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Dietary risk factor

Nasopharyngeal carcinoma (NPC), a rare tumour in most parts of the world, occurs in high frequencies in China and South-East Asia. It is particularly high among the Southern Chinese in China itself and wherever these Chinese migrate, including Singapore[1]. Study of NPC is receiving attention because of the complex interaction of genetic, viral and other environmental factors that may be associated in the aetiology of this cancer[2]. A hypothesis proposed by Ho[3] states that NPC in Southern Chinese is a consequence of three interacting factors, namely genetically determined susceptibility, early infection by the ubiquitous Epstein-Barr virus (EBV), and regular consumption of traditional Cantonese diet, especially salted fish. Further epidemiological observations by Geser *et al.*[4] and Anderson *et al.*[5] in Hong Kong confirmed that feeding salted fish to babies during weaning was a major risk factor. A case–control study conducted among Malaysian Chinese showed that consumption of salted fish during childhood was a significant risk factor for NPC in this population[6]. Another case–control study of NPC in Guangxi region of Southern China, which has the second highest death rate from NPC of all regions in China, showed that exposure before the age of 2 years to salted fish emerged as a risk factor, but, in comparison with previous findings among Cantonese, other preserved foods were also independent risk factors[7]. More recently Morton and Benjamin[8] studied the incidence of NPC among Pacific island Polynesians because the Pacific islands were probably colonized by eastward migration from Asia between 3000 BC and 100 AD[9]. Morton and Benjamin suspected that the genetic predisposition for NPC among Chinese may have been carried into the Pacific. They observed that there is a gradient from Europeans through Pacific island Polynesians to Chinese throughout the age range. They also suspect that exposure to salted fish in the diet in childhood may be associated with the genesis of NPC in Polynesians.

In India, Misra[10] indicates that incidence of NPC in the northeastern part of India is relatively high, 1.9% of total carcinoma cases compared to the all-India average of 0.6% cases. He further stated that about 55.6% of these NPC cases belonged to the tribal population of Nagaland. Our data, collected during the years 1988 and 1989 from different hospitals of the NE region of India, indicate that about 55% of total NPC cases were from the state of Nagaland. Taking the 1981 census figures for population of Nagaland, about 0.414 million males and 0.359 million females, it appears that the incidence of NPC is about 62 and 21 per million males and females respectively[11].

While looking for possible environmental factor(s) we visited various places in Nagaland and noted that most of the Naga people live in ill-ventilated houses without a separate kitchen (particularly in rural areas). They keep firewood burning for heating, cooking and lighting. A bamboo shelf hanging over the fireplace is meant for smoke-drying meat and other foodstuff for preservation and for future consumption. In clastogenicity tests of soots collected from different houses of Nagaland, the soots produced sticky chromosomes, chromosome bridges and fragments in root-tip cells of *Allium cepa*[12]. Smoke meat extract (SME) was found to be mutagenic in the Ames test with or without S9 mixture and was clastogenic in a mammalian test system[13]. SME also has the potential to induce skin papilloma as well as systemic tumour in Swiss bare mice[13]. Our studies on SME also suggest that it induces abnormality in sperm head shape in Swiss albino mice[11]. Seth[14] demonstrated high EBV antibody in the sera of all six cases he tested from this region.

On the basis of these findings, we subscribe to the Ho hypothesis that NPC is a consequence of three interacting factors. We suspect that genetic susceptibility and EBV infection being common factors for the populations of South China and Nagas of Nagaland in India, the third factor in Nagaland is smoked dried foodstuff in place of the salted fish of Cantonese style in South China.

A comparison of the HLA profile of the people at risk in South China, which has been worked out, with that of the population of Nagaland, which has not yet been worked out, may reveal another interesting aspect of NPC, a disease that shows clustering in different geographical areas of the world.

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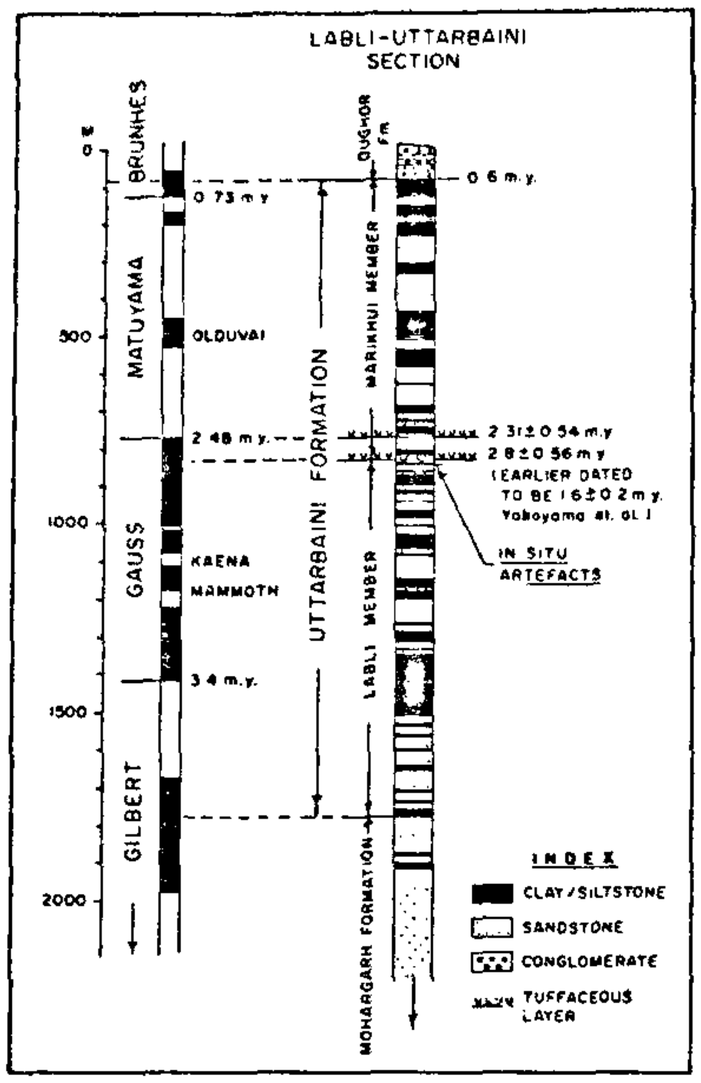
Siwalik Stone Age culture

Sites associated with the Siwalik Stone Age[1] culture (Early Palaeolithic tool types) are known to occur all along the Himalayan foothills extending from Jammu (Jammu & Kashmir) to Nepal, as well as the Trans-Himalayan region of Ladakh[2–7].

A site near Uttarbaini (J & K) yielded artefacts of this culture below a tuffaceous layer in the Upper Siwalik (see figure). This layer was earlier dated by the fission-track method to 1.6 ± 0.2 million years before present (Myr BP)[8,9]. Ranga Rao *et al.*[10] dated the same tuffaceous layer to 2.8 ± 0.5 Myr BP by the same fission-track method. This date appears to be compatible with the regional palaeomagnetic profiles of the Upper Siwalik of both India and Pakistan. As the revised age for the tuffaceous layer has a direct bearing on the age of the associated stone artefacts, it necessitates a revision of the dates of the Siwalik Stone Age culture also. The revised temporal range of the Siwalik Stone Age culture is between 2.8 ± 0.56 Myr and 0.5 Myr BP, making this culture the oldest known so far from the Indian subcontinent.



Relationship of Uttarbaini Formation with Standard Magnetic Time Scale and the level of the dated tuffaceous layers and the recorded artefacts, Uttarbaini section, J & K (palaeomagnetic and age data from ref. 10).

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