VACCINE FAILURE
PROBABLE CAUSE

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Of late there are reports on polio cases in Tamil Nadu, but there are no authentic reports on whether these cases were in immunized or non-immunized children. For every new born, a schedule of vaccination is given has to be followed to prevent against certain diseases. In spite of scrupulously following the schedule, there are reports of vaccine failure and children get the disease. Why does it happen? Is it the failure of vaccine to protect? Is it due to manufacturing defect? Is it the failure of the immune mechanism of the body to react? Is it due to the human error at the time of administration? There are several questions yet to be answered; but the fact is that children are bearing the brunt of faults of unknown cause.

The human body has an inherent capacity to protect itself against infection by its immune system. But vaccines are manufactured to prevent certain specific diseases. The vaccines can work against diseases caused by both bacteria and viruses. The pathogenic virulent [disease causing] viruses which are causative agents are made avirulent (non-infectious) by attenuation process in laboratories. The laboratories make the virus lose their potency and prepare the vaccine, which is innocuous but capable of protecting the body against that specific viral infection.

The major factor, which has not drawn the attention of both laymen and scientists is the internal milieu in the newborn, which has to recognise the antigen [from vaccine] and then react to produce the antibody. The immune system developing in the prenatal stage as primary lymphoid organ and is the main source for protection and production antibody against antigen [from vaccine]

A detailed study of development of the primary lymphoid organ and developmental defects may throw some light on one aspect of vaccine failure.

There are several causes for the failure of oral vaccines. The most important one is the development of immune system of the recipient. For the oral vaccines to

produce the expected immune response, the fetal immune machinery has to be properly developed. Fetus, which was once thought to be immunologically inert, develops primary lymphoid organ, called Peyer's Patches (PP) in the gut, which is the first organ to encounter antigenic stimuli. The mechanism of antigen binding is crucial for conferring immunity or failure, the latter is immuno deficiency syndrome.

To recognise the cause of failure, due to the failure of gut associated lymphoid tissue (GALT), knowledge of development and cyto-architectural pattern of GALT, distributed in the ileum as PP, is mandatory.

The terminal part of small intestine called ileum has aggregation of lymphoid nodules (ALN) forming PP in the antimesenteric wall. The mucous membrane is characterised by the dome and non-dome areas. Non-dome areas are surface projections called villi with tall columnar cells with microvilli and mucus secreting goblet cells. In between the villi are domes. Domes are extension of submucosal lymphoid nodules projecting into the mucosa Domes are lined by short cuboidal cells called 'M' cells with intraepithelial lymphocytes. Absence of goblet cells is notable feature of dome epithelium.

PP are aggregates lymphoid tissue, forming nodules (ALN) in the submucosa. ALN has three main components – germinal centres (of PPs) referred to as Bcell region, inter nodular areas, known as Tcell region, associated with immuno competent B Cells. The ability of local immune response esp. in case of oral vaccine depends on the proper development of PPs, which commences in the prenatal stage.

In the II trimester of pregnancy, lymphopoises commences. Increased activity of lymphopoietic cell forms aggregated lymphoid nodules, occupying submucosa. Development of dome is an extension of ALN into the mucous membrane. Domes are characterised by short cuboidal epithelial lining called follicle-associated epithelium (FAE) of M cells and infiltration of lymphocytes as seen in postnatal life. In fetus, cuboidal M cells are distinguished by hyperchromatic cytoplasm as against vacuolated cytoplasm of columnar cells of villi with H&E staining. The dome with FAE, M Cells, IEL, goblet cells in the villi, and PP in the submucosa form the primary lymphoid organ called Gut Associated Lymphoid Tissue (GALT), in the fetus and are totally responsible for recognition of antigen, conferring immunity. Certain cytoarchitectural abnormalities, even in developmental stages could form the cause of vaccine failures. Structural abnormalities such as flat mucosa (absence of villi), stunted villi, fewer villi leads to deficiency of IgA secretion, and the absence of goblet cells render the epithelium defenseless. The concomitant deficiency of lymphopoiesis may result in reduction of plasma cells, essential for secretion of antibody, resulting in immuno-deficiency. For the immune response, there must be coordination between "B" lymphocytes, macrophages, T lymphocytes, lymphatics, secretory columnar cells and goblet cells.

Apart from developmental defects, inflammatory changes such as hyperplasia, nodular hyperplasia, stratification of PPs, lymphocytic infiltration of lamina propria may be present, indicative of intrauterine infection in apparently healthy children.

Oral vaccine evokes a local immune response in the GALT stimulating antibody production. The abnormalities in development might lead to immuno incompetence of neonates. With the abnormal internal milieu prevailing in GALT, the defects detailed may not show any clinical symptoms and children are apparently normal with enteropathy.

My suggestion is that mass vaccination which happens without checking the child's health should be banned.

Some decades back, vaccines were administered only to the apparently healthy children. Even if the child had common cold, parents were advised to bring the children later. The reason is that any infection is likely to interfere with the specific antibody production against the vaccine; but nowadays, mass vaccination is done irrespective of health condition of the children.

Oral vaccine, when administered in sick children {with any infection} reaches the lymphoid organ in the gut, which does not provide a conducive atmosphere for the production of antibody due to any one of the causes listed earlier. The attenuated virus in the vaccine may mutate to become virulent resulting in polio or the failure of vaccine to produce antibody in the abnormal environment may make the child prone to acquire the disease at a later stage.

To ensure that vaccination is done, every child at preschool stage should have a certificate from health officer in vaccination centre {corporation, Municipality} which has to be produced in school for admission.