# IMMUNITY TO MUMPS IN CHILDREN AND YOUNG ADULTS IN EGYPT

THESIS

Submitted for Partial Fulfillment of

The Master Degree in Basic Medical

Science (Bacteriology)

By

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M.B., B. Ch.



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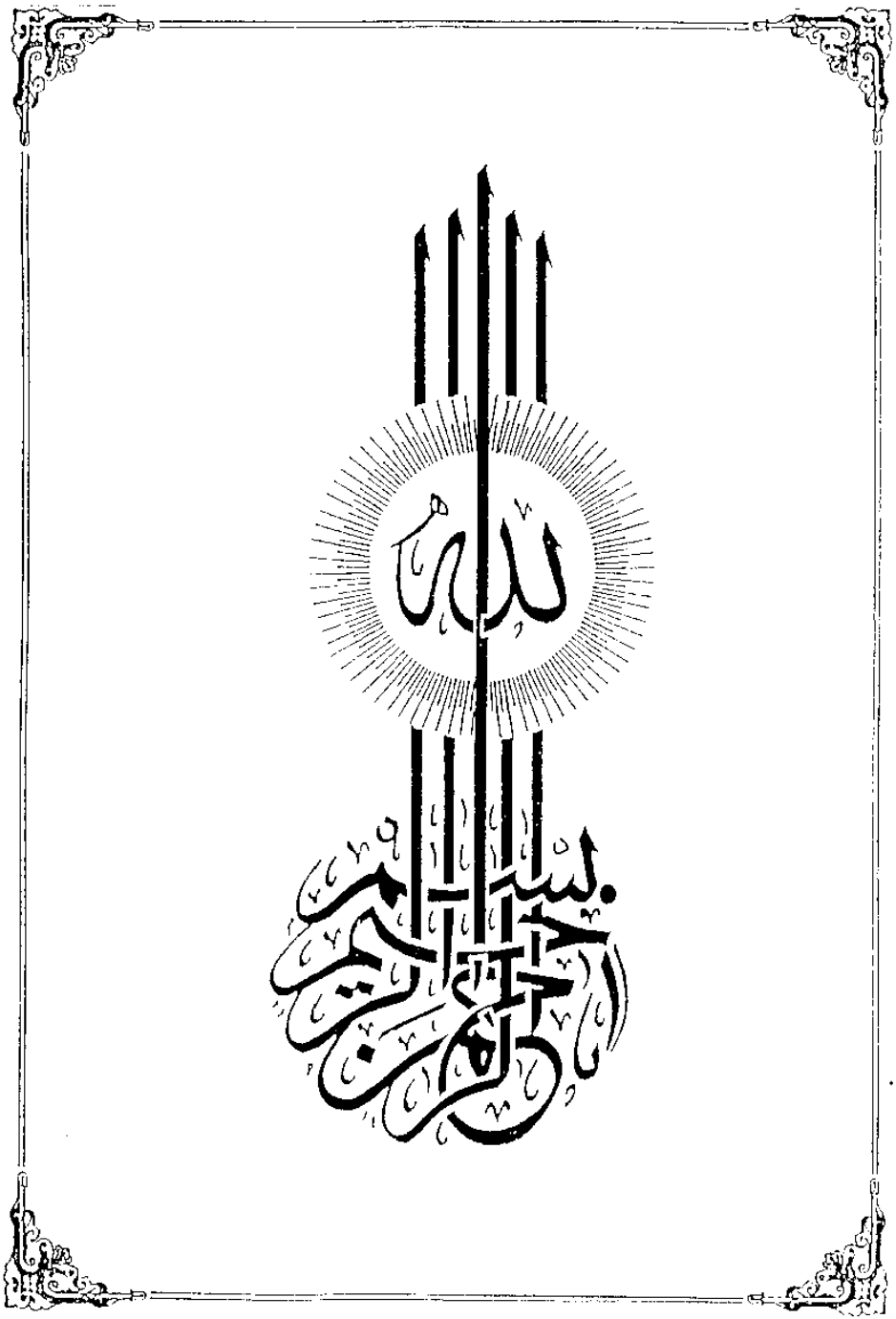

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# I INTRODUCTION

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Mumps is one of the 4 common childhood diseases. It is an acute viral disease endemic in most urban populations. Mumps is more frequent in children and is usually mild with few complications. However, it affects also young adults when they are not immune, and they develop a severe form of the disease with more tendency towards complications. Lifelong immunity usually follows clinical or subclinical infections.

Immunization with attenuated mumps vaccine is the best approach for reducing mumps-associated morbidity and mortality (Hilleman et al., 1968).

Routine mumps vaccination is not compulsory in Egypt, but routine vaccination in childhood is recommended by the Committee of Infectious Diseases of the American Academy of Pediatrics for children over the age of one year, and since 1989 a second dose of the vaccine has been recommended in USA (American Academy of Pediatrics, 1989).

# II AIM OF THE WORK

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The aim of this study is to explore the immune status of children, adolescents, and young adults in Egypt against mumps, to show the importance of mumps vaccine and the need for compulsory vaccination.

# III REVIEW OF LITERATURE

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## HISTORY

The word "mumps" probably derives from the British verb "to grin or grimace". Thus the name of the disease likely refers to the marked parotid swelling which is the most common physical manifestation of infection with this virus. In fact, until modern virologic methods showed that mumps virus could cause illness without parotitis, and that other viruses could cause parotitis, mumps virus infection was known as "epidemic parotitis" (Toplin and Schauf,1984).

In the fifth century B.C., Hippocrates described a mild epidemic illness characterized by nonsuppurative swellings near the ears and sometimes accompanied by painful swelling of one or both testes. Hamilton, a physician of the late eighteenth century, is credited as being the first to associate CNS involvement with mumps.

A number of investigations, dated back to 1908, implicated a variety of organisms in the etiology of mumps. Several of these suggested poorly reproducible evidence for a filterable agent. In 1934 Johnson and Goodpasture demonstrated that mumps was the result of a viral infection. They showed that the filtered parotid secretion from four of six patients with mumps could induce parotid swelling when injected into the orifices of the ducts of Stensen of rhesus monkeys. Subsequent serial transmission studied in monkeys delineated

some of the physical properties of the virus, and incomplete neutralization of infectivity with human convalescent sera was demonstrated. (Wolinsky and Waxham, 1990).

Johnson and Goodpasture went to fulfill Koch's postulates in a remarkable series of experiments. Johnson enlisted the cooperation of his neighbors, whose children received an experimental inoculum of mumps virus prepared from a filtrate of infected monkey parotid tissue. Virus was administered by nasal spray. None of four children with a past history of mumps developed symptoms of infection, whereas six of 13 children presumed to be susceptible developed definite parotid swelling. Three of the later developed swelling within the now accepted incubation period of about 18 days (Wolinsky and Waxham, 1990).

The mumps virus was subsequently propagated in embryonated chicken eggs. This development allowed the production of mumps antigen for use in both serologic complement fixation test and a skin test for delayed hypersensitivity to mumps ( Tolpin and Schauf, 1984).

# MUMPS VIRUS

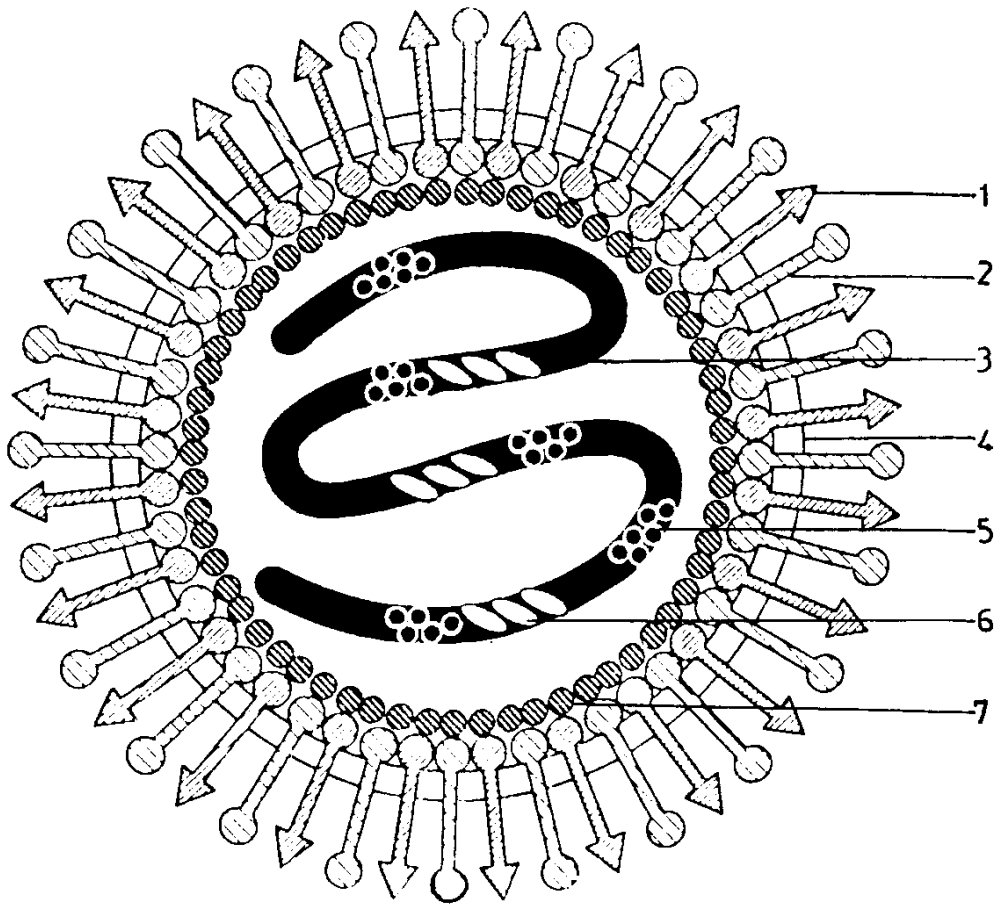
## Classification:

Mumps virus was originally classified with the influenza viruses in the myxovirus family based on its ability to agglutinate red blood cells and other chemical and morphologic criteria (Andrews et al., 1955). Mumps virus is now classified as a member of the genus *Paramyxovirus* in the family Paramyxoviridae. It is therefore related to parainfluenza, measles, and Newcastle disease viruses.

## Morphology:

Mumps virions are markedly pleomorphic with particle size ranging from 100-600nm. (Fig 1). Typical virion are spherical and usually have an outer membrane that encases the inner helical nucleocapsid which includes a single stranded, nonsegmented ribonucleic acid (RNA) genome complementary in base sequence to the positive sense viral messenger RNA. This inner nucleocapsid (which is a ribonucleoprotein complex) appears as a hollow tube with a unit length of approximately 1μm, a diameter of 17nm, and a central core of 5nm. The outer membrane is studded with projections that extend 12-15nm from the virion surface (Horne et al., 1960; Hoska and Shimizu, 1968). Although the majority of mumps virions are spherical, filamentous and bizarre forms are common. Also variation in the alignment and configuration of the nucleocapsid structure in the mumps virions has also been observed, suggesting a change in the integrity of the viral envelop (Wolinsky et al., 1976).

**Figure (1) : Typical Paramyxovirus Particle.**




(1) Hemagglutinin-neuraminidase glycoprotein (HN).

(2) Fusion glycoprotein (F).

(3) Nucleocapsid: single stranded non-segmented RNA, complexed with nucleocapsid protein (NP).

(4) Lipid bilayer of viral envelop.

(5) Polymerase (P).

(6) Large protein (L).

(7) Matrix protein (M).

(Brooks et al., 1991).