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Words of Wisdom

Re: Geobiology Reveals How Human Kidney Stones Dissolve In Vivo

Sivaguru M, Saw JJ, Williams JC, et al

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Article info

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Experts' summary:

Thinly sectioned human urinary stones were evaluated using high-resolution light microscopy. Classic stratification, a common occurrence in nature, was also observed in kidney stones. The intriguing aspect of this study is the ability to detect various phases of matter emitting light of red, blue, and green wavelengths. The beautiful quilt-like colorful pattern also contained onion ring–like layers and voids. The structural forms (voids) and chemical composition (mostly calcium oxalate monohydrate [COM] and calcium oxalate dihydrate [COD]) of these stones from humans are appreciated during routine stone fracture in minimally noninvasive laser lithotripsy, with hard mineralized regions sometimes next to apparent soft areas void of biominerals within a stone.

Experts' comments:

This study imaged the "anatomy of a stone" using high-resolution microscopy and found that kidney stones are like other biominerals that evolve over time; stones are not inert. A laboratory stone assessment of mineral content has limited clinical utility to influence short- and long-term management. Stone analyses to date do not take into account the various molecular constituents associated with stone pathogenesis. Laboratory results for stone composition are reliant on piece analysis. Different parts of a stone frequently give very different results [1]. Stones made by humans, like most other biominerals, have varied degrees of heterogeneity [1].

Most calcium-based stones are composed of a combination of COM and COD. Sivaguru et al suggest that both forms of calcium oxalate (COM and COD) can undergo changes in composition from COM to COD and vice versa; stones are dynamic entities. What are the stimuli that initiate these changes? What are the upstream events that could lead to downstream clinically detectable pathogenesis such as a stone [2,3]? Could the solution for mitigating stones lie in the elusive nature of stone "remodeling", the continuous dissolution and reformation of mineral? And could this be the reason why understanding the mechanistic link to stone formation has become an ageless quest? Findings from this study provide insights for the development of new therapies for contemporary medical management and will help eliminate the long-standing stale interventions that have been relatively constant for the last few decades.

Conflicts of interest: The authors have nothing to disclose.

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