infection than has the negative reactor. B.C.G. vaccine is at present distributed on request to hospitals and chest clinics where there are specialists in tuberculosis. Any

doctor who wishes to use the vaccine should get in touch with the nearest centre where a specialist is likely to be available, or he may apply directly to the Ministry of Health on Form B.C.G. 1.

Enteric Fever

Vaccination against the typhoid-paratyphoid group of fevers is not ordinarily recommended in civilian practice except for nurses going to fever hospitals and for those going abroad to countries where the infection is still prevalent. The vaccine consists of killed cultures of typhoid, paratyphoid A, and paratyphoid B bacilli in the proportion of 1,000 million, 500 million, and 500 million organisms per ml. respectively, and is given in two subcutaneous doses of 0.5 ml. and 1 ml. at an interval of seven to ten days. If the vaccine is "alcohol-treated" to preserve the Vi (or virulence) antigen of Felix the doses should be 0.25 ml. and 0.5 ml. Children under 1 year of age do not need to be vaccinated; the dose for children aged 1–5 years should be about one-third of the adult dose, and for children aged 5–15 years one-half. Immunity, which is by no means absolute, may be expected to last for about two years. Booster doses are given yearly to those likely to be exposed to the risk of infection.

Local or constitutional reactions may occur after an injection of T.A.B. vaccine, which should be given late in the afternoon and the patient advised to go early to bed, taking 5–10 gr. (0.32–0.65 g.) of aspirin if need be.

Scarlet Fever

Scarlet fever is to-day a mild infection distinguishable from streptococcal tonsillitis only by the presence of an erythematous rash. The rash is caused by an exotoxin produced by certain strains of *Streptococcus pyogenes*, and this toxin (which cannot be satisfactorily converted to toxoid) has been used to immunize susceptible individuals against scarlet fever. Because four to six injections of increasing doses of toxin are needed, because local and systemic reactions are not infrequent, and because scarlet fever is so mild and readily amenable to antibiotic therapy, active immunization against this infection is not practised nowadays except perhaps for administrative reasons—for example, among nursing staff in a fever hospital. Passive protection of intimate contacts in a family or institution by an injection of the refined scarlatinal antitoxin has also been mostly discarded.

Influenza and the Common Cold

Epidemics of influenza are caused by viruses which can be cultivated artificially on the chick embryo; there are two main types, called A and B. Vaccines of these two types, given in one injection shortly before exposure, have given a considerable degree of protection against the homologous virus infection. The obstacles to the large-scale use of influenza virus vaccine are the uncertainty of foretelling an epidemic of influenza; the difficulty, when an epidemic occurs, of identifying the infecting strain in time to prepare sufficient vaccine; and the apparently short duration of the artificially induced immunity. Efforts are being made to overcome some of these difficulties, and suitable vaccines may become available, particularly for the protection of those in important posts—for example, nursing staff and medical men—at the onset of an epidemic. As outbreaks usually occur in the early spring, the best time to give the prophylactic vaccine is in November or December.

The common cold is also believed to be due to a virus which, unlike the influenza virus, cannot be cultivated artificially. Therefore at present there is no hope of a common cold virus vaccine. Some individuals, however, seem to suffer unduly from secondary bacterial infections—sinusitis, bronchitis, and the like—after an attack of the common cold, and for these subjects mixed stock or autogenous bacterial vaccines have been recommended in the form of a prophylactic course of injections in the late autumn.

Yellow Fever and Cholera

Vaccination against these tropical infections is required only for travellers to or through certain countries where these diseases are endemic. Inoculations with the living yellow fever virus vaccine are given at certain specified centres named in the list set out in the "Notes to Travellers" issued at the Passport Office and the travel agencies. Certificates of inoculation against smallpox, typhoid, yellow fever, and cholera must be on the prescribed International Form, which the traveller again should obtain from a travel agency or the consulate of the country to which he is going. If his own doctor is unwilling to undertake vaccination or inoculations against typhoid and cholera, the traveller may be directed to one of the centres where these inoculations are being done regularly—for example, in the London area there are inoculation clinics at the Tropical Diseases Hospital, at the Wright-Fleming Institute, St. Mary's Hospital, and at the B.O.A.C. Airways Terminal. In the provinces the doctor can usually find out from the medical officer of health where facilities of this kind are available.

Inoculations against plague and typhus fever are not at present required for travellers abroad.

THE LAW IN RELATION TO THE ILLEGITIMATE CHILD

On February 1 a joint committee* of the British Medical Association and the Magistrates' Association, under the chairmanship of Dr. DORIS ODLUM, issued a report† on the present law governing the custody and maintenance of the illegitimate child. The report has received the unanimous approval of the Council of the British Medical Association, but the Council of the Magistrates' Association, in agreeing to publication, wishes to make it clear that it is not necessarily committed to all the views expressed therein.

After reviewing the legal and historical background of the existing law on bastardy, the committee discusses the rules governing the application to a court for a maintenance order, the limitation of the hearing of such cases to magistrates' courts where the maximum order that can be made is £1 a week, the statutory demand for corroboration of the mother's story, the place of blood tests, the registration of "voluntary agreements," guardianship, adoption, and legitimation, as well as the psychological aspects of illegitimacy and the dangers of poverty in these cases. The committee's recommendations are summarized below.

*The members of the joint committee were:—*For the British Medical Association:* Dr. Doris Odum (chairman), Dr. F. Bodman, Dr. Denis Carroll, Dr. T. P. Rees, and Dr. J. G. Thwaites. *For the Magistrates' Association:* Mrs. E. G. F. Birley, Major Reginald Bullin, Mr. B. L. O. Henriques, Dr. W. S. Macdonald, and the Rt. Hon. Lord Merthyr. *Co-opted:* Dr. H. Mannheim, Dr. J. C. W. Methven, and Mr. Claud Mullins.

†The report is obtainable from the Finance and Business Officer, British Medical Association. The price, including postage, is sixpence.

Recommendations

1. The law concerning the maintenance, custody, and welfare of illegitimate children is in urgent need of revision.
2. A committee of inquiry should be set up by the Government to investigate the present law relating to the maintenance, custody, and welfare of illegitimate children with a view to recommending amendments to the law.
3. Under certain conditions a married woman should be enabled to apply for maintenance in respect of an illegitimate child.
4. The High Court should be given concurrent jurisdiction to hear claims for the maintenance and custody of an illegitimate child.
5. When a magistrates' court hears a bastardy case magistrates of each sex should be members of the court.
6. The legal necessity for the corroboration of the applicant's story should be modified.
7. The ruling in the case of *Johnson v. Pritchard* should be modified so that, subject to challenge, all letters between the parties would be admissible in evidence.
8. The maximum amount that can be ordered by a magistrates' court for the maintenance of an illegitimate child should be increased to that applicable in the case of children born in wedlock.
9. Courts should be enabled to extend the duration of bastardy orders beyond the age of 16 in cases where a child is continuing a course of education or training beyond the age of 16.
10. The words "putative father" should not be used in bastardy orders and simple words with the same meaning should be substituted therefor.
11. The usefulness of blood tests and the procedure concerning the use in paternity cases should be further investigated.
12. Further investigation is desirable into the procedure to be adopted by the courts when a defendant alleges that the mother of an illegitimate child has been promiscuous.
13. It should be possible for a voluntary agreement to maintain an illegitimate child to be registered with a court and thereafter to be enforced or modified as if it were an order of a court.
14. In exceptional cases a court should be able to grant an application made by the father for the custody of an illegitimate child.
15. There should be a provision in the law declaring that Section 4 (2) (a) of the Guardianship of Infants Act, 1925, as amended by the Children Act, 1948, is applicable to illegitimate children.
16. There should be further investigation into the necessity for the provision in the Legitimation Act which precludes the legitimation of a child in a case where one of the parents was married to a third party when the child was born.
17. The present law, whereby proceedings to enforce payment on a bastardy order cannot be taken after the death of the father, should be amended.
18. Marriage should not be regarded as necessarily desirable when the birth of an illegitimate child is probable.
19. Provided there are no good reasons to the contrary, an illegitimate child should remain with the mother.
20. As far as possible, every illegitimate child should be brought up in a home and a family.
21. The emotional needs of children must be considered when arrangements are being made for the adoption of an illegitimate child, or when foster-parents are being chosen.
22. The fact of a child's illegitimacy should either be explained at an age prior to adolescence, when the child can understand the implication, or earlier in response to questions from the child. The child should not be told of its illegitimate birth during adolescence unless the case has first been referred for expert advice.
23. A new name for the illegitimate child is desirable.