A contribution for the IDD Newsletter to introduce the DFID Iodine project to those working in the field of IDD (predominantly medics).

Environmental controls in IDD - what do we really know?

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Search any library or the internet for information on iodine deficiency disorders (IDD) and you will find volumes of information on symptoms, assessment and treatment but very little on its primary cause - a lack of readily available iodine in the environment. A recent search of the World Wide Web revealed numerous links and discussions concerning IDD, all medically related, but not a single reference to the behaviour and distribution of iodine in the environment. The medical community is well organised when it comes to tackling the problem of IDD, as exemplified by the activities and information dissemination of the ICCIDD. Unfortunately, amongst earth scientists who have an interest in the geochemistry of iodine there is not such a good forum for discussion and dissemination. Not since the Chilean Iodine Educational Bureau's works of the 1950's has there been any concerted effort in the scientific community to widely disseminate information on iodine.

In recent years data on the distribution of iodine at the earth's surface has been approached from four different and largely independent perspectives.

Firstly, workers in the field of iodine deficiency disorders, dominated by researchers with a medical background, have done case studies in which a variety of materials from the environment have been analysed and results published. Much of the data on iodine geochemistry from the early years of the last century owes its origin to this type of research.

In the 1970's and 1980's there was interest in the geochemistry of iodine from scientists involved in mineral exploration. Iodine in brine solutions is associated with some of the ore forming processes and so it can be found within zones of mineralisation in the earth's crust. As iodine is a mobile element it will migrate a long distance from its source so it can be used as an indicator element ("pathfinder" element) for the location of deeply buried mineral deposits. Much of this work was done in the USSR and yielded a lot of information concerning iodine's behaviour in rocks and soils.

More recently, the majority of research into the behaviour of iodine in the environment has been connected to the nuclear industry and the threat posed by radionuclides of iodine in the environment. In the aftermath of nuclear accidents I-131 readily finds its way through the food chain to humans where it is preferentially concentrated in the thyroid and may lead to thyroid cancer. I-131 has a half-life of only 8 days but I-129, which is less radioactive, remains for a much longer time with a half-life of 16 million years. Research in this field, principally connected with the safe disposal of radioactive waste, has led to a much better understanding of the migration of iodine in the environment. Particularly, soil fixation of iodine by different components of a soil along with volatilization to the atmosphere from the soil-plant interface are both far more significant in the geochemical cycle of iodine than previously recognised.

Finally, there has also been a small but significant interest in the oceanic and atmospheric distribution of iodine. An increasing understanding by marine scientists of how and where iodine is concentrated by algae in hot spots in the middle of the oceans and near the coast has improved our understanding of how iodine is transferred from the ocean to the atmosphere. This has supplemented analyses of air masses showing sources and transport of mainly particulate iodine.

Despite these interests the flow of data on iodine's behaviour in the environment has often been less than desirable because of the analytical methods used for the determination of iodine in environmental materials. Iodine is not an element that is routinely determined in most geochemical or environmental surveys as its generally low levels require separate methods from the majority of elements routinely determined. Techniques for the determination of iodine have improved over the past few decades and this had led to much more information regarding levels of iodine in the environment becoming available. Early researchers only tended to publish data for materials in which iodine could be measured, giving rise to mean values for rocks and soils much higher than those generally recorded today.

There are some perpetuated myths concerning iodine in the environment, such as those connected with glaciated soils and the relationship between iodine levels in the environment and distance from the sea. Communities in remote highland regions are said to be most at risk from IDD. Is this risk just because of remoteness? Are highland areas really iodine-deficient and just what is meant by an iodine-deficient environment? The British Geological Survey, funded by the UK Department for International Development, has just commenced a three year project looking at the environmental controls of IDD. The project hopes to address some of these questions and make resources concerning iodine's behaviour in the environment more available to any researchers with an interest in IDD. Information will be disseminated from the project's web site at http://www.bgs.ac.uk/dfid-kar-geoscience/idd . Hopefully, this site will be recognised as useful by many interested in IDD, not just geochemists, and links made from other iodine and IDD sites.

A better understanding of the distribution and behaviour of iodine in the environment creates another tool to tackle the worldwide risks of IDD. Environmental intervention schemes could be developed that make more efficient use of the iodine that is already there in the environment but not currently available to the food-chain. Certain environmental conditions are known to fix iodine in the soil and hence restrict its bio-availablity. Some research has demonstrated how certain land management activities (e.g. drainage improvements) have led to problems of IDD amongst livestock. In schemes where iodine is added to the environment by irrigation water or by fertilizers, our knowledge of the geochemistry of iodine will help to ensure that the precious iodine is not lost by volatilization to the atmosphere or taken out of the food-chain by being too strongly fixed in the soil. Every soil will have a certain potential to fix or release iodine and we need to develop better understanding and methods to determine just what this is.

We do know a lot about more about the behaviour of iodine in the environment than we did ten years ago. The different lines of research need to be brought together to present a more comprehensive account of iodine geochemistry that is made more readily available to workers in the field of IDD. It is hoped that our current project will achieve this aim.