

IgE LEVEL IN PARASITIC DISEASES  
BEFORE & AFTER SPECIFIC THERAPY

Thesis

Submitted For Partial Fulfilment Of Master Degree In

Pediatrics

By

AMAL MOHAMMED IBRAHIM EID

M.B. ; B.CH.

SUPERVISORS

PROFESSOR DR. MAHMOUD ESSAWY

Professor Of Pediatrics  
Ain-Shams University

DR. GALILA MOKHTAR  
Lecturer Of Pediatrics  
Ain-Shams University

DR. LAILA ABOU EL MAGD  
Assistant Professor Of  
Clinical Pathology  
Ain-Shams University

Ain-Shams University

Cairo

1988

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ  
سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا عَلَّمْتَنَا  
إِنَّكَ أَنْتَ الْعَلِيمُ الْحَكِيمُ  
صَدَقَ اللَّهُ الْعَظِيمُ

سورة البقرة آية « ٣٢ »



## ACKNOWLEDGEMENT

I would like to express my deep thanks and gratitude to PROFESSOR DR. MAHMOUD ESSAWY, Professor Of Pediatrics, Ain Shams University, for giving me the privilege of working under his supervision, for his encouragement and unfailing guidance throughout the whole work.

Also I would like to express my deep thanks and gratitude to DR. GALILA MOKHTAR, Lecturer Of Pediatrics, Ain-Shams University, for her kind patience, great support, great help and unending guidance in preparing and finishing this thesis.

I also greatly indebted to DR. LAILA ABOU EL-MAGD, Assistant Professor Of Clinical Pathology, Ain-Shams University, for all the help, kind encouragement and advice I have received.

Also, I greatly thank DR. MONA RAFIK, Lecturer Of Clinical Pathology, Ain-Shams University for the great help she offered me during work.

Lastly, to every one who participated in some way or the other, to let this work come to such a final picture , I owe my thanks and gratitude.

## List Of Figures

| NO. | Title  | Page |
|-----|--|------|
| 1   | A theoretical scheme of cellular and humoral immunity.               | 4    |
| 2   | Schematic illustration of polymeric human immunoglobulins.           | 5    |
| 3   | Structure Of immunoglobulin.   | 6    |
| 4   | IgD & IgE levels in the first 12 months of life.                     | 10   |
| 5   | A scematic model of IgE.   | 11   |
| 6   | An electron micrograph of a plasma cell.                             | 14   |
| 7   | A scheme showing the role of IgE & eosinophils in helminth immunity. | 28   |
| 8   | Ultrastructure of <i>E.histolytica</i> trophozoite.                  | 34   |
| 9   | <i>E.histolytica</i> & <i>E.hartmanni</i> trophozoites.              | 35   |
| 10  | <i>E.histolytica</i> , diagram of life cycle.                        | 35   |
| 11  | <i>Enterobius vermicularis</i> , morphology.                         | 42   |
| 12  | Life cycle of <i>Enterobius vermicularis</i> .                       | 42   |
| 13  | <i>Ascaris lumbricoids</i> , morphology.                             | 43   |
| 14  | Life cycle of <i>Ascaris lumbricoids</i> .                           | 43   |
| 15  | Life cycle of <i>Hymenolepis nana</i> .                              | 53   |
| 16  | Indirect ELISA for antibody measurement.                             | 65   |

## List Of Tables

| No. | Title   | Page |
|-----|---|------|
| 1   | Functions of T & B cells.   | 4    |
| 2   | Properties of human immunoglobulin chains.  | 7    |
| 3   | Properties of human immunoglobulins.  | 8    |
| 4   | Levels of serum IgE immunoglobulin of normal subject at different ages.             | 10   |
| 5   | The metabolic characteristics of IgE as compared with other immunoglobulin classes. | 16   |
| 6   | Biologic properties of IgE compared with IgG.                                       | 20   |
| 7   | Categories of parasitic antigens.   | 25   |
| 8   | Normal values of eosinophils in the blood according to age.                         | 29   |
| 9   | Some immunodiagnostic tests for tropical parasitic infections.                      | 55   |
| 10  | Drugs and dosages for treatment of parasitic infections.                            | 59   |

## CONTENTS

|   | Page |
|---|------|
| 1- Introduction & Aim Of Work.                                      | 1    |
| 2- Historical Background.   | 2    |
| 3- Immune System:   |      |
| * IMMUNOCHEMISTRY.  | 3    |
| * Ige IMMUNOGLOBULIN SYSTEM.  | 9    |
| 4- Intestinal Parasitic Infections:                                 |      |
| * CLASSIFICATION OF PARASITIC ANTIGENS.                             | 24   |
| * IMMUNITY TO PARASITIC INFECTIONS.                                 | 26   |
| * ROLE OF EOSINOPHILS IN PARASITIC INFECTIONS.                      | 29   |
| 5- Immune Response To Entamoeba histolytica.                        | 32   |
| 6- Immune Response To Nematodes                                     | 41   |
| * GENERAL FEATURES OF THE IMMUNE RESPONSE TO NEMATODES.             | 44   |
| * IMMUNE RESPONSE TO ASCARIASIS.                                    | 47   |
| 7- Immune Response To Cestodes.                                     | 50   |
| * IMMUNE RESPONSE TO HYMENOLEPIS NANA.                              | 52   |
| 8- Immunodiagnosis Of Tropical Parasitic Infections.                | 54   |
| 9- What Can The Immunologist Do To Help Control Helminthic Disease? | 56   |
| 10- Treatment Of Intestinal Parasitic Infections.                   | 58   |
| 11- Material & Methods.   | 61   |

| Continued                  | Page |
|----------------------------|------|
| 12 - Results.              | 67   |
| 13 - Discussion.           | 89   |
| 14 - Summary & Conclusion. | 94   |
| 15 - References.           | 96   |
| 16 - Arabic Summary.       |      |

INTRODUCTION

AND

AIM OF WORK

More humans are infested with parasites than with any other group of pathogens. Yet, little is known of the immune responses to the numerous protozoa or helminths that infect man.

A parasite whether unicellular or multicellular is complex with multiple antigenic components permitting a spectrum of possible immunologic responses.

Both cellular and humoral mechanisms are known to share in the defense mechanisms against parasites. Certain cellular responses particularly eosinophilia, are characteristic of helminthic infections e.g. Ascariasis, Shistosomal infection and Ancylostomiasis [David & Butterworth, 1977].

Most protozoa and helminths stimulate antibody production, while useful diagnostically, antibodies were known to play only little role in host defense. Serum IgE has been known to be elevated in the tissue phase of many parasitic infestations and is associated with an immediate hypersensitivity skin reaction in amoebiasis, trichinosis, ascariasis, filariasis and visceral larval migrans [Radermecker et al, 1974].

After that, IgE has been demonstrated by Capron et al. [1977], to have not only allergic reflection to parasitic infestation, but also a protective role against these parasites. More recently, Capron [1984], has demonstrated an antibody-dependent eosinophil cytotoxicity against parasites in which IgE plays the major role. In addition, there is evidence that IgE antibodies interact with membrane receptors on macrophages to increase their binding to parasites and enhance IgG antibody dependent macrophage mediated cytotoxicity.

With these points in mind, we aim to study changes of serum IgE level in some intestinal parasitic diseases as *Ascaris lumbricoides*, *Enterobius vermicularis*, *Hymenolepis nana* and *Entamoeba histolytica* during infestation and after therapy with specific antiparasitic drugs to delineate the definite role of IgE in host defense mechanisms.

HISTORICAL BACKGROUND

The first demonstration of specific humoral factors responsible for immediate hypersensitivity reactions was by Prausnitz and Kustner in 1920. A major breakthrough in the study of allergic diseases occurred in the late 1960 when Ishizaka and co workers, as a result of their intensive studies on skin sensitizing antibodies, presented data which indicate the presence of a unique immunoglobulin as a carrier of reaginic activity in allergic serum. The specific activity was found in the gamma 1 region by radio-immuno-electrophoresis and was called gamma E globulin [Ishizaka & Ishizaka, 1969].

At the same time, and independent of Ishizaka, Bennich and Johansson reported in the 1967 the isolation of an atypical myeloma protein and its counterpart in normal serum. It represented a new immunoglobulin class which was designated IgND. In many aspects, physico-chemical properties of gamma E globulin were similar to those of IgND and the two proteins shared the major antigenic determinants. The findings were verified and it was agreed that both represent the same immunoglobulin class which was designated IgE [Bennich et al, 1968].

IMMUNE SYSTEM

## IMMUNOCHEMISTRY

The immune system is comprised of two components, exhibited as cellular immunity or as humoral immunity.

The lymphocyte is the primary cell involved in both components. The cells destined to become lymphocytes arise as multipotential precursors from which derivatives of the hematopoietic and lymphoid systems will ultimately develop. In early intrauterine life, the fetal liver serves as the repository for the cells. Subsequently, the bone marrow is populated and in extrauterine life serves as the major source of the precursor cells. The detection of various immunologic markers on the lymphocyte membrane as well as the functional characteristics of lymphocytes have permitted identification of 2 distinct populations of lymphocytes called T\_cells and B\_cells. [Reinherz & Schlossman, 1980]. Figure "1".

The T\_lymphocytes [T\_cells] are thymus derived or thymus influenced during their development. T\_cells are responsible for cellular immunity [i.e. delayed skin reactivity, allo graft rejection, antitumour immunity, and cellular defense against fungi, intracellular pathogens, and poxviruses].

The B\_lymphocytes [B\_cells] develop in the bursa of Fabricius in birds but are believed to be derived from bone marrow in mammals. Recent evidence suggests that the fetal liver assumes the bursal function in humans [Reinherz & Schlossman, 1980]. The B\_cells are responsible for humoral immunity, which is expressed by the production of specific circulating plasma proteins termed antibodies or immunoglobulins. They are present in the blood\_stream, tissues, and exocrine secretions [Harper, 1979]. Table "1".

Immunoglobulins are also termed gammaglobulins which was introduced by Tiselias in 1937 to designate the serum protein which moves most slowly on free electrophoresis [Soloman, 1976], but significant amount are also found in B globulin zone [WHO, 1972].