History of iodine research

Basil Hetzel’s groundbreaking iodine study in Papua New Guinea in the 1960s now a ‘classic’

The following article contains excerpts from the commentary paper: “Epidemiology, iodine deficiency and the power of multidisciplinary sufficiency” by Anthony McMichael in the International Journal of Epidemiology (published online on May 13, 2012). It celebrated the recognition of the paper: “Neurological damage to the fetus resulting from severe iodine deficiency during pregnancy” published in the Lancet in 1971, as a ‘classic’ paper.

It is pleasing to see this article (1) being accorded ‘classic’ status. Around 1970, Basil Hetzel, Foundation Professor of Social and Preventive Medicine at Monash University, Melbourne, Australia—and supervisor of my (unrelated) PhD—saw clearly the need and opportunity to pursue a program of research for which this classic article is the prime foundation. The program sought, via epidemiological research and then animal experimental studies, a fuller understanding of the developmental and health consequences of lifelong iodine deficiency.

University, there were occasional frissons of excitement relating to the ongoing randomized controlled trial of cretinism prevention in newborns in a sample of villages in the PNG highlands. The intervention, in 1966, entailed intramuscular injection of reproductive-aged, alternate, women with iodized oil or saline. Follow-up of pregnancy outcome occurred over the next 3 years, via copious boot-leather epidemiology in the mountainous PNG highlands. This classically experimental study was a relatively novel epidemiological research design in the late 1960s—and especially so for non-communicable disease outcomes. Hetzel was fortunate to have able and energetic field-working colleagues, well-attuned to tramping around the PNG highlands—Drs. Ian Buttfield and, especially, Peter Pharoh. The support from the PNG Department of Public Health was also invaluable.

Meanwhile, back in Australia, the other side of the ‘iodine coin’ was causing public health concern. Tasmania, with its longstanding problem of iodine deficiency and adult goiter, had introduced iodine-supplemented bread in 1966. At that same time, coincidentally, iodine-based sterilizers (iodophors) were introduced into the dairy industry to ensure a safe milk supply. This became a second, unintended, source of iodine supplementation in the diet. A subsequent rise in thyrotoxicosis occurred due to over-exposure to supplementary iodine and, hence, overactive thyroid glands. Hetzel was called in as an advisor. Here was further confirmation of a central role for dietary iodine imbalance as a source of various human health disorders.

Few in the epidemiology research arena have the chance to test and elaborate their ideas in the realm of animal experimental research. In 1975, Basil Hetzel took the opportunity to take over as head of a revamped branch of the Australian Government’s CSIRO (Commonwealth Scientific and Industrial Research Organization). This now became the Division of Human Nutrition, based in Adelaide, South Australia. A sequence of experimental studies of iodine deficiency in pre-pregnant animals was carried out first in sheep and then in marmoset monkeys. This stage of the research story made clear that the iodine deficiency caused abnormal development of the fetal cortex and cerebellum; growth retardation and stillbirths and abortion.

Following Hetzel’s clarification of the syndrome of IDDs in the early 1980s, IDD prevention became part of modern, global, public health architecture. This ‘translational’ step is where the really hard work often begins. How to actually prevent disorders and diseases for which there is now clear empirical evidence of major risk factors? Hetzel and colleagues saw that, in the long haul, it was going to be necessary to esta-
lish an authoritative body to deal with international agencies and national governments. In 1985, they established an international NGO, the International Council for the Control of Iodine Deficiency Disorders (ICCIDD).

In the wake of successful lobbying and negotiation at the international level, with the WHO and UNICEF in particular, the ICCIDD was then able to assist in the development of a global program of elimination of IDDs. Basil Hetzel was executive director during 1985–95, and then chairman during 1995–2001. Today, the ICCIDD comprises a global network of >800 professionals. This network includes epidemiologists, endocrinologists, salt chemists, media experts and others.

The ongoing program of iodine supplementation, led by WHO, has not been a straightforward path to continuing prevention. Cultures and governmental capacities differ, and population diets and environmental conditions change over time. In 2007, WHO therefore took action to require countries to monitor and report on their IDD control programs. Even so, iodine deficiency has been reappearing in various parts of the world in recent years, including in some locations in Australia. As ever with environmental health, there is need for continuing vigilance – especially as expanding populations farm on increasingly marginal land and deplete iodine from the soil.