IODINE AND THIOCYANATE IN GOITER – HOUSE OF BAMBOO

Abbreviations:

ID = iodine deficiency

Endemic goiter has been recognized in many parts of the world for centuries. Following the discovery of iodine in the early 19th century iodine deficiency (ID) was recognized as major cause of goiter about 100 years later in the early 20th century. During the latter half of that century it was realized that there is a spectrum of iodine deficiency disorders and that ID was one of the most important causes of mental impairment on the planet (1). The treatment of ID by improving iodine nutrition, usually by the introduction of iodized salt, has been a major public health success story although there are many areas of the world (including parts of Europe) which are still iodine deficient in the 21st century. Correction of ID results in a reduction in goiter rate as well as improvements in mental performance particularly in children (2).

In the 1960s and 1970s it was noted that goiter reduction was not consistently observed following adequate iodization in areas of Africa which had been known to be iodine deficient (3). Attention focused on cassava consumption as it was known that this may result in goiter due to the concentration of thiocyanate which is released in variable amounts depending on the method of cooking cassava (4).
As reported in this issue of *Endocrine Practice* (5), workers from India have suggested that the presence of goiter in Manipur, North East India may in part be related to the consumption of bamboo shoots. The authors studied 4852 schoolchildren and noted satisfactory iodine concentrations in the urine as well as in household salt samples and water. However, the goiter rate was 31%, which although high, had shown a considerable improvement following iodization. It is known that people resident in this area of India traditionally consume large amounts of bamboo shoots. Measurement of thiocyanate concentrations in the urine showed high levels although the iodine/thiocyanate ratio was around 18, far above the values of 7 or less which have been considered indicative of thiocyanate induced goiter in Zaire (3). However the urinary thiocyanate levels were higher in goitrous children than their non goitrous colleagues. The authors point out that the role of thiocyanate in goitrogenesis is critically dependent on the balance between iodine supply and thiocyanate in the diet. Endemic goiter was associated with an I/SCN ratio of around 3 (normal >7) but several factors - discussed by Chandra et al.- suggest that reliance on this ratio may be misleading. The mathematical calculation of the ratio has not been standardised. The statistical distribution of individual ratios implies that the median and mode should be used rather than the mean. Urinary excretion of thiocyanate will not reflect serum levels if the latter are so high that the renal threshold is exceeded. Lastly, wide seasonal variation in thiocyanate levels due to variations in cassava consumption have been described which will affect goitrogenesis. Clearly, an up to date review of the interpretation of the iodine thiocyanate ratio as an indicator of goitrogenesis due to thiocyanate exposure is indicated.

Chandra et al sought confirmatory evidence of the pathogenetic role of bamboo shoot consumption by measuring cyanogenic glucosides, glucosinolates and thiocyanate content of the shoots from the study area and also from a control area (Tripura). Results confirmed that all three goitrogenic substances were in higher concentration in shoots from Manipur.
compared to those from the control region. Furthermore, administration of bamboo shoots to rats in their daily feed for 45 days resulted in thyroid hypertrophy, reduced serum thyroid hormone concentrations and impairment of thyroid peroxidase activity in the thyroid gland. These data strongly supports the view that bamboo shoot consumption in the Manipur area of NE India is a significant risk factor for goiter development. It is interesting that bamboo shoots from a nearby region were not so goitrogenic and further botanical study of these species is awaited.

This study emphasizes the complex etiology of goiter in a given area. While iodine deficiency is accepted as the commonest cause of goiter and reduced thyroid function, improvement in iodine nutrition does not always result in complete cure of the problem. Other nutritional factors may also contribute to changes in thyroid physiology, as in Manipur. It is important to appreciate that these nutritional factors may vary within short distances and also may vary due to cooking practice.

The public health implications of this study are important. Ideally bamboo shoots should be avoided, especially in children. This is probably impossible to achieve so an alternative strategy may be to increase the iodine intake above normal levels to try and counteract the goitrogenic action of the shoots. This has recently been suggested as an appropriate therapeutic approach in rescuing the endangered species of giant panda (Ailuropoda melanoleuca) by improving their reproductive capacity (6). Our understanding of the relationship between ID and thiocyanate has been improved by the study of Chandra et al. which will benefit man and animals.

**DISCLOSURE**

The author has no multiplicity of interest to disclose.

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