

## Fluoride and Arsenic Poisoning in Ground Water of Kalalanwala Area near Lahore, Pakistan

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Fluoride and Arsenic Toxicity in ground water of Kalalanwala area near Lahore, Pakistan causes bone deformity disease in residents of especially in children. The area is an agricultural area however has been developed as industrial zone in these two decades.

17 Shallow tube well waters and deep well waters including 3 irrigation and four drinking well waters were collected for the chemical analysis. Irrigation and drinking well waters were found free from F and As, while the shallow tube well waters contain high F (2-26ppm) and As (20ppb-1.889ppm) and low Ca<sup>+2</sup>(0.2-3.24meq/L) and Mg<sup>+2</sup>(0.2-3.2meq/L). The Electric Conductivity of these shallow hand pumps is also found to be very high (0.36-3.06mS/cm).

High Cl<sup>-</sup> (0.3-8.43meq/L) and SO<sub>4</sub><sup>+2</sup> (2.02-16.12meq/L) probably due to the human and animal waste are found in the centre of the village. The distribution of high F- and As waters are distinct from that of Cl<sup>-</sup> and SO<sub>4</sub><sup>+2</sup>, concentrated waters indicative of different origin.

Although the source(s) is unknown the high F concentration is the most probable factor in deforming the bones, would be caused by the low Ca<sup>+2</sup> and Mg<sup>+2</sup> concentration in the ground water. At the present As has not affected the people however it would be a menace to the future disease.

**Key words:** Arsenic, Fluoride, Calcium, Alkalinity, Groundwater, Bone Deformity

## Evolution of oceanic $\Delta^{33}\text{S}$

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Anomalous (mass-independent), enrichments and depletions for the rare isotopes of sulfur in some of Earth's oldest rocks point to a radically different sulfur cycle early in earth history compared with that operating today (Bekker, et al., 2002, Farquhar, et al., 2000, Farquhar, et al., 2001, Farquhar, et al., 2002, Hu and Rumble, 2003, Mojzsis, et al., 2003, Ono, et al., 2003, Pavlov and Kasting, 2002). Measurements from sulfur-bearing minerals with marine affinities show  $^{33}\text{S}$  of ocean surface waters were strongly negative and likely depth-stratified during the late Archean as a result of atmospheric deposition of sulfate and suppressed oxidation of sulfide and sulfur on exposed continents. Shortly after the Archean-Proterozoic transition, atmospheric oxygen and the concentration of sulfate in the oceans are thought to have increased (Canfield, et al., 2000, Habicht, et al., 2002, Rye and Holland, 1998). Oxidation of the atmosphere closed the channels for efficient transfer of anomalous sulfur from the atmosphere to the oceans (Kasting, 2001, Pavlov and Kasting, 2002), removing the negative  $^{33}\text{S}$  signature for atmospheric contributions to the oceanic sulfate reservoir. The influx of sulfate derived from oxidation of continental sulfide with positive  $^{33}\text{S}$  would have reversed the sign of oceanic  $^{33}\text{S}$ . An upper limit on the magnitude of the positive excursion of oceanic  $^{33}\text{S}$  at this time is given by estimates of the mean  $^{33}\text{S}$  of sedimentary sulfide (0.5 +/- 0.2‰, (Farquhar, et al., 2002)), Estimates of an oceanic  $^{33}\text{S}$  excursion are constrained by the relative contribution of sulfate from these sources, and a signature of  $^{33}\text{S} = 0.3$  ‰ such as has been observed for some 2.1-2.45 Ga samples (Farquhar, et al., 2000) would indicate that up to 60 % of the sulfate could have been contributed by oxidation of such a source.

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