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A STUDY OF HYPERCROTONAEMIA IN SRI LANKAN CHILDREN AND ITS POSSIBLE AETIOLOGY

By

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Thesis submitted to the University of Sri Jayewardenepura for the
award of the degree of Master of Philosophy in Biochemistry on
16th March 2010.

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ABSTRACT

Hypercarotenaemia is clinically diagnosed by yellowing of the dermal tissue particularly of the palms and soles but not the sclera of the eye. It is reported in Sri Lanka particularly, but not exclusively in infants and young children. This study excludes hypercarotenaemia caused by liver and thyroid pathology and is confined to the feeding of carotenoid rich foods. In this case there are relatively few subjects who develop hypercarotenaemia. In Sri Lanka the carotenoid rich foods fed to infants and children are boiled, carrot, pumpkin and ripe papaw. In the present study an attempt was made to study hypercarotenaemic serum profiles, time course on serum carotenoid profiles on cessation of feeding carotenoids, proportion of hypercarotenaemics in the Western province and the aetiology using animal models.

Hypercarotenaemic subjects (n=36) were tested for carotenes in their serum. The carotenoids were classified as α and β carotenes, monohydroxy metabolites and polyhydroxy metabolites which varied from 119 $\mu\text{g/dL}$ to trace amounts, 148.7 $\mu\text{g/dL}$ to trace amounts, 214 $\mu\text{g/dL}$ to non detectable or less than 0.5 $\mu\text{g/dL}$, 822.7 $\mu\text{g/dL}$ to 7.0 $\mu\text{g/dL}$ respectively. It was possible to predict the contribution of carotenoid rich foods to the condition by the presence of α -carotene (carrot), β -cryptoxanthin (papaw). There was no hypervitaminosis due to vitamin A.

Longitudinal studies following withdrawal of carotenoid rich food indicated serum carotenoid levels declining at slightly varying rates in each individual, while vitamin A

levels were more or less maintained, probably due to the liver 15-15'-dioxygenase activity.

Classically hypercarotenaemia is termed to be genetic or metabolic. However, in types of hypercarotenaemia studied it can be predicted to be in some way or another due to genetics. In the present study, identical hypercarotenaemic twins had similar serum carotenoid profiles which may be due to genetics. However, this needs further studies with statistically significant number of such twins before it can be confirmed.

Preliminary tests on faeces to study the effect of absorption of carotenoids in the development of hypercarotenaemia with 08 hypercarotenaemic and 10 non-hypercarotenaemic subjects showed that no α and β carotenes were present (LOD = 0.5 $\mu\text{g/dL}$) in hypercarotenaemic patient's faeces while the faeces of the 10 non-hypercarotenaemics showed 1.53 $\mu\text{g/dL}$ and 0.7 $\mu\text{g/dL}$, 1.74 $\mu\text{g/dL}$ and 1.0 $\mu\text{g/dL}$, 1.0 $\mu\text{g/dL}$ and trace amounts, 1.8 $\mu\text{g/dL}$ and 1.4 $\mu\text{g/dL}$, 1.2 $\mu\text{g/dL}$ and 1.0 $\mu\text{g/dL}$, 1.6 $\mu\text{g/dL}$ and 0.9 $\mu\text{g/dL}$, 1.0 $\mu\text{g/dL}$ and 1.3 $\mu\text{g/dL}$ and trace amount and 0.7 $\mu\text{g/dL}$ of β and α carotenes respectively per one gram of freeze dried faeces. This indicated that the mechanism responsible for controlling absorption of carotenoids in hypercarotenaemics to be deranged which again could be due to a genetic factor.

A study in determining the proportion of hypercarotenaemics among pre-school children aged below 5 years in the Western Province showed that the proportion was 1.5%. However, the proportion of hypercarotenaemia among subjects fed carotenoid rich food was approximately 2%. This observation was made irrespective of vitamin A mega dosing.

Animal studies were designed originally to determine the biliary excretion product(s) of carotenoids in hypercarotenaemia induced Wistar rats and ICR mice with the intention

of studying the carotenoid metabolism. This was unsuccessful as neither breed, despite being fed on high carotenoid rich diet, developed hypercarotenaemia. The serum, liver, adipose tissue around the kidneys, bile (in mice), digesta (in rats) did not show carotenoids. However both types of rodents had high levels of α and β carotenes in the faeces similar to the human fecal study. This indicates that one natural way of preventing hypercarotenaemia is by controlling the absorption of carotenoids.

This study proves that the genes responsible for synthesis of proteins which are responsible for metabolism and/or absorption of carotenoids are not common in the group studied.

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