Goldschmidt 2025 Abstract
https://doi.org/10.7185/gold2025.26904

Fluorosis and the Hidden Smiles of the Sahel: A Geochemical Tale

WILSON FANTONG[1] , JING ZHANG[2], ERNEST CHI FRU[3], HYCINTH S BANSEKA[4], AND EMILIA B.S. FANTONG[5]

[1]Institute of Geological and Mining Research

[2]University of Toyama

[3]Cardiff University

[4]Lake Chad Basin Commission, Ndjamena-Chad

[5]Japan Embassy

The Sahel, a vast 3.1 million km² semi-arid region in Africa, extends over areas with extreme climate change conditions of rising temperatures and decreasing rainfall, leaving its surface water unreliable for socio-economic activities. As a result, groundwater becomes essential, particularly for the 5 million people living in the Sahel of northern Cameroon. However, there is ubiquitous presence of fluoride at harmful levels in the groundwater, causing “silent” dental fluorosis, a condition that many inhabitants across the area unknowingly suffer from. For years, before 2007, people blamed witchcraft for the condition, leading to deeply entrenched social stigma and exclusion that many refused to smile and were not attracting marriage partners. Recent scientific studies uncovered the true cause of high fluoride content in groundwater, which comes from naturally occurring fluor-apatite minerals in the region’s granitic rocks, with controlling factors including groundwater pH, age and cation exchange. A diverse team of experts comprising geologists, chemists, engineers, water managers and sociologists, developed a simple yet innovative solution. They created defluoridation filters made from cheap, locally sourced materials like cow bones and marble. These filters not only reduced fluoride to safe levels but also removed dangerous arsenic and uranium from the water. This solution has proven to be a powerful way for local communities to adapt to the impacts of climate change, as it can be used to adjusts fluoride levels in water based on rising climate change induced atmospheric temperatures, ensuring a fluorosis-free community in the future. The results have helped reduce the stigma surrounding dental fluorosis and led to the inclusion of affected individuals in social life again. However, tests on the filters suggest there’s still room for improvement. The team is working on optimizing the bone charring process to enhance fluoride removal, coupled with investigating how long the filters last before saturation. We are also studying how the filters can continue removing arsenic and uranium. By combining geochemistry with various disciplines, including effective science communication, our study demonstrates how local, sustainable solutions can make a real difference in combating health and social issues linked to climate change in underprivileged communities.