Vitamin D and the Risk of Developing Multiple Sclerosis for British and Irish Migrants to Australia

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Hammond et al. (2000) recently documented that British and Irish immigrants to Queensland, Australia, situated at latitude 120-280, had a striking 75% reduction in their risk of developing multiple sclerosis (MS) when compared with that of their native countrymen. Importantly, this reduction affected both adult and child immigrants. Furthermore, using migration data from the other Australian provinces, they elegantly demonstrated that the reduction in MS risk for the relatively genetically homogeneous British and Irish immigrants progressively lessened with increasing latitude, finally reaching zero risk reduction in the Hobart area of Tasmania, the highest latitude area (420) of Australia. These results, which overcome weaknesses in previous migration study designs (Gale and Martyn 1995), provide the strongest evidence to date that an environmental factor, which protects both adults and children against the development of MS, is abundant in Queensland at latitude 120-280, but lacking in Tasmania at latitude 420.

Identifying this unknown protective factor, which has been postulated for many years (Visscher et al. 1977), is crucial, because it could suggest how to prevent MS in susceptible individuals living at higher latitudes. Although Hammond et al. (2000) did not attempt to interpret the nature of the protective factor, they provided an important new clue: the factor must benefit both children and adults, in addition to varying substantially and systematically with latitude. One prevalent interpretation is that the latitude-linked protective factor may be early contraction of a common transmissible agent such as Epstein-Barr virus (Gale and Martyn 1995). This interpretation is inconsistent with the Hammond et al. (2000) finding that the protective factor is effective for adult immigrants.

We would like to point out that a hypothesis involving vitamin D supply as a protective factor is entirely compatible with the results of Hammond et al. (2000). Sunlight intensity, and consequently the vitamin D supply, varies substantially and decreases systematically with increasing latitude (Holick 1995), and sunlight exposure could benefit all age groups. Furthermore, a vitamin D metabolite was shown to be a potent inhibitor of an experimental autoimmune disease that serves as a model for MS (Hayes in press).

Additional studies support the concept that vitamin D supply may be a protective factor for MS. Sunlight intensity and therefore the vitamin D supply varies substantially with season. In Queensland (120-280) vitamin D synthesis occurs year-round, but in Tasmania (420), there is not enough sunlight intensity for vitamin D synthesis from November through February (Webb et al. 1988). Embry et al. (in press) pointed out that the nadir in vitamin D supplies correlated with both the peak of MS lesion activity in German MS patients (Auer et al. 2000) and the peak of MS disease onset in Switzerland (Wüthrich and Rieder 1970). Another relevant study is a very large and well-controlled epidemiological survey (Freedman et al. 2000) that demonstrated that individuals who had the highest residential and occupational sunlight exposure had a substantially lower mortality risk from MS (odds ratio 0.24). The beneficial effects of sunlight exposure as regards MS mortality risk were independent of country of origin, age, sex, race, and socioeconomic status.

It is unlikely that some other aspect of sunlight, as suggested by Hutter and Laing (1996) and McMichael and Hall (1997), will turn out to be the main protective factor because low rates of MS can occur in areas with low winter sunlight intensity, if dietary practices, such as high fish consumption, supply high intakes of vitamin D (Goldberg 1974).

The robust and diverse database which points to vitamin D supply as a protective factor for MS underscores the urgent need for further research. The level of vitamin D nutrition that may inhibit MS is not known. Studies measuring serum 25-hydroxyvitamin D3 (25(OH)D) (the best indicator of current

vitamin D supplies) in MS patients and correlating these with MS disease activity are needed to provide guidance on optimal vitamin D levels from the perspective of established MS. Further, clinical trials are needed to test improved vitamin D nutrition as a possible MS prevention strategy, as well as a possible treatment for established MS.

Until such trials are conducted, clinicians may want to monitor the vitamin D status of their MS patients, many of whom display reduced bone mass and high fracture rates indicative of vitamin D deficiency (Nieves et al. 1994), and ensure that their patients have adequate vitamin D intakes. In low sunlight areas (>35o lat.), an intake as high as 3000-4000 IU/day of vitamin D (1000 IU for children) may be required to inhibit MS on the basis that this intake approximates vitamin D synthesis and 25(OH)D levels in individuals who live and work in low latitude, sunny climates where the MS risk is lowest (Vieth 1999). This intake is known to be safe (Vieth 1999).

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