



Fluoride in groundwater in the Bongo District, Ghana: an assessment, health impact and possible mitigation strategies

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ABSTRACT

Fluoride contamination in groundwater in the Bongo District of Ghana was investigated using samples from 323 boreholes covering three geologic zones; granite, greenstones, and igneous/metamorphic. The relationship between fluoride concentrations and the geologic zones, groundwater depth, pH, and conductivity were determined to assess the risk of fluorosis from the ingestion of groundwater in these zones and to potentially guide future borehole locations. Data clearly showed that the problem of groundwater fluoride contamination exists mainly in the area underlain by granite and the risk of fluorosis and other fluoride ingestion related diseases exist for about 39% of the population of the District living in the granite zone. No clear correlation was found between fluoride concentration and pH, conductivity or depth of the boreholes, which rules out alternative borehole locations as a solution to the problem. An option for fluoride removal is a hybrid pre-adsorption/ultrafiltration treatment system powered by solar panels in off-grid communities in the District. Under non-optimized field conditions, the performance was affected by the adsorption capacity of the unmodified, natural laterite and membrane type. Improvement on laterite capacity or use of other adsorbents, and membrane type selection and optimization of such a system would be required for the field application.

Keywords: Decentralized water treatment; Fluoride; Groundwater; Hybrid pre-adsorption/ultrafiltration

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