Global or Gaelic epidemic of hypothyroidism?

Something peculiar about the occurrence of hypothyroidism warrants consideration and further investigation. Recent epidemiological studies have shown a nine-fold difference in the number of new cases of hypothyroidism diagnosed in Tayside, UK, and in Denmark (figure). Most cases of hypothyroidism are caused by gradual thyroid failure, which is presumably of autoimmune origin. Once clinical suspicion has been raised, diagnosis, therapy, and control are often straightforward and care is not confined to any particular part of the health-care system. Therefore, no overall recording takes place, and few studies have examined the incidence in large unselected populations.

In 2002, Bülow Pedersen et al published results of a Danish survey in which new cases of overt hypothyroidism were investigated.

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hypothyroidism (high and low concentrations in serum, respectively, of thyroid-stimulating hormone and thyroxine) had been prospectively recorded in more than half a million people with mild to moderate iodine deficiency. Data were collected before the start of the Danish iodine-fortification programme. Recently, R Flynn and colleagues\(^1\) reported a much higher incidence rate of hypothyroidism in the population of Tayside. The remarkable difference in results between the two studies may be caused by differences in methods, environment, and genes.

There were differences in methods, but it is difficult to imagine how these should introduce a nine-fold difference in results. Methods were evaluated extensively in both studies. Moreover, the Whickham, UK, study\(^3\) of 2000 people followed up over 20 years and a previous Danish population-based study\(^4\) of 280 000 people studied over 2 years gave similar high and low incidences.

Several environmental factors alter the risk of thyroid disease, the most important being the level of iodine intake.\(^5\) One might speculate that the cause for the difference in occurrence of hypothyroidism depicted in the figure is a difference in iodine intake. Urinary iodine in the Tayside population was around 140 µg/L,\(^1\) which is considerably higher than in the Danish study,\(^2\) but within recommended limits.\(^6\) If the higher iodine intake of the UK population is the cause for the much higher incidence of hypothyroidism, this may imply that the occurrence of hypothyroidism will increase considerably in the world. During the past two decades iodine intake worldwide has increased tremendously. Nearly 70% of the world’s population is now more or less covered by some iodine-fortification programme, to prevent iodine-deficiency disorders.\(^7\) The most severe consequence of iodine deficiency is developmental brain damage.\(^6\) The Danish iodine programme is the first to monitor prospectively the effect of an increase in population intake of iodine on the incidence of hypothyroidism. Reassuringly, preliminary data have not revealed major increases, but it is far too early to give conclusions.\(^8\)

In the UK, iodine intake was once relatively low, with areas of endemic goitre. Endemic goitre disappeared as part of “an accidental public health triumph” caused by farmers’ use of iodine-rich feeding of dairy cows.\(^9\) In 1987 Hall and Lazarus\(^10\) called for monitoring but it is largely unknown how this shift in intake of an essential nutrient affected disease in the population. Similar unplanned increases in iodine intake occurred in the USA, mostly caused by bakers’ use of iodine-containing conditioners for bread. Some degree of hypothyroidism is common in the USA population,\(^11\) but the association with a previous shift in level of iodine intake is unclear.

Another cause for the difference in hypothyroidism epidemiology might be differences in genes.\(^11\) It can be hypothesised that the early Gaelic population in the UK and Ireland had a genetically determined propensity to develop hypothyroidism when exposed to iodine. Emigration from these areas may now have effects elsewhere. For example, increased concentrations of thyroid-stimulating hormone in serum is very common in Iceland.\(^1\) The high prevalence of thyroid failure might be caused by high intake of iodine in Iceland,\(^5\) but genes may also be involved. Iceland was inhabited around AD 900, mostly by Norwegian Vikings fleeing persecution by the Norwegian king and looking for better prospects. On their sailing they brought many women from northern UK and Ireland to Iceland, as revealed by studies of mitochondrial DNA.\(^12\)

The mechanisms behind the very high incidence of hypothyroidism in the UK and some other populations

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### Figure: Age-specific incidence rates of primary hypothyroidism in Tayside, UK, and in Denmark\(^{11,12}\)

Overall incidence in Tayside was 3469 new cases during 1166 216 person-years of follow-up (incidence rate 297 [95% CI 288–308] per 100 000 per year). In Denmark, incidence rate was 27 (21–32) in subcohort with urinary iodine 45 µg/L (96 new cases during 361 811 person-years) and 40 (32–48) in subcohort with urinary iodine 61 µg/L (98 new cases during 244 516 person-years). Graph shows combined data from the two Danish subcohorts. For calculation of age-specific incidence rates, all age groups in both populations were adjusted to male/female ratio of 1/1.

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should be clarified to allow for optimal prevention. If the propensity to develop hypothyroidism has a genetic background, this may not be modifiable. However, screening for hypothyroidism (eg, in pregnant and elderly women) might be cost effective in some populations.

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I declare that I have no conflict of interest.