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Nitrate content of ground water is not a valid indicator of faecal pollution in rural Sahel regions

Short communication

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In contrast to some rural areas in the developing countries nitrogenous fertilizers are scarcely used in Sahel regions, and industrial wastes induce little, if any, problems of water pollution. Nonetheless, the nitrate content of underground water could be dangerous for man in Sahel regions, as a result of deforestation, field-fire and uncontrolled spreading of animal and human faeces.

Since faecal pollution represents a major source of nitrates at ground level, a correlation was searched between bacterial faecal pollution and nitrate content in ground water.

This study was part of a large field program aimed to control the bacteriological quality of water from hundreds of drilled and bored wells in a rural Sahel region of Burkina Faso. The bacteriological quality was assessed by the enumeration of total (TC) and faecal coliforms (FC) by using bacterial field monitor technique (BFMI) as follows. Water samples from 125 borings (20 to 80 metres of depth) equipped with hydraulic hand-operated pumps were analyzed on-site in the villages. 100 ml of each sample were filtered through a membrane (Sartorius) which was deposited on a culture medium (NKS Tergitol TTC – SM 14056 N – Sartorius). The enumeration of TC and FC was performed after 24 h incubation at 37°C and 44°C, respectively. Results were compared to the bacteriological standards of WHO for drinking water. A further biochemical identification of doubtful bacteria was systematically undertaken with API galleries (API 20E).

The nitrate content of water was measured by a classical colorimetric reaction (CR) (Gales, 1974; Rodier, 1984). The principle of the method is relying on the reduction of nitrates to nitrites in presence of cadmium. Nitrites are quantitatively determined by photometry, results being expressed by mg of N/l. A portable spectrophotometer (HACH DR/3 – USA-Ref. 41.700.00) with a 12 V battery supply was used.

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WHO (1984) standards for potable drinking water are set at $\leqslant 10$ mg of N/l.

Large discordances were observed between the two methods. BFMT gave positive results in 19 water samples (15.2%) with a mean FC concentration of 6 ± 4 per 100 ml. In addition, the TC of all specimens exceeded 46/100 ml.

By contrast, only 2 samples (1.6%) had CR values above the WHO standards, 24 and 24.4 mg of N/1, respectively; the remaining 123 had a mean nitrogen concentration of 1.49 ± 3.17 mg/l.

Taking into account results obtained by both methods, a single water point would have been considered polluted.

In the absence, therefore, of correlation between microbiological pollution and nitrate content, the determination of nitrate content is not a valid indicator, in rural Sahel regions, of faecal contamination of drinking water.

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Gales M. E.: Determination of nitrate using copper cadmium. Inorganic analyses, section physical and chemical methods. Branch. MDQARL US Environmental Protection Agency, National Environmental Research Center, Bethesda 1974.

Rodier J.: L'analyse de l'eau. Eaux naturelles, eaux résiduaires, eau de mer, p. 202 and 696–698. Dunod, Paris 1984.

WHO Tech. Rep.: Guidelines for drinking water quality. Vol. 1: Recommendations, 130 p. Geneva 1984.