EVALUATION OF THE ROLE OF LABORATORY INVESTIGATION IN STUDYING THE EPIDEMIOLOGY OF STREPTOCOCCAL INFECTION IN A PRIMARY SCHOOL CHILDREN IN A SEMIURBAN AREA

THESIS

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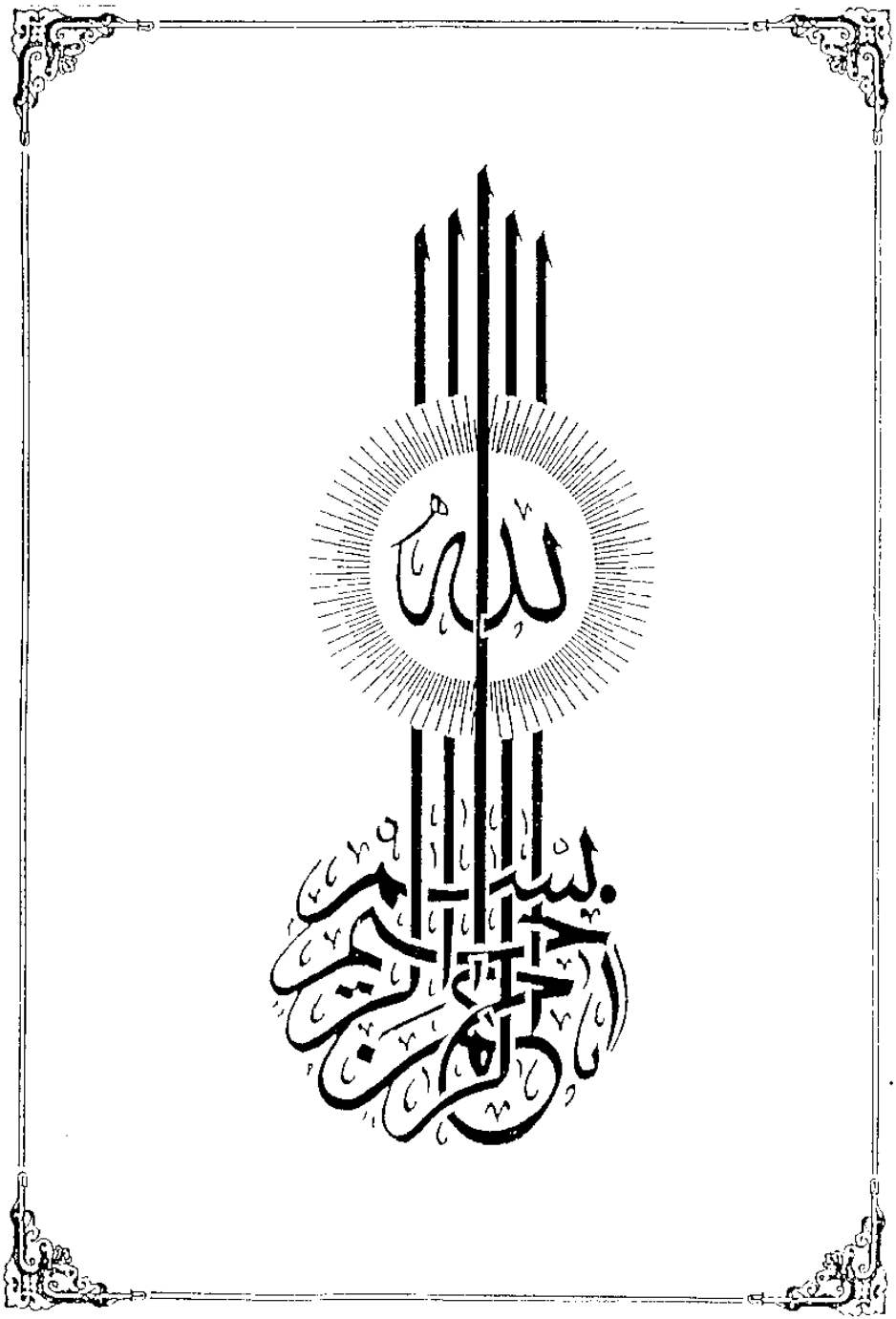

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INTRODUCTION

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The American Heart Association, 1965 showed that the documentation of a previous streptococcal infection in establishing a diagnosis of acute rheumatic fever is of prime importance and without this information the diagnosis of rheumatic fever will be doubtfull.

Therefore the discovery of a streptococcal infection allow the prophylaxis and prevention of rheumatic fever which may lead to rheumatic heart disease which we all know it's great hazards.

Streptococcal infection can be determined through serological tests depending on the determination of antibodies against streptococcal enzymes in the sera of the patients. These enzymes are mainly streptolysin O, nuclease B, and nicotine-amide adenine dinucleotidase.

It has been demonstrated that if one antibody is measured at least 80 % of streptococcal infections will show a significant antibody rise, if two are measured at least one will be increased in more than 90 %, but if three are measured more than 95 % will show an increase in the titer of at least one antibody.

The following study was applied to two different groups of population in Cairo.

1. Primary school children of a semiurban area.
2. Outpatient clinic of a hospital serving this area those patients are suffering from tonsillitis or acute pharyngitis.

While group of primary school children will show inbetween patients, carriers of the organism or free ones.

The aim of the study is to select the best two serological tests which would elicit the maximum of streptococcal diseased patients, streptococcal recent infections and carriers groups.

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REVIEW OF LITERATURE

B. HAEMOLYTIC STREPTOCOCCI

Streptos mean twisted - They are micro-organisms growing in chairs were - first described by Billroth, (1874) from erysipelas lesions.

In 1903 Schottmuller & Brown 1919, introduced the terms Alpha, Beta & Gamma to describe the three types of haemolytic reactions observed on blood agar plates which are incomplete, complete and no haemolysis respectively.

In 1930, Lancefield differentiated Bhaemolytic streptococci into a number of immunological groups now designated by the Letters A to O. She showed that most strains causing human infections were found to belong to group A.

Mac - Carty (1965), reported that supernatant culture fluid of group A was a rich source of biologically active extracellular products which mightlyse RBCs, produce skin erythema and digest both protein and lipoprotein., depolymerize both nucleic acid and hyaluronic acid and split nicotinamide adenine dinucleotidase.

Wannamaker (1970), found that the main value of extracellular products was in study of various highly specific neutralizing antibodies which develop in the human sera after streptococcal infections.

In 1976 Wannamaker used sera from normal controls and from patients with streptococcal diseases and these sera were tested for the titer of antistrcptolysin O and anti nuclease B titer.

The usefulness of the ADN ase B test in addition to ASO was confirmed as when both tests were performed elevated titers could be demonstrated in a higher percentage of various streptococcal diseases.

Streptococcal cellular components

1. Intracellular components formed from proteins, lipid and glucose.
2. Hyaluronic acid capsule.
3. Cell wall protein M, T., & R.:

Group A haemolytic streptococci can be broken down into approximately 68 immunological types which differ in the protein M antigens contained in their

cell walls. The M proteins can be extracted by the drastic procedure of acid treatment at Ph_2 and boiling.

Typing is usually done by precipitin tests performed with the extracted M protein and specific antisera from rabbits immunized with streptococcal strains of each immunological type (Lancefield & Dole 1946).

Lancefield also described other surface antigens of group Astreptococci which is the cell wall proteins known as T and R antigens.

T antigen include number of immunologically distinct proteins which resist digestion by proteolytic enzymes destroyed by heat at an acid Ph.

The same T antigen may be present in a number of different M types and strains of the same M type may have different T antigens.

T antigens can be demonstrated through agglutnation technique.

Method of Distinction	M protein	T protein
✱ Method of extraction	Boiling at Ph 2-3	Peptic or tryptic digestion.
✱ Proteolytic enzymes.	Rapidly digested	Resist digestion
✱ Chemical composition.	Alcohol soluble protein.	Protein insoluble in alcohol.
✱ Boilingat Ph 7 for 30 minutes	Stable	Destroyed in some media.
✱ Specificity	Distinct M for each type.	One T antigen may occur in a single type or be common to several types.
✱ Antigenicity	Moderately antigenic in intact cell, poorly antigenic in solution.	Highly antigenic in both intact cell and solution.
✱ Protection	Antibodies confer type specific protection.	Antibodies confer no protection.
✱ Virulence	One of essential factors in causing virulence.	Not apparentty related to virulence.

4. Group carbohydrate:

   N - acetylglucosamine rhamnose.

5. Mucopeptide:

   N - acetylglucosamine , N - acetylmuramic acid, alanine, glutamic acid, lysine and ghycine.

Modified known extracellular products:

1. Erythrogenic Toxins.
2. Streptolysin O.
3. Streptolysin S.
4. Nucleases A, B, C & D.
5. Ribonucleases.
6. Streptokinase.
7. Proteinase and its precursor.
8. Amylase.
9. Nicotine amide adenine dinucleotidase.

(Microbiology Bernard Davis).

Streptolysin O

Has been so named because of the ease with which it is reversibly inactivated by atmospheric O_2 as Neil and Mallory , 1926 observed that fresh broth filterates in which Bhaemolytic streptococci had grown rapidly loose it's haemolytic activity on standing in air.

Todd 1938, demonstrated 2 kinds of haemolysis produced by streptolysin O and streptolysin Saround streptococcal colonies . He also found that streptolysin O is oxygen labile existing in an inactive oxidized form which can be reversibly reactivated by reduction to the active reduced form.

Streptolysin O stimulates the formation of antibodies which neutralize it's haemolytic action in the human sera.

Herbert & Todd 1941, proved that SLO is a protein Bernheimer,1954 showed that SLO was inhibited by a specific antibody, cholesterol and other lipids.

He also 1960, reported that SLO may be stored in it's active reduced state or may be reactivated just

prior to use. It's activity can be measured by it's ability to haemolyse RBC_s.

The SLO unit was defined as the amount of SLO which after mixing with one unit ASLO gives rise to 50 % of haemolysis (Sung J. Liao.).

ASLO :

Rantz and Randall (1945), described their modified technique for determination of ASLO which was an antigen - antibody reaction in which antigens will be reduced SLO and the antibodies are those tested in the patient's sera. The reaction will be demonstrated by using rabbit RBCs as indicator system and the reading of the results will show either occurance of haemolysis or absence of it.

Boisvert & Clark 1948 and Setetson 1954 reported that ASLO response varies with the infecting strain of streptococci.

Edwards 1964, Klein & Moody 1968 adapted the microserological technique developed by Tabatsy 1955 for ASLO determination .