

SOMATOMEDIN
IN
PROTEIN ENERGY MALNUTRITION

THESIS

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PEDIATRICS



BY

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A handwritten signature in dark ink, located at the bottom right of the page. The signature is stylized and appears to be the name of the student, Inas Ismail Ahmed.

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ABBREVIATIONS

SM	Somatomedin.
HGH	Human growth hormone.
MSA	Multiplication stimulating activity.
IGF	Insulin growth factor.
NSILA	Non suppressible insulin like activity.
NSILA-P	Non suppressible insulin like activity precipitate.
NSILA-S	Non suppressible insulin like activity soluble.
RNA	Ribonucleic acid.
DNA	Deoxyribo nucleic acid.
NGF	Nerve growth factor.
EGF	Epidermal growth factor.
S ²⁵	Radioactive sulfate.
I ¹²⁵	Radioactive iodine.
C.S.F	Cerebrospinal fluid.
PEM	Protein energy malnutrition.
mol.wt	Molecular weight.

< Less than.

> More than.

GIT Gastrointestinal tract.

WHO World Health organization.

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INTRODUCTION

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Growth and development especially in early life are influenced by many factors among them are hormones nutrition and genetic factors.

Hormones are found to play a major role in growth mainly growth hormone of pituitary gland.

Growth hormone stimulates linear growth indirectly by formation of secondary growth promoting factors known as sulfation factor or somatomedin, a family of GH dependent peptide mitogens.

Although serum somatomedin concentrations usually exhibit a strict growth hormone dependence, but in cases of protein-energy malnutrition, SM activity is reduced despite of increased levels of GH. This discordance suggests that serum SM is also highly dependent on nutritional status.

The aim of this essay is to study the effect of protein and energy intake on somatomedin activity and the effect of balanced diet on it.

This essay also throw light on somatomedin discovery, actions, regulation, role in growth and measurments with brief account on protein energy malnutrtion.

REVIEW OF LITERATURE

SOMATOMEDINS

Historical review

Growth hormone of pituitary origin has been recognized over 50 years, as a factor critically important for growth. Recognizing that growth involves proliferation of cartilage at the epiphyseal plates Kibrick et al.(1941), found that marrow epiphyseal plates in hypophysectomized rats became wider after growth hormone was given in vivo. Cartilage metabolism could be measured by the incorporation of radio active sulfate into cartilage matrix.

Discovery and definition:

In studies of the mechanism by which growth hormone (GH) promotes growth Salmon & Daughaday(1957) observed that hypophysectomized rat costal cartilage exposed to GH in vitro had no change in cartilage sulfate uptake, and addition of serum from GH deficient hypophysectomized animals also had little effect. Serum from animal

pretreated with GH did produce cartilage growth. From these observations the hypothesis was formulated that growth hormone promoted skeletal growth indirectly through generation of serum factor or factors that directly cause cartilage proliferation called sulfation factor (Salmon & Daughaday 1957).

Subsequent studies have indicated that normal plasma contains an unknown number of growth hormone dependent substances which stimulate cellular events concerned with the growth of both extraskeletal and skeletal tissues. These substances have many insulin like metabolic action in vitro, although immunologically distinct from insulin. As the result of these and other studies, the original name (sulfation factor) became too constrictive. The more open term somatomedin was introduced to include all growth hormone dependent substances in plasma which stimulate growth in responsive tissues. The name comes from "Somato" which points to hormonal relationship to somatotrophin and (Medin) to indicate that it mediates the action of somatotrophin (Daughaday et al, 1972).

Isolation of somatomedins

The growth promoting actions of GH are mediated through these sulfation factors somatomedins. For a peptide to be considered as somatomedin it must fulfil the following criteria:

- . Its serum concentration must be growth hormone dependent.
- . It must possess insulin-like actions in the extra-skeletal tissues.
- . It must promote the incorporation of sulfate into proteoglycans of cartilage.
- . It must stimulate multiplication of certain types of cultured cells. (Underwood and D'Ercole 1980).
- . Five substances meeting these criteria have been described:
 - . Somatomedin A SM-A
 - . Somatomedin C SM-C
 - . Insulin like growth factor I and II (formerly referred to as non suppressible insulin like activity or (NSILA)).

. and Multiplication stimulating activity MSA.

Somatomedin-B (SM-B) although exhibits some dependence on GH, it does not stimulate cartilage and therefore not included.

Since tissue extracts generally have little somatomedin activity, these SMs have been isolated from large volume of plasma or serum. MSA has also been obtained from liver cell culture.

The following table obtained by Phillips & Sellin, (1980) show the isolated polypeptide and it's molecular weight, isoelectric point and the source:

Product	M.W.	P.H.	Source
SM - A ₁	7.000	Neutral	Human plasma.
SM - A ₂	7.000	Neutral	Human plasma.
SM - C	7.500	Basic	Human plasma.
IGF - 1	7.549	Basic	Human plasma.
IGF - 2	7.471	Neutral	Human plasma.
MSA	10.000	Neutral	Liver-cell cultre.