A PROFILE OF THE AQUATIC ENVIRONMENT IN SRI LANKA

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We generally consider economic growth and industrialization as key development priorities. The preservation of the aquatic environment has not been given the same weight. In fact, water pollution, until recently considered a lesser problem in developing countries such as Sri Lanka, has now been recognized as a severe one and a major health hazard. In fact the discovery of dead fish in the Kelani river due to the intoxication by industrial effluents draining into the river forced the Central Environmental Authority (CEA) to devise laws pertaining to environmental protection.

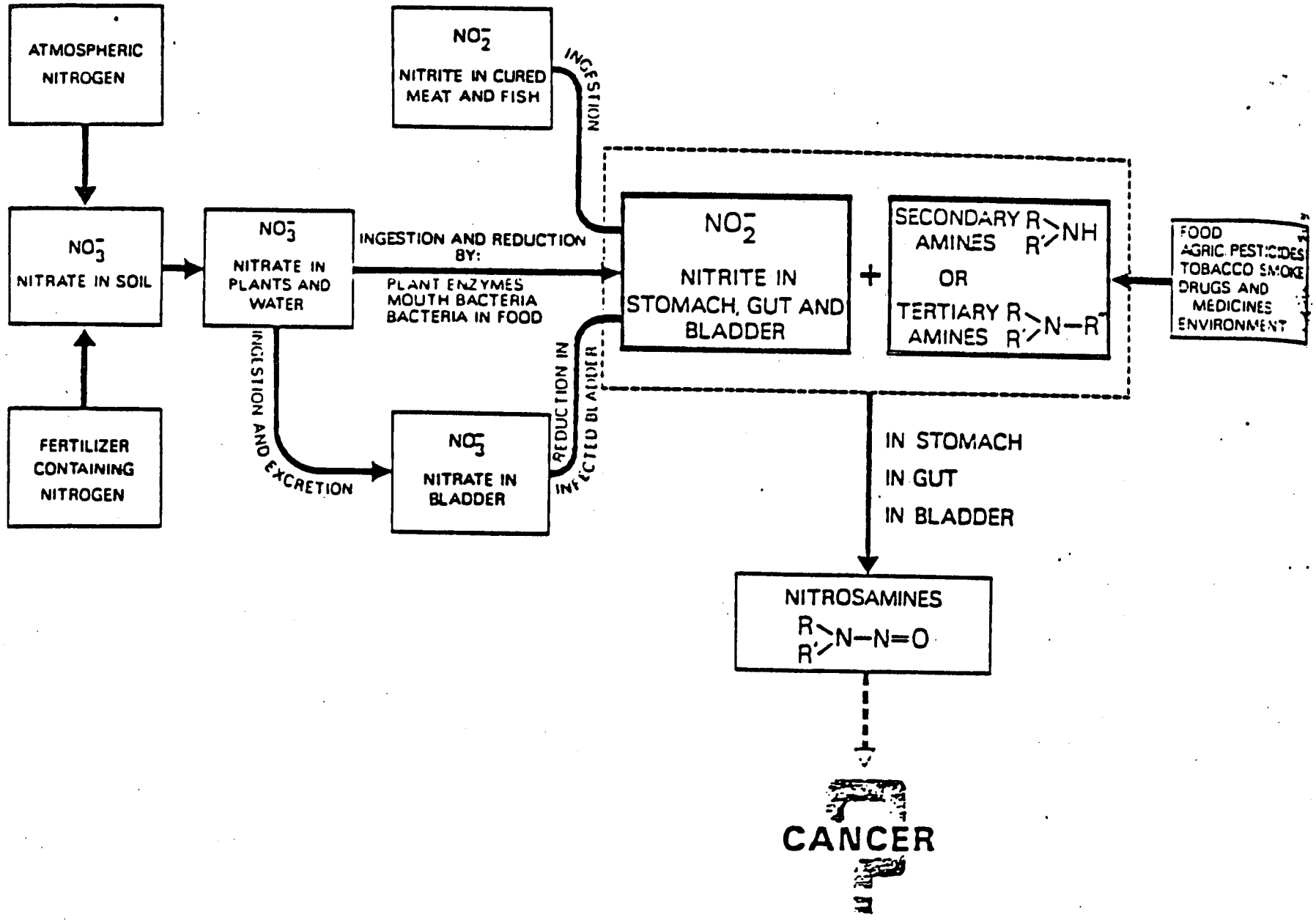
Water - A geochemist's view

Water is a good solvent that dissolves (at least) everything it meets: gases from the atmosphere, salts of many different kinds from rocks and minerals of the soil, organic colouring matter from decaying vegetation and even traces of silica. Therefore, by determining the chemical composition of water that has spent sometime underground, a geochemist can usually determine the subsurface geology of the region.

Contamination vs Pollution

Any impurity that makes water unfit to drink is said to contaminate the water. Pollution is a stronger word, implying complete befoulment. Contamination often comes from natural sources; as when salts from an underground deposit enter the groundwater regime. The high fluoride in groundwaters in the areas around Eppawela phosphate deposit could be given as an example. The accidental impurities in water are sometimes even beneficial. The fluoride content in water at 1 ppm concentration plays an important role in preventing dental caries. The dissolved oxygen relieves deaerated water of

Figure 1 Sources of nitrite and nitrosatable amines and some sites of formation of carcinogenic nitrosamines. (Ref.: W. Lijinsky (1976) Ambio 5(2):67:72.



its flat taste and such water is needed to support the life of aquatic organisms. In this report some slides will be shown from Anuradhapura, Kandy, Colombo and Galle areas to illustrate the pressing problems of water pollution that we are facing today.

Natural Pollution - Fluoride (A case study from Anuradhapura)

Dental diseases

In general, food is the principal source (80%) of all trace elements required by man except fluoride, which is mainly derived from water. Virtually all fluoride i.e. 90% in man is present in bones and teeth. The fluoride in water (1 ppm) is beneficial in that it prevents dental caries in children during the period when their tooth enamel is forming. Fluoride at concentration levels of 6-8 ppm apparently affords protection against osteoporosis in some men and post-menopausal in women. Furthermore, at such levels of concentration, fluoride would cause mottling of teeth in children. Ingestion of very high fluoride (20 mg/day) regularly for several years may cause skeltal fluorisis. The levels of fluoride in ground-water in various parts of Sri Lanka correspond well with the incidence of dental caries and dental fluorisis. However no data are available about the incidence of skeltal fluorisis.

Domestic Pollution - Nitrate (Case studies from Kandy, Colombo and Galle)

Blue baby disease and cancer (See Fig. 1)

Concern on nitrate is not because of the ion itself, but due to the fact that certain species of bacteria found in the mouth and sometimes in the stomach and bladder can enzymatically reduce nitrate into nitrite and may result in the disease methaemoglobinemia (blue baby disease). This is, however, not an easily diagnosed disease in Sri Lanka, and thus its true incidence is unknown.

according to the methods described by the W.H.O. (Table 1). Presence of goitre in a subject was accepted only when confirmed by two individual examiners.

A total of 8153 subjects between the ages of 10-22 years from different schools in and around Kandy were examined. 6687 students from schools within the Kandy Municipality limits while 1466 were from outside the Municipality limits.

The students from schools outside the Municipality limits showed an overall incidence of 41.6% in girls and 27.5% in boys but in the case of the students within the Municipality limits, the incidence of goitre was only 28.5% in girls and 18.4% in boys.

Teenage goitres were more common among the girls, with an incidence of 33.6% in girls and 20.6% in boys. Grade II goitres were 5-6 times higher among girls, than among boys.

Goitre Among School Children in Other Regions

An island wide survey of incidence of goitre among school children was carried out from 1985 to 1987 by M.A. Fernando, S. Balasooriya, K.B. Herath and S.L. Katugampola of the Faculty of Medicine, Peradeniya. This work was sponsored by the W.H.O. The incidence of goitre obtained in some parts of the country are given in Table 2.

As can be seen from the table the prevalence was highest in the district of Kalutara (30.2%) and lowest in Matale (6.5%). It has also been found that in all the districts in the south west sector of Sri Lanka the incidence of goitre is significantly high.

Age of Menarche and Goitre

Delayed puberty is associated with many diseases in children. Thyroid deficiency is well known to affect growth as well as sexual maturity of pubescent females. However, the presence of goitre among girls causing delay in menarche has not been reported in the literature.

Nitrites formed by the reduction of nitrate can react with secondary and tertiary amines to form N- nitrosoamines - the most widely active and potent carcinogens known. The amount of nitrosamines formed depends in part on the amount of nitrate ingested in drinking water, vegetables and cured meat products. It has been demonstrated that over 70% of daily intake may be derived from drinking water when more high concentrations of nitrates are present. Thus, drinking water may make a significant contribution to the formation of nitrosamines when high nitrates are present.

Eutrophication (Case studies from Colombo and Kandy)

The algal population of lakes often fluctuates violently with slight changes in the concentration of dissolved nutrients, changes in temperature, and other factors which are not yet identified. Plant nutrients contained in sewage effluents or in the runoff from fields may cause an incredible increase in the short-lived algal population. As algae die, they sink to the bottom and decay. Decay consumes oxygen. Finally, the oxygen in water is so depleted that fish begin to die. Their decay results in further decreases of the supply of oxygen. It is brought about by anaerobic bacteria, worms, and other scavengers which live in the mud at the bottom of the lake. The enrichment of water by nutrients, which gives rise to the sad results described above is called eutrophication.