In our article[1], we did not intend to misinterpret Nicholson and Flohn[9] when citing their hypothesis of distinct latitudinal shifts of the subtropical climatic belt from interglacial to glacial times. Accidental over-simplification of the alternatives may be one of the reasons for the apparent wrong citation. On the other hand, we feel rather corroborated in our statement by the comments of Nicholson discussed above.

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Western diets and faecal nitrosamines

THE paper by Suzuki and Mitsuoka[1], while apparently demonstrating clear differences in nitrosamine production in individuals on different diets, makes unwarranted claims for the significance of these findings.

Japan has a low incidence rate of large bowel cancer compared with the United States[2] or Australia[3]. International correlation studies[4,5], studies of subcultures within societies[6], and case-control and cohort studies of individuals[7–10] have implicated dietary factors in colon carcinogenesis. Current hypotheses involve fat[4,9,11], fibre[9,11], alcohol[11], female sex hormones[12], vitamin A[13], and cruciferous vegetables[8] either as promoting colon cancer, via endogenous and bacterial bile acid metabolism, or as protective agents.

To test the hypothesis that a balanced Western diet constitutes a greater risk of exposure to nitrosamines (which act as initiating agents in some cancers) it is necessary to design an experiment which actually uses a balanced Western diet. The diet used by Suzuki and Mitsuoka bears no resemblance to a normal Western diet. Specifically, the energy content of a typical Western diet[14,15] is 9.7–10.5 mJ per day, compared with 11.8 mJ per day in the study of Suzuki and Mitsuoka. As a percentage of energy, protein intake is normally 12–15% (as opposed to 25%), fat ~40% (compared with 55%), carbohydrate ~45% (as opposed to 20%). In some European countries, certain vegetables may be consumed for breakfast but nowhere are salad vegetables eaten for breakfast. Indeed these vegetables were deliberately added to the 'typical' Western breakfast to increase nitrate intake. This ensures a good test of an hypothesis but not the one we are led to believe is being tested by the authors.

Although Suzuki and Mitsuoka have established that a very high protein and fat diet with a large intake of nitrate increases the faecal output of nitrosamines, they have not demonstrated that this has anything to do with differences existing in the real world.

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SUZUKI AND MITSUOKA REPLY—We agree with Potter that the diet used in our study does not exactly resemble a typical Western diet. To determine that nitrosamine formation in the intestine depends on diet, we used in our experiments a diet which contained a large amount of nitrosamine precursors. Our study demonstrated that the faecal output of nitrosamines was increased by this kind of Western-style diet. However, we cannot implicate these diets directly in the aetiology of colon cancer. Further investigations of nitrosamine formation in the intestine in populations of high and low risk for colon cancer are necessary.

With respect to the p.p.b. analysis of nitrosamines in biological specimens, there are several problems associated with artefacts and contamination during the analysis. Nitrosamines are generally extracted from the specimens in alkaline conditions, because this inhibits nitrosation. We have noticed recently, however, that artificial formation of nitrosamines occurs in these conditions. This reaction seems to resemble the 'alkali effect' reported by Tozawa[1]. We have used 1 mM of morpholine to monitor artificial nitrosamine formation during the analysis, as morpholine is nitrosated 500 times more readily than piperidine[2]. However, we have recently found that morpholine is more difficult to nitrosate than piperidine in alkaline conditions, which renders morpholine unsuitable for use as a monitor of possible artificial formation of nitrosamines. We are re-investigating the faecal output of nitrosamines, thus our data[3] may require correction.

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