WATER POLLUTION AND LABORATORY METHODS USED FOR ITS DETECTION

ESSAY

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BY

SHERINE MAHMOUD MOHAMED FAHMY

M.B., B.Ch.

Under Supervision of

Prof. Dr. IBRAHIM KHALIL ALI
Professor of Clinical Pathology
Faculty of Medicine
Ain Shams University

Dr. MAGDA SALAH ELDIN GAB R
Lecturer of Clinical Pathology
Faculty of Medicine
Ain Shams University

Dr. OMNIA ABO ELMAKAREM SHAKER
Lecturer of Clinical Pathology
Faculty of Medicine
Ain Shams University

Faculty of Medicine
Ain Shams University
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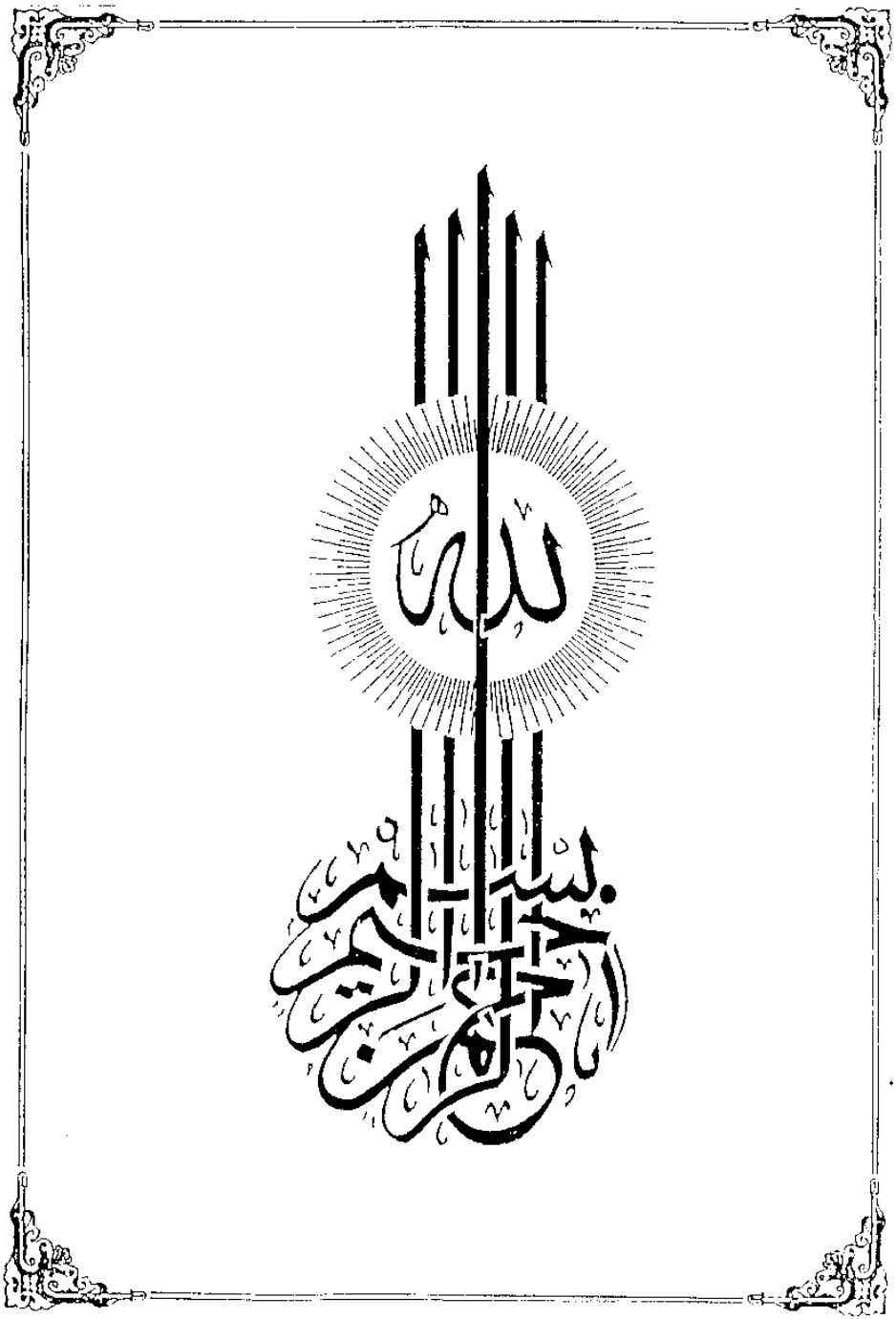
بسم الله الرحمن الرحيم

«وجعلنا من الماء كل شئ حي»

صدق الله العظيم



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CONTENTS

LIST OF ABBREVIATION

BCYE	: Buffered charcoal yeast extract agar.
BGLB	: Brilliant green lactose bile.
C	: Campylobacter.
CFU	: Colony forming unit.
Cl	: Clostridium.
CPE	: Cytopathic effect.
E	: Escherechia.
ECHO	: Enteric Cytopathic Human Orphan.
H_{2s}	: Hydrogen Sulphide.
HE	: Hepatitis E.
IMVC	: Indole, Methyl red, voges proskauer's, citrate.
LST	: Lauryl sulphate tryptose broth.
LT	: Heat labile enterotoxin.
MPN	: Most probable number.
MR	: Methyl red.
MUG	: 4-Methyl umbelliferyl-B-D-glucuronide.
N_2	: Nitrogen.
O_2	: Oxygen.
ONPG	: O-nitrophenyl-B-D-galactopyranoside.
P	: Pseudomonas.
P-A	: Presence-absence.

S : Salmonella.

SPC : Standard plate count.

ST : Heat stable enterotoxin.

Strept. : Streptococcus.

TCBS : Thiosulphate citrate bile salt sucrose.

V : Vibrio.

V.P. : Voges proskauer's.

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INTRODUCTION AND AIM OF THE WORK

INTRODUCTION

The water demand for drinking and other domestic needs in a modern town varies from 100 to 500 litres a day. But water is also consumed in industry and agriculture, and if the total water demand is thus considered it increases 10-12 times. Water delivered to the consumer should meet the high requirements of modern hygiene, should be at least free from pathogenic organisms and toxic substances, and should be fit for domestic use *(Voznaya, 1983)*.

Natural water is rich in bacteria, algae, protozoa, worms and other organisms. There are organisms that are commonly found in water free from heavy pollution such as pseudomonas, serratia, flavobacterium, and micrococcus. The greater the amount of nutrients in water, the faster the biological contaminants develop *(Smith, 1981)*.

Soil bacteria are organisms which are not normal inhabitants of water but contaminate it during heavy

rains. Most of them belong to the group of aerobic spore-forming bacilli such as Bacillus subtilis and Bacillus mycoides. Aerobic non-sporing bacilli such as klebsiella aerogenes and Enterobacter cloacae may be found on grain, plants, and vegetations *(Last and Wallace, 1992)*.

Sewage bacteria are introduced to water as contamination from human or animal excreta. Most of them are normal commensals of the intestine, but occasionally pathogenic organisms are present. Intestinal bacteria are E coli group, Streptococcus faecalis, Clostridium perfringens and pathogenic organisms such as Salmonella typhi and Vibrio cholerae, Sewage bacteria proper as Proteus vulgaris and Clostridium sporogenes *(Topley and Wilson, 1984)*.

Numerous viruses have been found in water, belonging to the ECHO, entero, adeno, parvo and reo groups. They are derived from sewage, in which many of them can survive for long time *(Ward, 1981)*.

The degree of water pollution with pathogenic bacteria are determined by the presence of Escherichia coli, which are found in the intestine of man and animals. These bacteria are harmless to man but their presence in water indicates that it is polluted with human and animal excreta *(Smith, 1981)*.

In the United Kingdom water is examined for coliforms by the multiple tube method or the membrane filter technique *(Collins et al., 1991)*.

A simple automated microplate system for biochemical characterization of water isolates can be used to obtain finger prints of bacterial flora from various water samples. This system was demonstrated on coliform bacterial populations from various water samples, with or without suspected contamination *(Kuhn et al., 1991)*.

The greatest damage of water is inflicted by petroleum and its products. Water can be also polluted by heavy metal ions. The metal ions are usually poisonous and get into water with industrial effluents and sewage *(Moore and Ramamoorthy, 1984)*.

AIM OF THE WORK

This work is aimed to review the subject of water pollution and the laboratory methods used for its detection.

CLASSIFICATION OF WATER

According to the requirements, water can be classified into:

1. Potable water: for cooking and drinking.

2. Cooling water (cooling of machinery, liquid and gas products in condensers. Untreated natural water is normally used for cooling purposes.

3. Water for boilers.

4. Technical water: used in the manufacture of paper, leather.

5. Irrigation water. This is used in agriculture and should not contain salts in quantities greater than 1.5 g/litre *(Okun, 1992)*.

Water may be divided according to its source into two types:

1. Surface water: which is found on the surface of earth, and it is exposed to contamination from dust, sewage and it has not been filtered through any

considerable thickness of soil. It contains large numbers of bacteria most are of intestinal origin *(Crau.n, 1988)*.

2. Deep water: It is generally pure because most of the contaminants are filtered off on their passage through the soil and so the bacteria which may be found is small in number and harmless *(Jawetz et al., 1987)*.

From a sanitary point of view water can be classified as:

1. Potable water: free from injurious materials and has a good taste.

2. Contaminated water: contains dangerous microbial or chemical agents, and inspite of that it may be of good taste and odour.

3. Polluted water: has unpleasant taste, odour and appearance. It is unclear and unfit for use *(Mckee and Wolf, 1971)*.