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A COMPARISON OF MEASLES VIRUS VACCINES

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The measles vaccines currently in wide use in The Americas, Western Europe and Africa have all been derived from an attenuated variant of measles virus, first produced by Enders and his co-workers in the U.S.A., termed the "Edmonston Strain". Measles vaccines derived from other strains have been developed and widely used in the U.S.S.R. and Japan but as these vaccines have had little application in Africa they will not be further considered.

The original Enders Edmonston B Strain vaccine was the first measles vaccine to be subjected to controlled clinical trials. Early trials in the U.S.A. and Africa confirmed that this attenuated measles virus vaccine was an effective immunising agent but concern soon arose about the frequency with which severe reactions occurred in the vaccinees[1]. In North America where measles is seldom a killing disease, it soon becomes apparent that both the medical profession and the general public were reluctant to accept a vaccination procedure with a predictably high frequency of severe febrile reactions.

In Africa and other developing areas of the world where measles is a major killer in childhood, the vaccine was more readily acceptable but some workers expressed grave reservations about the desirability of using a highly reactinogenic vaccine in communities where untoward reactions in malnourished children exposed to a host of endemic diseases might cause serious morbidity and possibly some mortality[2].

Notwithstanding these reservations, the attenuated Enders vaccine was increasingly widely used, and as early as 1962, some 730,000 children in Upper Volta were subjected to a mass vaccination program with the original Enders type vaccine[1].

Efforts were meanwhile being directed at modifying the vaccine, or the vaccination procedure, so as to reduce the severity of reactions while retaining its antigenic properties. Three approaches were adopted. (a) Attempts were made to produce a live, further attenuated vaccine of low reactinogenicity and high antigenity, (b) The use of killed measles virus vaccine was explored, and (c) simultaneous measles vaccination and gamma globulin administration was tried.

The last mentioned procedure was soon shown to be a very satisfactory method for measles immunisation. Reactions to the vaccination procedure were in general very much milder than with the Enders vaccine alone and antibody responses were entirely satisfactory.

The use of this method of vaccination on a wide scale in developing countries was however precluded because of limited supplies of gamma globulin, high costs, and logistical problems related to the administration of gamma globulin in correct dosage simultaneously with measles vaccine[3].

The use of killed measles vaccine was explored and found to be unsuitable for the following reasons:

(a) A minimum of two doses of killed vaccine are required to provoke detectable antibodies and even after 3 doses antibody levels are poorly maintained and vaccinees become susceptable to measles within a year or two.

(b) Subjects who receive killed vaccine are prone to develop a hypersensitivity type reaction to subsequent live measles vaccination or natural measles [4].

In view of these considerations, the use of killed measles vaccine has been abandoned and the subject is now only of historical interest.

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Further Attenuated Measles Vaccines

In the early 1960's intensive efforts were directed at producing further attenuated measles vaccines. Clinical trials were undertaken in a number of countries on new further attenuated measles vaccines as they became available, and countries in Africa, including Nigeria, made significant contributions to the development of further attenuated measles vaccines[3,5,6,7]. The first further attenuated measles vaccine to become widely available was the Schwartz vaccine, derived from the original Enders Edmonston A Strain, which was produced in the U.S.A. This was followed by the Beckenham 31 vaccine, produced in the U.K., which was derived from the original Enders Edmonston B strain[1]. Both these vaccines were subjected to extensive field trials in a number of countries and their properties compared with those of the attenuated Enders vaccine. Results of all trials confirmed the following points.

(a) The further attenuated Schwartz and Beckenham 31 vaccines cause significantly fewer severe febrile responses (103 F. or more), measles like rashes and general illness than the attenuated measles vaccines.

(b) The further attenuated vaccines give reaction rates similar to those recorded when the attenuated Enders B vaccine is given with gamma globulin.

(c) The serological conversion rates with the further attenuated vaccines are entirely similar to those achieved with the Attenuated Measles Vaccines and there is substantial evidence to show that protective antibodies persist for at least 7 years and may possibly persist for life.

Direct comparison of Schwartz and Beckenham 31 further attenuated measles vaccines has been undertaken in several countries including Nigeria, Iran and Hong Kong. These studies indicate that the two vaccines are very similar in their general behaviour. Such slight differences that have emerged from these studies suggest that the Beckenham 31 vaccine is slightly more reactinogenic and antigenic than the Schwartz vaccine.

Conclusions.

The further attenuated measles vaccines have been shown to be effective immunizing agents capable of affording long, possibly permanent, immunity against measles; the level of protection they afford is entirely similar to that afforded by the original Enders attenuated vaccine while the clinical response to vaccination is significantly milder. In the light of these facts, there can be no reasonable justification for the continued use of the attenuated Enders type measles vaccine, especially in situations where the child population is exposed to the ravages of malnutrition and serious endemic infections which might predispose them to serious untoward effects of measles vaccination.

References

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