Role of Zinc in Lepromatous Leprosy

Thesis

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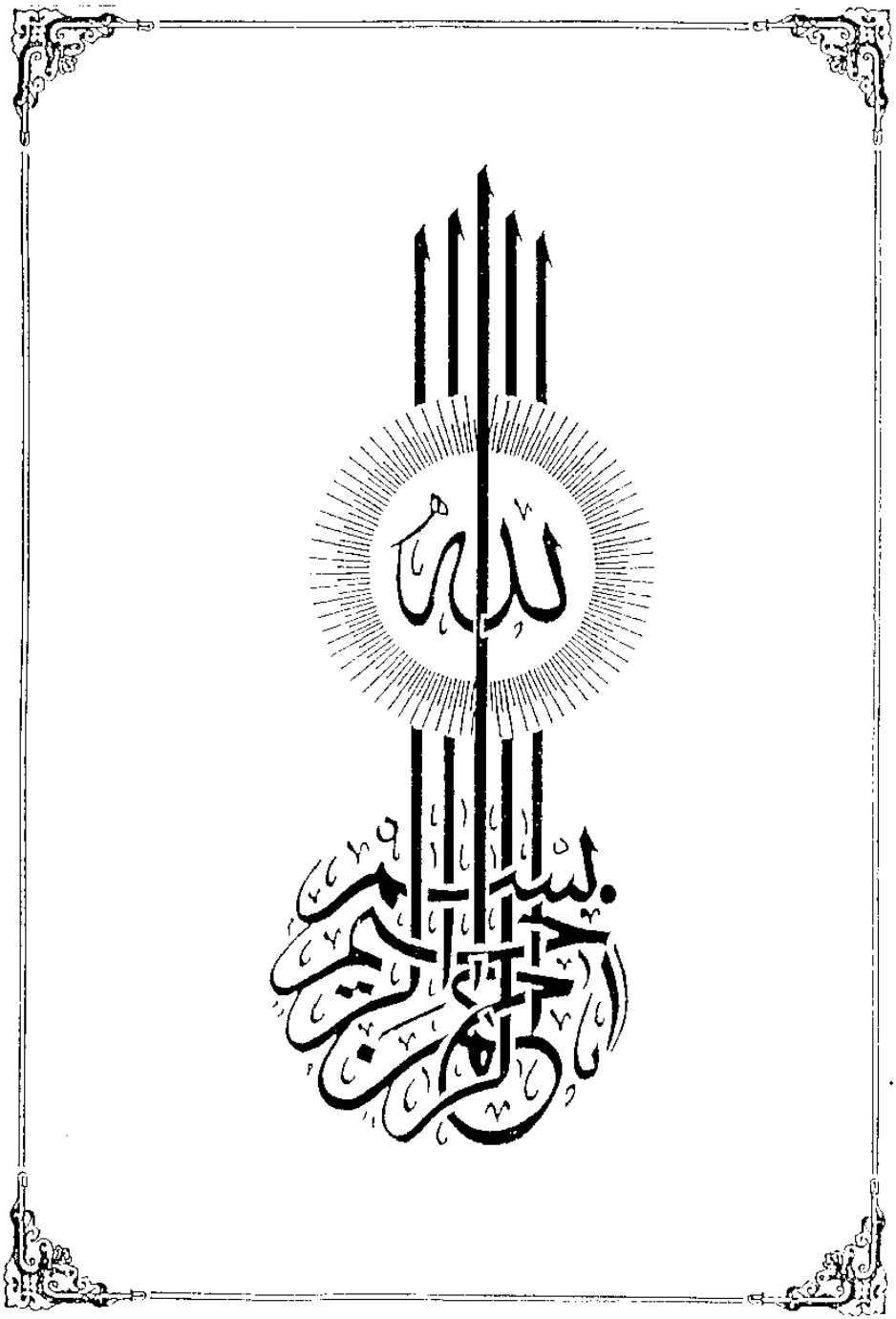

Contents

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Zinc deficient animal are known to be susceptable to infection.

A reduced resistance to infection is seen in severely deficient calves with lethal organisms. Zinc supplementation could normalize the reduced resistance to infections.

In previous study HBsAg carrier rate in lepromatous patients was high **(El-Shafei, et al., 1985).** This was explained to be due to impaired immune mechanism necessary for elimination of HBs Ag mainly in patients with lepromatous leprosy. This was due to impairement of cell mediated immunity rather than a defect in humoral response as these patients are able to form antibody **(El-Shafei, et al., 1985).**

Recent evidence suggest that thymus dependent lymphocyte (T cells) are zinc dependent also T-helper cells **(Fraker et al., 1977).** T-effector cell and natural killer cells appear to be also zinc dependent **(Fernandes et al., 1979).**

Thus it appears that zinc may have an important role in immunity **(Golden, 1977).**

The aim of the present work is to:

1- Study the zinc status in lepromatous leprosy in relation to immune response mainly cell mediated immunity.

2- The effect of zinc supplementation on the degree of immune response.

Review of Literature

LEPROSY

Definition:

Leprosy is a chronic infectious disease caused by mycobacterium leprae, which evokes a localized or wide spread granulomatous disease that can be either self- limiting or progressive depending on the immunological status of the infected host. Its course can be interrupted by acute immunologic responses by the host to dead M. leprae and the organs affected are primarily the superficial peripheral nerves, skin, mucous membrane of the upper respiratory tract, anterior chamber of the eyes and testes i.e. all cooler parts of the body (Binford, 1982).

Geographical Distribution:

Leprosy probably affects 12-15 million people throughout the World. But is most common in the tropics and subtropics. Of this approximately 25 percent bear some forms of disabilities (WHO, 1977). The greatest concentration is to be found in India (3 millions) and the highest prevalance rates in tropical africa 20 to 50 persons in every 1000 may be affected. Most of the countries of South East Asia have considerable numbers and no country in South

America is without its leprosy probelm **(Browne, 1976).** In Egypt the registered cases in 1984 were 23.739 with prevalence rate 0.5 per 1000. While the estimated cases were 150.000 with prevelance rate 3-17 per 1000 **(World Health Statistics Annual, 1984).** Leprosy in Egypt, covers all Egypt especially Assiute, Sohag, Minia, Asswan... while the Canal zone is the least affected **(Ashmalla, 1984).**

Epidemiology:

Two factors are essential for the spread of leprosy; a susceptible person and contact with an open case, also the disease is prevalent among poor people living in crowded conditions. Other factors to be considered in the epidemiology.

1. Race:

   All races are affected, the proportion of lepromatous cases seems to fall with increasing skin pigmentation, also the tendency to lepra reaction (type 2) is highest in the Causasian and lowest in the African Nigro **(Canizares, 1975).**

2. Sex:

   In most series, males are affected rather more than

females, the proportion generally varing from 1:1 to 3:1 **(Browne, 1979). El Zawahry, 1979** explained this to be due to the prevalence of abortive cases among females than males and his record was males to females; 2:1.

3. Age:

Leprosy is not a hereditary disease children are more susceptible, usually they show the indeterminant type that usually subsides spontaneously within 2 years. Classical clinical signs are evident in adults between the age of 15-40. There is a fall in the rate among the old people **(Ashamalla, 1984).**

4. Genetic factors:

Genetic factors determining resistance or susceptibility to leprosy infection have been suspected, **(Browne, 1979).** Data on family segregration analysis of HLA provide evidence of some genitic involvement in tuberculoid and perhaps also lepromatous disease **(International Leprosy Congress, 1984)**

5. Climate:

Highest incidence is now in the tropics, but role of climate is of doubt **(Canizares, 1975).**

6. Hormonal State:

It has some definite -though ill understood- effect on leprosy thus first lesion may appear at puberty, during pregnancy, or after parturition during these periods existing lesions may become raised and new lesions may appears, also evidence of hypersensitivity (i.e. erythema nodosum lepresum) may appear for the first time **(Browne, 1979)**

Although leprosy is highly infectious but of low pathogenicity, subclinical infection is common among healthy contact of persons with clinical leprosy. Clinically appreciated disease is found only in a small proportion of those infected **(Godal et al., 1972).** It is widely believed that approximately 95% of adults of most populations are resistant to the infecting bacilli as it develops in about 5% of spouses living with patients with leprosy **(Pettit, 1984).**

Aetiology:

- There have been many reports of successful cultivation of organisms from leprosy tissues.
- Three types of organisms have been cultivated from infected tissues:

a. Mycobacteria leprae.

b. Corynebacteria resembling human pathogenic corynebacteria.

c. Morphologically variable organisms with acid fast forms. **(International Leprosy Congress, 1984).**

I. Mycobacterium Leprae

The organism was first discovered by **Hansen, 1873** it is strongly acid fast rod 1-8 um long 0.3 um in diameter with parallel sides and rounded ends. There is some evidence that the acid fastness of mycobacteria is related to the properties of their surface layers and that lipid may be involved **(Goren et al., 1978).** The organism can be cultivated in:

a. Mouse foot pad in the immunologically intact mice **(Shepard, 1960).**

b. 9 Banded Aramadillo:

It is primarly used for production of the organism **(Internatinal Leprosy Congress, 1984).**

c. Nude mouse (Congenitally athymic) it is highly susceptible to infection with M. leprae. It is used as a model for lepromatous leprosy (LL), also as a model for chemotherapy and immunological study **(International Leprosy Congress, 1984).**

d. The Grey mangabey monkey has recently been shown to be susceptible also to infection with M. leprae **(Maugh, 1982).**

Leprosy derived Corynebacteria:

They are non acid fast, gram positive bacteria. They were previously thought to be diphtheroids because of their resemblance to corynebacterium diphtheriae, recently it is proved that they are true corynebacteria according to their R.N.A. base composition and mycolic acid structure. They have been isolated in numerous cases of leprosy from cutaneous lesions as well as from blood **(Cocito et al., 1982).**

Mode of Transmission

- The exact mechanism of transmission and the portal of entery of M. leprae remain abscure. Some believe that infection is contracted via the upper respiratory tract as there is large numbers of bacilli emerging from the nasal mucosa of untreated lepromatous patient and as they remain viable for 1-7 days, this suggest that it is an airborne infection **(Pedley and Greater, 1976).** Others believe that it is contracted through the skin

as bacilli can be shed from lepromatous skin ulcers. However the importance of airborne spread has now gained wide acceptance **(International Leprosy Congress, 1984).**

- Arthropods may carry the infection. The bacilli are able to persist for several days in the feaces, and proboscis of mosquitoes **(Narayanan et al., 1978).** The legs, mouth parts and feaces of flies become heavily contaminated with leprosy bacilli after they have fed on nasal mucous and skin lesions **(Geater, 1975).**
- With the demonstration of animal reservoirs of leporsy, it is now considered a zoonosis **(Walsh, 1981).**

Portal of entry:

Leprae bacilli must penetrate the epidermal barrier of the host through minute solution of continuity (excoriation insect pites) as it cannot penetrate intact skin. Localized accidental infection (hypodermic infection needle, surgical instrument, tattoing needles) have been recorded **(Browne, 1975).**