# RECENT CONCEPTS IN VACCINATION IN INFANCY AND CHILDHOOD

ESSAY

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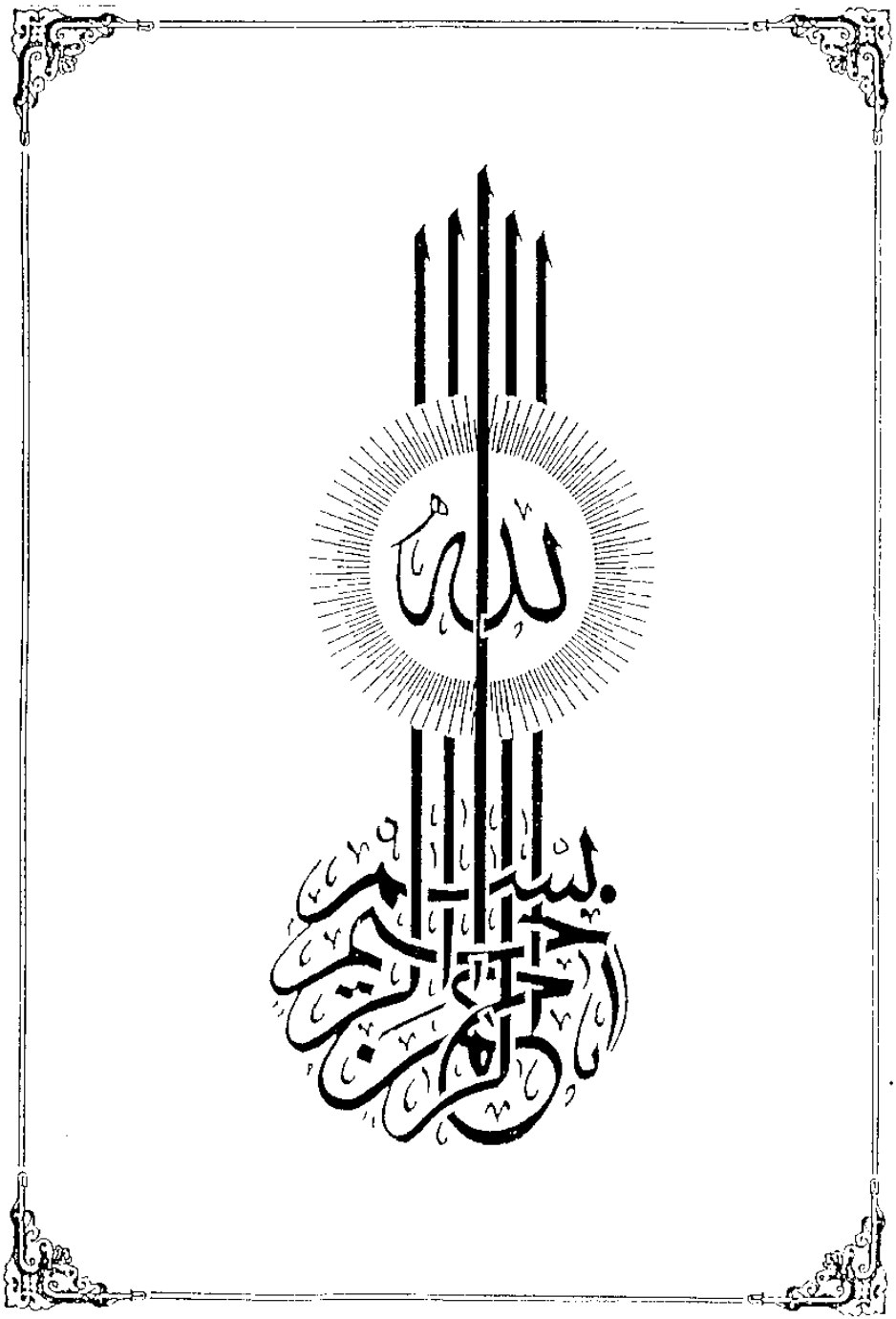

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# INTRODUCTION

# I N T R O D U C T I O N

Vaccination is the procedure of giving an individual an antigen derived from, or similar to, a pathogenic organism in order to induce specific, active protection against the disease caused by that organism . A successful vaccination programme not protects individuals, but if a critical number of people are immunized, it reduces transmission of infection in a community .

The current WHO expanded programme of immunization [ EPI] recognizes that each year, in the whole world, about five million children die and a further ten million are seriously disabled by diseases which are preventable by vaccination . [ Mitchell R.G., 1984].

Recently many new vaccines and vaccination programmes have been developed like hepatitis B, meningococcal, pneumococcal, malaria, Schistosomiasis and many other vaccines. In addition, there are a number of vaccines under development which may have

an important influence on child morbidity., and mortality in the future. These include vaccines against haemophilus influenza, respiratory syncitial virus, varicella - zoster virus, cytomegalovirus, rota virus and many others. [Ellis and Gully, 1984]

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## AIM OF THE ESSAY

The aim of this essay is to review the literature about all new vaccines, immunization programms used in infancy and childhood, and to throw a spot light on those vaccines that will develop in the future, stressing on their indications, schedule of vaccination, benifits and complications.

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# REVIEW OF LITERATURE

## MANUFACTURE OF VACCINES

Vaccines are some of the most successful and cost-effective scientific accomplishments. The future, However, has the potential for production of vaccines over an extraordinary range. Recent advances in biotechnology have brought exciting prospects for the development of new vaccines and improvement of existing ones. There is now hope for extending the concept of vaccination from viruses and bacteria to parasites and even to non-infectious diseases. [Hinman et al., 1985].

The earliest vaccines were live wild-type organisms. Although these have been mostly replaced by attenuated or killed organisms, some are still in use. Attenuation is achieved by growing the pathogens in an unnatural host. For inactivation, the pathogens are either subjected to autoclaving or fixed by agents such as methanol. Killed vaccines may present problems in that there is always the chance that some infectious pathogens may survive the inactivation process. These risks of virulence and contaminants can be reduced by the use of subunit vaccines which attempt to enrich the active components by conventional

biochemical purification. These conventional vaccines still contain contaminating materials far exceeding the immunologically active ingredients. [Liew, 1985].

Two methods in vaccine manufacture are involved :

-Chemical Synthesis of antigens

-Forcing harmless bacteria or yeasts to make antigens through genetic engineering. This technique depends upon transplantation of a gene for a particular protien into a fast-growing organism such as E-coli, candida albicans or vaccinia virus which then produces the desired protein at a rapid rate. Thus the DNA coding for the antigen can be engineered into a living microbe which could actually grow inside the host. [Hinman et al., 1985]. Panicali and Paoletti in 1982 have found that vaccinia virus is suitable as a carrier for several antigens. Vaccinia vius is unique in that it retains infectivity after accomodating at least 25,000 base pairs of foreign DNA which is equivalent to about 20 average genes. However, despite successes in the laboratory, the use of vaccinia virus as a carrier for human vaccines is extremely controversial. Vaccinia itself can produce complications with adverse reactions accuring at a frequency of one case per 1,000 [Behbehani, 1983]. For this reason alternative virus carriers are being explored, such as attenuated salmonella

strains [Winther and Dougan, 1985].

The basis for synthetic peptide vaccines was laid by Anderer [1963] who showed that short fragments of the protein from tobacco mosaic virus could inhibit the precipitation of the virus by antisera, and that a hexapeptide from the fragment, when coupled to bovine serum albumin, induced specific virus precipitating and neutralizing antibodies.

Further work by Arnon et al in 1971, extended this concept to show that chemically synthesized peptides could also induce antibodies that recognize the intact virus particle from whose coat-protein the amino acid sequence was derived. [Liew, 1985].

The first step in developing a synthetic peptide vaccine is to identify the relevant antigen and determine its amino acid sequence, the next step is to identify the antigenic determinants. So far, no synthetic peptide vaccine has yet reached the stage of clinical trial or veterinary use. The most promising candidate at the moment is perhaps the synthetic vaccine for foot-and-mouth disease virus. [FMDV] [Bittle et al., 1982].

Another novel approach to vaccination is the use of anti-idiotypic antibodies to specifically stimulate the

immune response in such a way that the anti-idiotype antibodies serve as surrogate antigens. [Liew., 1985] .

An idiotype-the site where an antigen binds to an antibody-can itself act as an antigen to stimulate antibody production. Antibodies that are stimulated by idiotypes are called anti-idiotype antibodies. [Simmons, 1986]. According to Davie [1986], anti-idiotype vaccines represent an important advance when the antigen that might be useful in stimulating idiotype is either difficult to obtain or toxic or even non-immunogenic when pure.

Another approach would be to use anti-idiotype antibodies to activate cell-mediated-immunity [Yanagi et al., 1984]. It thus appears that the anti-idiotypic approach represents an exciting new strategy for future vaccination.

In spite of past successes and rapid modern technological advances, the number of vaccine producers in the world has declined sharply in the past two decades. The reason for such a state of affairs has been recently reviewed. The main reason is that vaccines in general are not profitable, another reason is that vaccine development is a very expensive and uncertain buisiness. [Liew, 1985].

## NEW VACCINES AND VACCINESS UNDER DEVELOPMENT

These can be classified as bacterial vaccines, viral vaccines, parasitic vaccines, and Mycoplasmal vaccines.

I. BATERIAL VACCINES : include :

1. Meningococcal vaccines.
2. Preumococcal vaccine.
3. E-coli vaccine.
4. Dental caries vaccine.
5. Haemophilus infleunzae vaccine.

II. VIRAL VACCINES : include :

1. Hepatitis-B vaccine.
2. Hepatitis-A vaccine.
3. Varicella-Zoster vaccine.
4. Herpes-Simplex vaccine.
5. Cytomegalovirus vaccine.
6. Respiratory syncitial virus vaccine.
7. Rotavirus vaccine.
8. Ebstein-Barr virus vaccine.

III. PARASITIC VACCINES : include :

1. Schistosomiasis vaccine.
2. Malaria vaccine.

IV. MYCOPLSMAL VACCINES :

- Mycoplasma preumomiae vaccine.

# NEW BACTERIAL VACCINES