بسم الله الرحمن الرحيم

سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ الْعَلِيمُ الْحَكِيمُ .

صدق الله العظيم

TRACE ELEMENTS IN HEALTH

AND DISEASES IN PAEDIATRIC PRACTICE

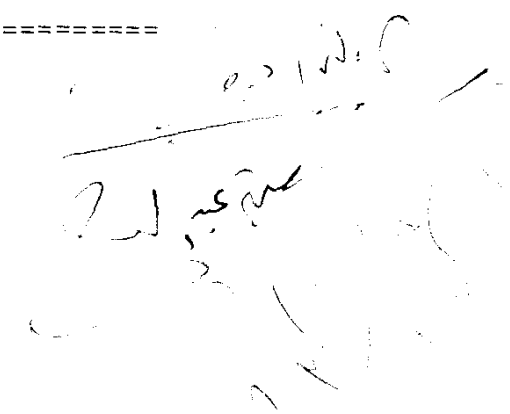
Thesis submitted for partial fulfillment of the Degree of M. Sc. (Paediatrics) submitted by :

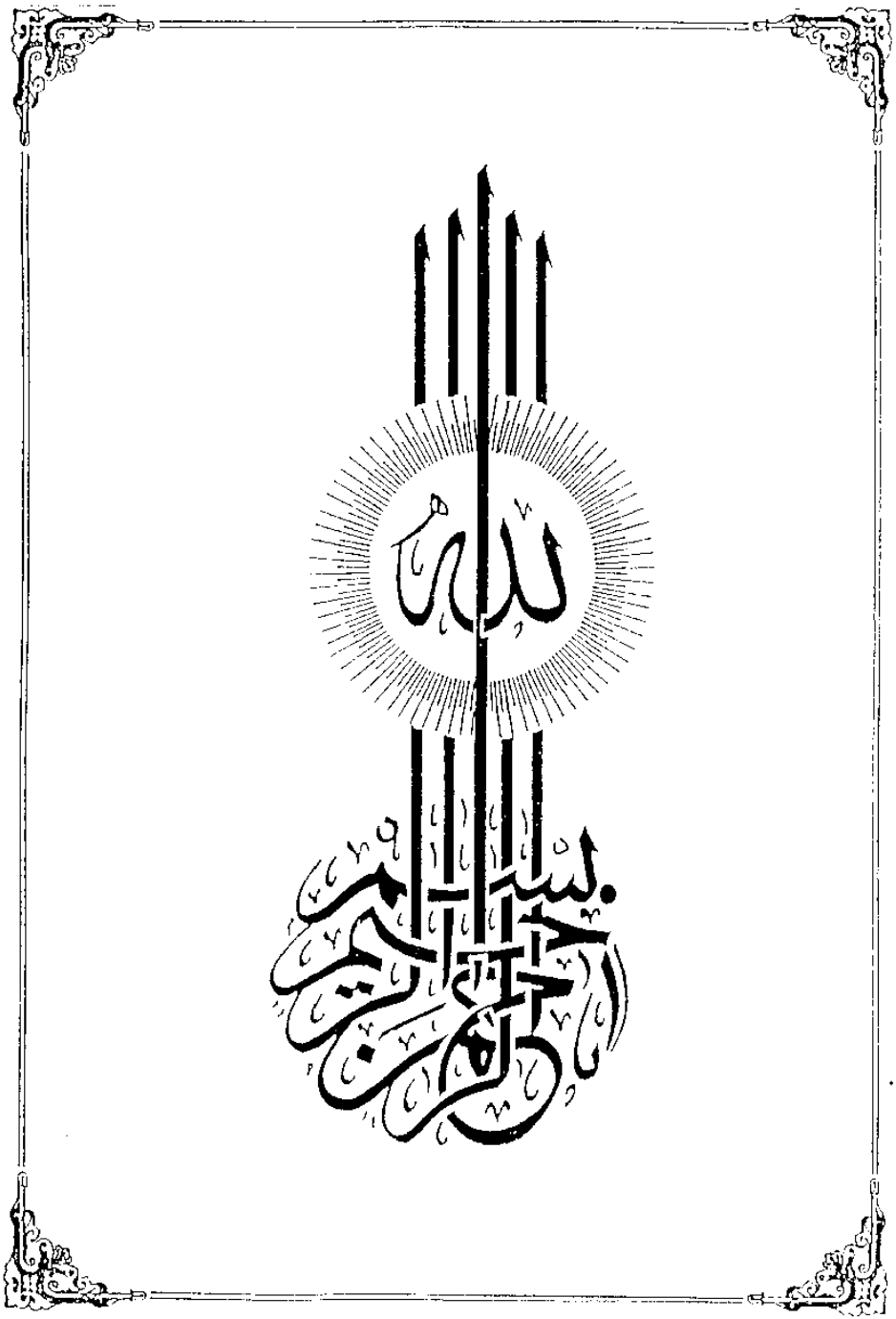
SOHAIR AHMED SHALABY

Under the Supervision of :

Professor A. K. KHATTAB

M.D, Ph. D. (Ed.) , F.R.C.P. (Ed.), M.R.C.P . (Glasg.) , Professor of Paediatrics , AIN SHAMS UNIVERSITY





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introduction

INTRODUCTION

race elements are those elements which occur in the body in
ery low concentrations, that is less than 0.01% of the body
eight (Laker 1982).

he elements included in this review are: Iron, Copper, Zinc,
agnesium, Iodine, Chromium and Manganese.
ırman and Mc Laren 1982 classified the elements into essential
acroelements which occur in concentrations more than 0.005 per
ent body weight as magnesium and essential micro (trace) elements
ɔcur in concentrations less than 0.005 per cent body weight as
:on, copper, zinc, Iodine , Chromium and manganese (Burman and
: Laren 1982).

:cording to Prasad (1978) magnesium is usually not considered
› be a trace element, but its biochemical role in enzymatic
ınctions is similar to that of other trace elements (Prasad 1978)

·tzias (1967) reported that a trace element can be dignified with
e formal title "essential" if it meets the following criteria:
) It is present in all healthy tissues of all living things,(2)its
ncentration from one animal to the next is fairly constant, (3)its
thdrawal from the body induces reproducibly the same structural
d physiological abnormalities regardless of the species,(4)its
dition either prevents or reserves these abnormalities, (5) the
normalities induced by deficiency are always accompanied by pertinent
ecific biochemical changes and (6) these biochemical changes can
prevented or cured when the deficiency is prevented or cured
ɔtzias 1967).
ace elements are sometimes classified into further group known as
xic elements.(Underwood, 1971).
ad is included here as an example of these toxic elements.

the aim of the review

THE AIM OF THE REVIEW

The aim of this review is to go through the important trace elements which are likely to be encountered in paediatric practice. Each of these trace elements will be tackled from two aspects :

a) Its role in health

b) Its role in the causation of diseases in the paediatric age groups.

The prevention as well as the treatment of any pathological condition resulting from derangment of the status of trace elements inside the body will be put forward.

chromium

CHROMIUM

PHYSIOLOGY

SOURCES :

Spices have the highest concentrations of chromium. Lesser amounts are present in meats, vegetables and fruits (exceptions are liver and kidney). (Maxia et al., 1972).

In some foods, refining processes may reduce the content of chromium as in refining of sugar and flour (Czerniejewski et al., 1964; Schroeder, 1968, 1971; Schroeder et al., 1970).

In refining of sugar, the chromium is concentrated in the molasses fraction, with refined sugar containing less than one tenth the concentration of chromium in molasses. (Schroeder et al., 1971).

FUNCTION;

Trivalent chromium has been shown to increase glucose tolerance and acts as a co-factor (G.T.F) with insulin in promoting normal glucose utilization. Glucose Tolerance Factor (G.T.F.) is required for maximal response to insulin in insulin sensitive tissues. (Mertz, 1969).

METABOLISM

ABSORPTION :

In man and animals, inorganic trivalent chromium salts are poorly absorbed but chromates are better absorbed.(Doisy et al., 1976).

The only group of people shows an abnormal rate of chromium absorption are insulin-requiring diabetics.(Doisy et al., 1976).

Insulin-requiring diabetic children have lower levels of hair chromium than normal children (Hambidge et al., 1978).

The hepatic chromium content in diabetic autopsy material was 8 Ug/g of ash in comparison with 12 Ug/g for control subjects. (Morgan, 1972).

At least two forms of chromium circulate in the plasma compartment. Some chromium is bound to transferrin in the B-globulin fraction and the other form is presumed to be Glucose Tolerance Factor (G.T.F.) bound chromium. (Hopkins and Schwarz, 1964).

During an induced infectious disease, serum chromium levels declined and glucose tolerance become impaired. (Pekarek et al., 1973 a,b).

On the other hand, intravenous administration of glucose or insulin seems to produce a rapid decline in serum chromium concentration in normal subjects. (Davidson and Burt 1973, Burt and Davidson , 1973).

EXCRETION :

Orally absorbed chromium is excreted mainly by the kidney. The daily urinary excretion of chromium is 3-5 Ug/24 hours. (Hambidge 1971, Davidson and Secrest, 1972, Wolf et al.,1974).

Glucose loading produced an increased chromium excretion in the urine during the first two hours following loading. (Schroeder, 1968).

CHROMIUM DEFICIENCY

The tissue chromium levels decline with increasing age, particularly in the United States.(Schroeder et al., 1962 ; Hambidge and Baum, 1972).

New born and young children have tissue chromium levels higher than those in adults. Hepatic chromium concentration in children 0-10 years of age was 17.2 Ug/g of ash, whereas subjects over 30 years of age had a concentration of 1-2 Ug/g of ash.(Doisy et al., 1976).

Children in Jordan suffering from Kwashiorkor, and children in Turkey suffering from protein-calorie malnutrition, received a chromium supplement (250 Ug/d) in their formula (Hopkins et al., 1968, Gurson and saner 1971, 1973).
This was followed by restoration of their intravenous glucose tolerance tests to normal. (Doisy et al., 1976).

Malnourished children in Egypt showed in beneficial response to chromium supplementation of their diets as the dietary intake of chromium in Egypt was higher than elsewhere.(Carter et al., 1968).

An increasing body of evidence , based primarily on improved glucose tolerance tests after chromium supplementation suggests that chromium deficiency does occur in man most likely due to inadequate intake. (Doisy et al., 1976).

The occurance of severe chromium deficiency is recently reported in a female patient on total parentral nutrition for more than five years. The patient exhibited weight loss, impaired