Environmental controls in Iodine Deficiency Disorders (IDD)

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It is estimated that in excess of one billion people world-wide are at risk from iodine deficiency disorders (IDD), the most obvious manifestation of which is goitre (see Fordyce, 2000). Iodine deficiency is the world's most common cause of mental retardation and brain damage, and the negative effects of impaired mental function have a significant impact on the social and economic development of communities. Although IDD can be caused by a number of factors, goitrogens for example are substances that interfere with the correct functioning of the thyroid gland; the simple cause in rural self-sufficient communities is a lack of iodine in the environment.

A search of literature on the subject of IDD will reveal much information on symptoms, assessment and treatment but very little on its primary cause – a lack of readily available iodine in the environment. The medical community is well organised when it comes to tackling the problems of IDD mainly through the work of the International Council for the Control of IDD (ICCIDD). Programmes which add iodine to salt have made a significant impact in reducing the risks of IDD in many countries of the world, but this type of medical intervention is not always successful and other strategies are required.

The UK Department for International Development (DFID), through its Knowledge and Research (KAR) geoscience programme, is funding the British Geological Survey to study environmental solutions to tackling the risks of IDD. With a better understanding of the behaviour of iodine in the environment, the availability of this precious trace element in the food chain can be better managed. This is particularly important in environmental supplementation schemes such as adding iodine to irrigation waters or the use of iodine-rich fertilisers.

The iodine fixation potential of soils needs to be more clearly defined. It is no use adding iodine to a soil that has no potential for holding onto it otherwise the iodine will just be lost from the soil to water or be volatilised to the atmosphere. Similarly, if the soil fixes the iodine too strongly it will not be available for uptake in crops.

Our knowledge of the geochemistry of iodine in the environment is limited, mainly because the analytical methods required for the determination of the element are not routine thus is it often excluded from systematic geochemical surveys. However, in the past decade, improved analytical methodologies and an interest in iodine from different, largely independent, perspectives have added much to our knowledge. Exploration geochemists have shown an interest in using iodine as a pathfinder element to locate deeply buried mineralisation. Atmospheric scientists have demonstrated the importance of atmospheric cycling of this element both from oceans and the soil-plant-atmosphere interface. Also, a further medical concern is the incidence of thyroid cancer caused by the ingestion of radio-nuclides of iodine. Nuclear scientists have been interested in modelling the passage of this relatively mobile element through the environment.

There are some perpetuated myths concerning the distribution of iodine in the environment, such as those connected with low levels in glaciated soils and the relationship between iodine levels in soils and distance from the sea. It is isolated communities in highland areas that are most at risk from IDD. Is this risk just because of remoteness or are these environ- ments really iodine deficient? The current project hopes to clarify some of these questions and make readily available a clearer picture of iodine geochemistry to those scientists working in the field of IDD. Information will be disseminated from the project's web site at http://www.bgs.ac.uk/dfid-kar-geoscience/idd.

A better understanding of the distribution and behaviour of iodine in the environment creates another tool in the kitbox of measures that can be employed to tackle the world-wide risks of IDD.

Fordyce F M. 2000. Geochemistry and Health – why geoscience information is essential. Geoscience and Development. No. 6. p 6- 8.