7 To go abroad for postdoctoral work: 1. Workshops on indology, literature, arts, music – anything to learn to cherish, to pass the idle moments and as a salve to bruised egos when treated as second-class citizens or as mere slaves 2. Workshops on martial arts to prevent getting mugged

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SCIENTIFIC CORRESPONDENCE

Antioxidants: Helpful or harmful?

In the light of the popular hypothesis that consumption of dietary antioxidants or supplementation of antioxidants protects against degenerative diseases of aging such as cancer, cardiovascular disease, immune system decline, brain dysfunction, cataract, etc., over the past few years, it has become a tenet that taking high doses of antioxidant vitamins like vitamin C, E or β-carotene may protect against a variety of diseases. As a result, 'antioxidant' has become the nutrition buzzword for 1994 (ref. 1) In the light of this popular trend towards antioxidants, many prevention experts nowadays have to struggle to make sense of more recent startling findings that supplements of antioxidants can be harmful[2]. The controversy after the publication of these findings of a large-scale Finnish study on vitamin E and β-carotene is difficult to understand Instead of protecting against cancer, results of this study have clearly shown that supplements of antioxidant β-carotene markedly increased the incidence of lung cancer among heavy smokers in Finland. Total mortality was also reported to be higher among those who took β-carotene. Clearly, the public is confused about the antioxidant vitamins and their benefits. Both advocates and manufacturers of vitamin supplements found these results inconsistent with their own beliefs. But the fact is that these results come from a large, randomized clinical trial – the gold standard test of medical intervention.

A similar type of controversy also exists about the supplementation of vitamin C and E[3,4]. However, so far, the beneficial effects of β-carotene, a precursor of vitamin A, were never questioned. In some circumstances, vitamin E supplementation, instead of protecting against heart attack, may promote excessive bleeding and can be harmful[3]. Large doses of vitamin E enhance immune activity and thus may promote progression of immune and autoimmune diseases (e.g. asthma, food allergy, diabetes, rheumatoid arthritis, multiple sclerosis and lupus)[4]. Large doses of vitamin C can promote kidney stones[3]. Vitamin C is especially dangerous in the presence of high body iron, which promotes the formation of harmful free radicals[5].

To prove the usefulness of antioxidant supplements, a number of intervention studies have already been completed and several others are still underway. A large-scale study conducted in 1993 on a group of nearly 30,000 Chinese with a high frequency of stomach and oesophageal cancer has provided strong evidence to show that 'antioxidant' supplements may protect against cancer[6]. This study showed that nutrient deficiencies promote the development of some types of cancers, and correcting these deficiencies can reduce the frequencies of these cancers. It has been known for quite some time that nutrient deficiencies promote cancers. In the Chinese study, intake of 'antioxidant' vitamins A, β-carotene and E was below the minimal daily vitamin requirements to sustain normal metabolism. Raising the intake of these vitamins above the minimum daily requirement eliminated the deficiencies that promoted the cancers. This study clearly indicates and supports the previous notion that supplementation of antioxidants protects against cancer.

The Finnish large-scale study goes against all the available evidence on the beneficial effects of β-carotene. In this study, 29,133 male smokers participated. These subjects were supplemented daily with vitamin E and β-carotene, both or placebo. Contrary to the expectation, neither of the vitamins prevented lung cancer. In fact, lung cancer rates were 18% higher with β-carotene than with placebo, and there were more deaths due to heart disease. All-cause mortality was 8% higher among those who took β-carotene than among those taking placebo. One of the aims of this trial was to test whether β-carotene prevents lung cancer and this viewpoint was based on several studies which did not indicate any harm. Hence, the findings of this trial were totally unexpected.

The difference between the Finnish study and the large-scale Chinese study is that the Chinese study subjects were deficient in the so-called 'antioxidant' vitamins, whereas the Finnish subjects were not deficient in any of these antioxidants. The other question that can be raised is how far one can extrapolate these findings from the Finnish study to people who are not Finnish male smokers as other studies show protection from β-carotene. The only way to find out whether β-carotene is beneficial or harmful is to wait for the results from other large-scale ongoing clinical trials on antioxidant supplementation. But these trials raise a difficult question that, in the light of Finnish results, is it safe to expose thousands of people to large doses of β-carotene?

In order to understand the beneficial and harmful effects of antioxidants, it is necessary to have a close look at the differences between supplementation of antioxidant vitamins and the natural antioxidant vitamins present in fruits and vegetables. The term antioxidants in biology broadly means fighter against harmful free radicals. In fact, these are redox agents, antioxidant under some circumstances and pro-oxidant, producing billions of harmful free radicals, under other circumstances. Antioxidants in physiologic quantities found in natural foods are often fighter against harmful free radicals, whereas antioxidants in pharmacologic quantities found in supplements often produce billions of harmful free radicals

We need to answer the following questions: 'If I eat carrots or drink

lemon juice for β-carotene or vitamin C, why not take pills of these vitamins for the same effect?' 'Is the effect same or different?' The answer lies in the fact that antioxidant vitamins naturally present in food are a balanced mixture of redox with reduced and oxidized form along with several other compounds which may also be beneficial, whereas every supplement pill, including those containing vitamin C or β-carotene, is unbalanced in this respect. Hence, the naturally occurring antioxidants have many advantages over the synthetic ones.

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On the occurrence of ostracod species from the Kallankurchchi Formation of Ariyalur Group, Tamil Nadu

The Ariyalur Group of rocks have attracted a good deal of attention due to their unique stratigraphic position and this is further enhanced by the presence of prolific fossil assemblage of marine nature. A detailed assemblage of foraminifera was described from these rocks three decades ago by different workers[1–4], but ostracod fauna received less attention compared to foraminifera. However, a few papers on ostracod are available[5–10]. The vertical as well as spatial distribution of ostracodes in the Ariyalur Group is not uniform, and like foraminifera they are rich locally while altogether absent from some beds Over hundred and seventy taxa have been identified so far from the Ariyalur Group[5–11]. They are fairly common in the Sillakkudi Formation (limestone/ calcareous sandstone member 26 m)[6, 10, 11], abundant in the Kallankurchchi Formation (40 m)[6–11], very poorly recorded in the succeeding Ottakkovil Formation (15 m)[6, 11], whereas the Kallamedu Formation (80 m) is devoid of ostracodes.

During the course of a detailed investigation of the ostracod fauna from the Ariyalur Group, Tiruchirapalli district, Tamil Nadu, two ostracod species, namely *Kalyptovalva ovata* (Bosquet) and *Wichmannella* sp. aff. *W. cretacea* Bertels, were found. The find assumes palaeogeographic significance as these species are so far known only from Europe and South America. The object of this paper is to record these species. It was generally agreed that the Ariyalur Group of rocks belong to Campanian–Maastrichtian age[1–6, 12, 13]. But recent investigations on ostracod fauna and calcareous nannoplanktons suggest a Late Campanian–Maastrichtian age[11, 14],

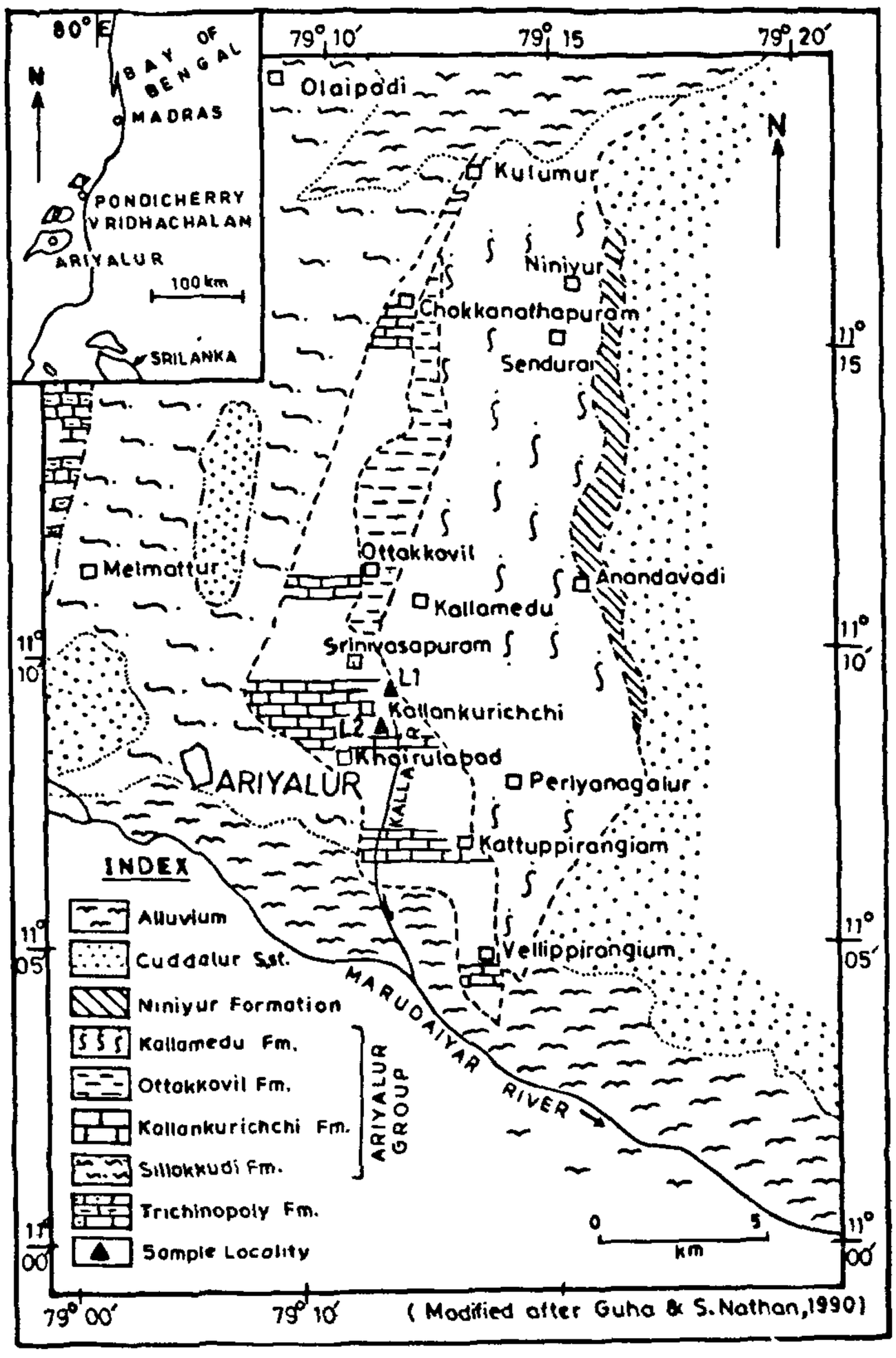

Figure 1. Geological map of the Ariyalur area showing the locations of the samples