THE RELATION BETWEEN URINARY HYDROXYPROLINE EXCRETION AND GROWTH

THESIS
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TO THE SOUL OF MY FATHER

بسم الله الرحمن الرحيم

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INTRODUCTION

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The growth of children may be studied by height and weight measurements, or by radiographic studies of bone. Though both are useful, neither avoids the difficulty of the wide normal variations, particularly during the adolescent growth "spurt" **(Zorab et al., 1970)**.

Measurement of height and weight are easy to make and are of interest for immediate assessment. Refering to centile charts; such as those of **Tanner et al. (1966)** will enable a child to be compared with others of the same age.

Predictions of adult height may be made from present height of children from three years of age until puberty **(Tanner, 1962)**. At adolescence, an assessment of the degree of skeletal maturity present may be made from a radiograph of the wrist. Predictions may be made of the expected adult height, which are rather better than those made from present height alone, if tables such as those by **Bayley and Pinneau (1952); Greulich and Pyle (1959)** are used **(Zorab et al., 1970)**.

Asymmetry of somatic growth found in patients with Scoliosis**(Burwell and Dangerfield, 1977)** makes measurement of growth difficult in this disease. No simple accurate measurement of height is possible, due to the curvature of the spine. It is therefore difficult to assess the rate of growth, which is a critical factor in decisions of treatment **(Clark and Zorab, 1978).**

Interest existed for some years in studying the relation between urinary hydroxyproline excretion and growth. This imino acid is found in significant amounts virtually only in body collagen, which is remarkably abundant in all connective tissues of mammals, particularly in bone tissue **(Gaggi et al., 1982).**

Isotopic studies have indicated that, the hydroxyproline excreted in urine is derived from the degradation of both soluble and insoluble collagen, and that the amount of hydroxyproline excreted is related to the amount of collagen degraded **(Lindsted and Prockop, 1961; Avioli and Prockop, 1967).**

Even though it is evident, largely on morphological basis, that changes in collagen play an essential role in the pathogenesis of several diseases, lack of suitable methods has previously hamperd the attempts to characterize the metabolism of human collagen. The progress of collagen chemistry has provided us with a methodology which has greatly improved our possibilities for the evaluation of the changes in collagen at least in some diseases **(Grant and Prockop, 1972).**

Since the collagen constituting most of the bone organic matrix is subjected to a faster turnover than that contained in other tissues, hydroxyprolinuria is an index of bone metabolism which contributes to amino acid excretion both through resorption and formation processes **(Gaggi et al., 1982).**

So the daily urinary excretion of endogenous hydroxyproline therefore provides a useful index of collagen turnover in health and disease **(Dull et al., 1962; Kivirikko and Laitinen, 1965a).**

AIM OF THE WORK

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The aim of the present essay, is to study the urinary hydroxyproline excretion in relation to the following:

[1] Different age groups: perinatal, neonatal, infancy, preschool, school-child, and adolescents.

[2] Normal, arrested, accelerated growth and in cases in which arrested growth has been stimulated by hormonal therapy.

[3] Some diseases: e.g. endocrine, bone, connective tissue and renal, etc.

REVIEW OF THE LITERATURE

CHEMISTRY

INTRODUCTION:

Living cells produce an impressive variety of macromolecules, chiefly proteins, nucleic acids, and polysaccharides, that serve as structural components, biocatalysts, hormones, and repositories for the genetic information characteristic of a species. These macromolecules are biopolymers constructed of distinct monomer units or building blocks. For nucleic acids, the monomer units are nucleotides, for complex polysaccharides,the monomer units are sugar derivatives, and for proteins, the monomer units are amino acids.

AMINO ACIDS:

Alpha-amino acids have both an amino and a carboxylic acid fraction attached to the same (α) carbon atom.(Fig.1)

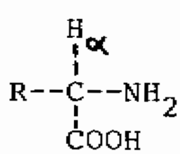

Figure [1] : Anα-amino acids

(Harper et al., 1979)

Although over 200 different amino acids occur in nature, only about one-tenth of these occur in proteins. What is perhaps more remarkable is that proteins of all forms of life-plants, animals, or microbes contain the same 20 amino acids.

Complete acid-, base-, or enzyme-catalyzed hydrolysis of proteins produces the 20 L-α-amino acids listed in table 1.

The amino acid present in proteins may be divided into two broad groups on the basis of the polarities of the R-groups attached to the α -carbon atoms (Fig.1)

Table 1: Classification of the L-α-amino acids present in proteins on the basis of the relative polarities of their R-groups.

A non polar group is the one which has little or no charge difference from one region to another, where as a polar group has a relatively large charge difference in different regions.

Table (1)

Non Polar	Polar
Alanine	Arginine
Isoleucine	Aspartic acid
Leucine	Asparagine
Methionine	Cysteine
Phenylalanine	Glutamic acid
Proline	Glutamine
Tryptophan	Glycine
Valine	Histidine
	Lysine
	Serine
	Threonine
	Tyrosine

(Harper et al., 1979)

Structure of Amino Acids:

For many purposes , it is convenient to subdivide the amino acids in protein into seven classes.

Group I:

With Aliphatic Side Chains:

Glycine, Alanine, Valine, Leucine and Isoleucine.