

Human Kidney Stone Formation: Insights from Yellowstone, Roman Aqueducts and the Deep Microbial Biosphere

Bruce W. Fouke

University of Illinois, Urbana-Champaign, Urbana-Champaign, Illinois

Abstract

Human kidney stone formation (*nephrolithiasis*) presently affects 12% of men and 5% of women in the United States, generating an estimated annual healthcare cost of \$2.1 billion. A first of its kind analysis is being undertaken of the integrated role of human microorganisms (the *microbiome*) in influencing the dynamics of human disease-related mineral precipitation (*biomineralization*). Direct comparison and inference is being drawn from geobiological studies of microbe-water-rock interactions in Yellowstone hot-springs, Caribbean coral reefs and Roman aqueducts. This work includes analyses of microbial communities, their genetic and biochemical components, and their interactions with micro-environmental physical and chemical conditions. All of which is being conducted within the three-dimensional (3D) structural context and function of specific diseased human body parts. We will evaluate pilot results that are suggesting surprising new approaches for the development of clinical approaches to prevention and treatment.