An Essay

On

Modern Trends of Active and Passive Immunization in prevention of Infectious Diseases.

SUBMITTED FOR PARTIAL FULFILLMENT

OF THE DEGREE OF (M.S.) IN

(PEDIATRICS)

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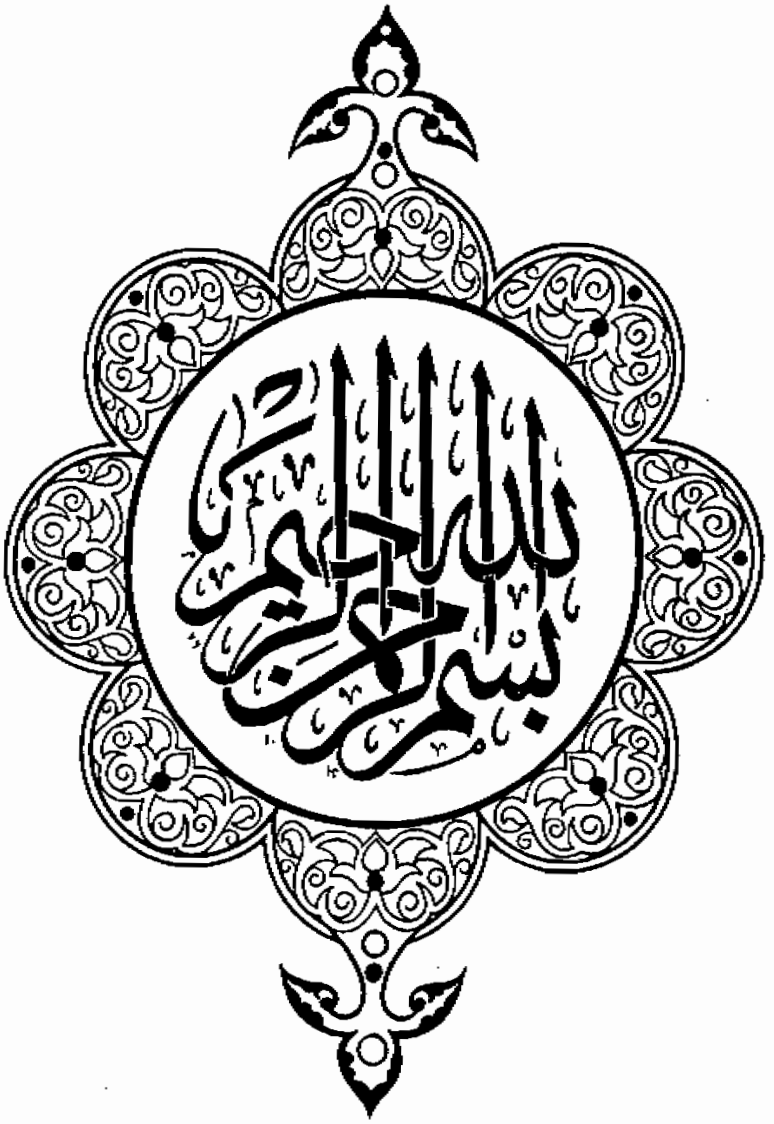
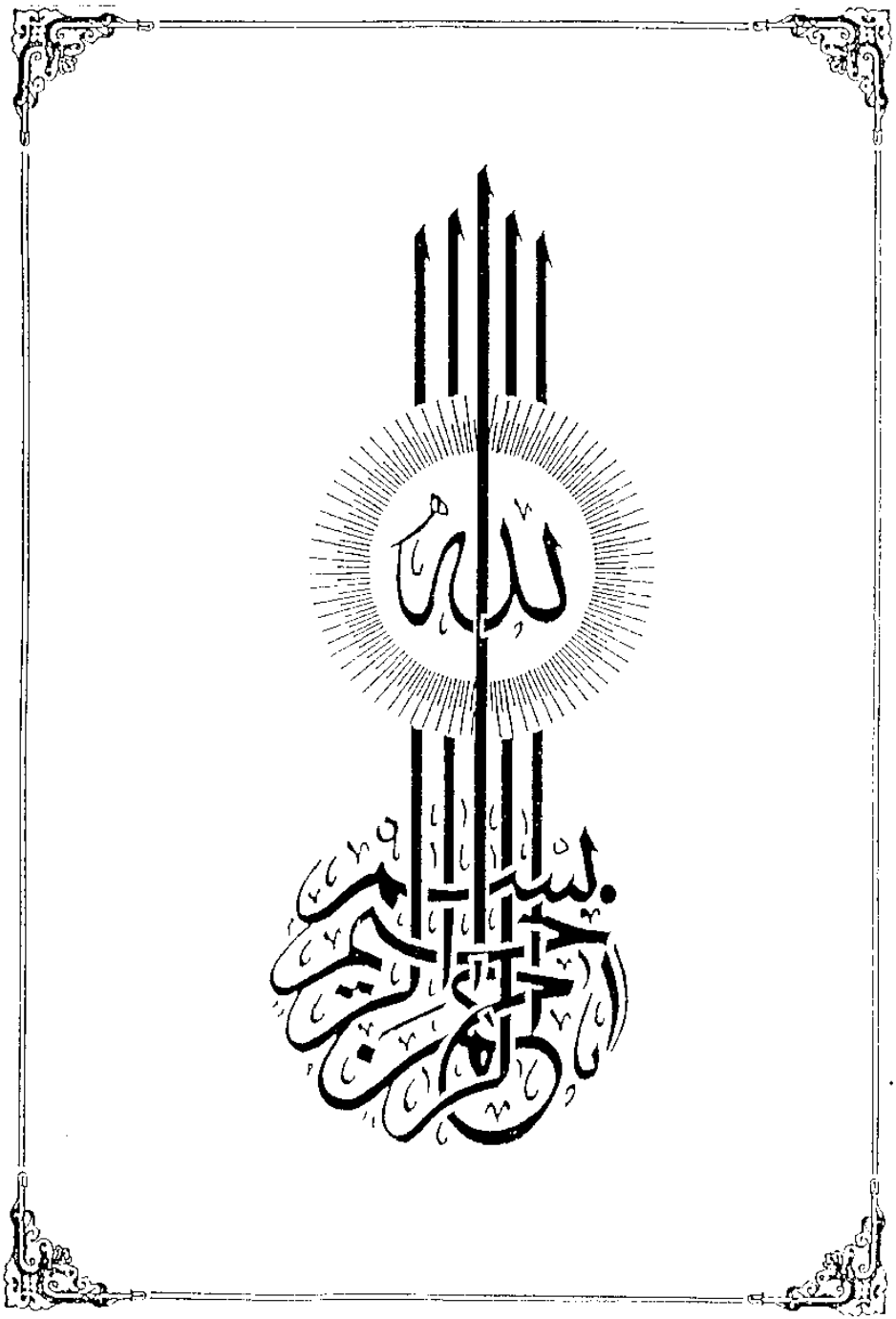
1984





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I- INTRODUCTION & AIM OF WORK

The prevention of infectious diseases by immunization is one of the outstanding accomplishments of medical science. Millions of children enjoy better health because of safe and effective immunization.

Through immunization, morbidity and mortality secondary to the contagious diseases have either been eleminated or greatly diminshed. Small pox has been eradicated, measles greatly reduced in occurance and other diseases significantly lessened in terms of their impact.

However, it must be admitted that many factors as improvement in sanitation, food processing and nutrition, and the development of antibiotics have contributed to the progressive decline in threatening infections, and to prolongation of life.

Yet, significant numbers of children still do not receive the recommended immunization and therefore,large segments of the population remain susceptible to infectious diseases.

Not all countries are in the same circumstances in the fight against communicable diseases. Countries with a low economical and medicosocial status are obliged to

meet the most urgent need by practicing mass vaccinations, while in medically advanced countries this requires simple methods of individual prophylaxis.

It is chiefly children, who must be immunized as soon as they have lost any maternal protection and hence the need for a vaccination calender,varying from country to country and growing rapidly as new active immunizations are discovered.

To achieve effective immunization, science, technology, and medical practice had to combine efforts in order to understand the biology of infectious agents and to learn to purify them, to develop and to test vaccines, to manufacture clinically useful products that are active, safe, effective, stable, free of contamination and to distribute the vaccines to appropriate segments of the population and lastly, to administer them to the subjects at the right age and in the correct fashion.

In this study, we attempt to review the modern trends in active and passive immunization, for prevention of infectious diseases.

Introduction & Aim of Work

II- HISTORICAL REVIEW

Long before the concept of contagious diseases was accepted, measures to prevent spread of disease were practiced by quarantine and by trying early methods of prophylaxis. The latter were based on the observation that individuals who recover from certain diseases become resistant to second attacks i.e become immune to these diseases. The term immune derives from the latin word "immunus" i.e exempt from charges (Taxes, expences). Attempts to protect against variola (small pox) were made in ancient China and Western Asia by inoculation (variolation), using vesicle fluid from persons with mild form of small pox.

Lady Mary Montagu (1725), wife of the British ambassador, introduced this process of variolation into England from Turkey.

The method spread to Europe and to America. However, it was quite dangerous, since disease and death frequently resulted. This stimulated the research for an alternative procedure. The fact that individuals who contracted cow pox, a naturally occuring disease of cows, seldom developed small pox, had been recognised early in England.

In 1774 a Dorestshire farmer, Benjamin Jesty, infected his wife and two children with cow pox matter and they remained free from small pox, but it was Edward Jenner (1747-1823), a general practitioner in Berkely, Gloucestshire, who recognised the significance of the cross protection between cow pox and small pox.

Jenner regarded cowpox as small pox of the cow, hence the term variolae vaccine (from the latin vacca, a cow and latin derivative vaccinus, hence vaccinate). Jenner's introduction of vaccination with cow pox (1796) to protect against small pox was the first documented use of a live spontaniusly attenuated viral vaccine. Jenner introduced the term (vaccine) and also "virus" of small pox, in the sense of a noxious poison of unknown cause, some 100 years before micro organisms, bacteria, and viruses had been identified. Never the less, it proved to be a most applicable term.

It was the practice at that time to variolate those vaccinated to see if they have become immune in modern terms. This would be called a challenge inoculation. After that, the work of Louis Pasteur (1822-1892) and Robert Koch (1843-1911) clearly established the microbial theory of infectious diseases.

Kock demonstrated the specific bacterial cause of anthrax in 1876 and the oetiologic agents of several common illnesses were rapidaly identified thereafter. Attempts to develop effective immunizing agents followed through the research of Pasteur.

Jenner's vaccinal lymph (1798), is a spontaneously attenuated living vaccine, but the first artificially attenuated living vaccine, was that of foul cholera developed by Pasteur, Chamberland and Roux, eighty years later. In 1880 i.e about a century ago, Pasteur presented to the Academy of science in France, the results of his expiriements to prepare anthrax vaccine, in the following terms: "We now posses anthrax vaccine strains which can provide protection from the fatal disease, without ever being lethal themseleves, which can be cultured at will, transported everywhere , without deterioration and, finally which can be prapared by a method that might be thought likely to pass into general use, since it has already prooved its worth in the preperation of a vaccine against foul cholera.

In view of the nature of these conditions and considering everthing from the scientific angle alone, the discovery of anthrax vaccine is a great advance over Jenner's

Further studies discovered that both diseases could be prevented in animals by prior injection of antitoxin. Passive immunization against diphtheria was achieved in 1894, but early attempts at active immunization with toxin antitoxin mixtures were discontinued on grounds of safety.

In 1924 Roman in Paris and Glenny and Sudmersen in England, showed that diphtheria toxin could be rendered atoxic, by treatment with formaldhyde, giving the so called anatoxin or toxoid and the anatoxin of diphtheria and of tetanus were found to be highly effective for active immunization against these diseases. That same year, BCG vaccine against tuberculosis was developed, but its adaptaion in current practice has been very slow.

In the field of virus vaccination, on the other hand, the progress had been slower.

Pasteur postulated that rabies was due to a microbe, so small that it could not be seen under the ordinary microscope.

It was in the first decade of the twentieth century that the viral aetiology of poliomyelitis, measles and yellow fever was established by expirements on human volunteers, tissue culture and other techniques.

The real break through in virology came in 1949 following the discovery of Ender's et al; (1949), that poliovirus could be grown in human tissue-cell cultures. This discovery completely revolutionised virological procedures and within 15 years, lead to the development of vaccines against poliomyelitis, measles, rubella and mumps.

The first mixed vaccination was given in 1936, associated tripple vaccine against salmonella, typhoso, paratyphi A & B with diphtheria and tetanus antitoxins. (DT - TAB). Now the commonly used combined vaccines are those of DPT (Diphtheria, pertussis, tetanus) and MMR (measles, mumps, rubella).

Table (1) gives a chronology of important achievements in vaccinations and Table (2) gives the choronology of important achivements in immunology.

Table (1): Choronology of Important Achievements In Immunology.

1	1796	Cow pox vaccination	Edward Jenner
2	1880	Attenuated vaccines	Louis Pasteur
3	1883	Phagocytosis-cellular defence theory	Elie matchnkoff
4	1888	Bacterial Toxins	Rerre Roux & J. Yersin
5	1890	Antitoxins, foundation of serotherany.	Von Behring.
6	1894	Immunologic lysis of microbes bacteriolysis.	Pfieffer & Vosily
7	1894	Complement & antibody activity in bacteriolysis.	Jules Bordet
8	1896	Specific agglutination	Herbert Durham & Von graber.
9	1896	Widal test for dignosis of typhoid.	Georges Vidal & Authursicard
10	1900	ABO blood group	Karl Landsteiner
11	1900	Complement fixation reaction.	Bordet J. & Gengon O.
12	1902	Anaphylaxis.	Charles Richet & Paul Portier.
13	1903	Specific Necrotic Lesion Arthus phenomena.	Nicholes Arthus.
14	1903	Opsonisation Reaction.	Almorth Wright & Stewart Douglas.
15	1905	Serum Sickness.	Von Pirquet & Bela Schick.
16	1906	Term allergic was induced by	Von Pirquet.
17	1921	BCG vaccine developed at beging of 1906 used exp-ermintally on new born from 1921-1924.	Albert Calmette & Camille Guerin.

After : "Basic & Clinical Immunology, ediated by Fundenberg H.H. etal;1976

Table (1) (Cont.)

18	1923	Diphtheria toxin modified with formaldhyde to produce antitoxin (toxoid).	Gaston Ramor.
19	1928	Nectotic reactions. Schwartzman phenomena.	Gregory Schwartzman.
20	1930	Template theory of antibody formation.	Jredrick & Haurowitz.
21	1935-1936	Pure antibodies,quantitive pre-ceptin reactions.	Hadelberger & Kendall.
22	1938	Demonstn that antibodies are globulins.	Wilhelm & Kabat.
23	1942	Theoresein labelling Immuno fluorescent.	Albert Cwns & others.
24	1942	Immunelogic unresponsiveness.	Lloyd Jelton.
25	1944	Theory of acquired immunologic tolerance.	Medawar & Macfarlane.
26	1945	Antiglobulin test for incomplete RH antibodies.	Coomb's et al.
27	1948	Antibody formed in plasma cells.	Astrid Fayroeus
28	1948-1949	Structure of ABO group antigens.	Kabat, Morgan & others.
29	1952	Histamine in mast cells.	Games Rirely & Geoffsywest.
30	1952	A gammaglobulinemia described in human.	Ogdoncarr Bruton.
31	1953	Immuno electrophorotic analysis.	Pierrer Grabar & Cwillims.
32	1955-1957	Clonal selection theory, discovery of human immunodeficiencies.	Neils Jerne & Frank-Macferfaue
33	1956	Introduction of autoimmunity in animals.	Ernest Witebsky & Neol Kose.
34	1957	Macroglobulines with antibody activity e.g cold agglutinin rheumatoid factor.	
35	1959	Structure & formation of antibody molecules.	Porler, Edelman & Nisonoff.