Re: Inhibition of Urease Activity by Different Compounds Provides Insight into the Modulation and Association of Bacterial Nickel Import and Ureolysis

S. Svane, J. J. Sigurdarson, F. Finkenwirth, T. Eitinger and H. Karring

Department of Chemical Engineering, Biotechnology and Environmental Technology, University of Southern Denmark, Odense, Denmark, and Institut für Biologie/Mikrobiologie, Humboldt-Universität zu Berlin, Berlin, Germany

Sci Rep 2020; 10: 8503. doi: 10.1038/s41598-020-65107-9

Abstract available at https://pubmed.ncbi.nlm.nih.gov/32444844/

Editorial Comment: Infections with urease producing bacteria may change the urinary environment to create a favorable milieu for the generation of struvite kidney stones. Urease hydrolyzes urea to carbonic acid and ammonia, which are in equilibrium with bicarbonate and ammonium in urine, the latter being replete with magnesium and phosphate. This drives the formation of magnesium ammonium phosphate stones (struvite). The active site of this enzyme contains 2 nickel cations.

These investigators assessed 71 compounds for their ability to inhibit ureolysis in urease producing Klebsiella pneumoniae and purified jack bean urease. Inhibition of urease was assessed by the ability of the compound to attenuate the natural rise in pH that occurs with ureolysis. The authors identified 30 compounds that demonstrated greater than 25% inhibition. The impact of these compounds on nickel uptake was variable. Could one of these 30 compounds have clinical applicability and serve as a replacement or alternative to acetohydroxamic acid?

Dean G. Assimos, MD

Suggested Reading

Hobbs T, Schultz LN, Lauchnor EG et al: Evaluation of biofilm induced urinary infection stone formation in a novel laboratory model system. J Urol 2018; 199: 178.

Edin-Liljegren A, Grenabo L, Hedelin H et al: Long-term studies of urease-induced crystallization in human urine. J Urol 1994; 152: 208.

Lerner SP, Gleeson MJ and Griffith DP: Infection stones. J Urol 1989; 141: 753.

Griffith DP, Khonsari F, Skurnick JH et al: A randomized trial of acetohydroxamic acid for the treatment and prevention of infection-induced urinary stones in spinal cord injury patients. J Urol 1988; 140: 318.

Re: Dietary Oxalate Induces Urinary Nanocrystals in Humans

P. Kumar, M. Patel, V. Thomas, J. Knight, R. P. Holmes and T. Mitchell

Department of Urology, University of Alabama at Birmingham, Birmingham, Alabama, and Department of Materials Science and Engineering, University of Alabama at Birmingham, Birmingham, Alabama

Kidney Int Rep 2020; 5: 1040–1051. doi: 10.1016/j.ekir.2020.04.029

Abstract available at https://pubmed.ncbi.nlm.nih.gov/32647761/

Editorial Comment: These investigators used a fluorescent dye and a high resolution imaging technique to identify nanocrystals composed of calcium oxalate in urine of healthy adult nonkidney stone formers. The amount of such nanocrystals in urine substantially increased after a dietary oxalate load. Such surges could lead to crystalline “bricks” being laid down on Randall plaque and could also incite an upstream epithelial inflammatory response, both of which could further promote kidney stone formation. An assessment of this biology in stone formers is certainly warranted.

Dean G. Assimos, MD

Suggested Reading

Williams JC Jr, Borofsky MS, Bledsoe SB et al: Papillary ductal plugging is a mechanism for early stone retention in brushite stone disease. J Urol 2018; 199: 186.

Fan J and Chandhoke PS: Examination of crystalluria in freshly voided urines of recurrent calcium stone formers and normal individuals using a new filter technique. J Urol 1999; 161: 1685.

Prochaska M, Taylor E, Ferraro PM et al: Relative supersaturation of 24-hour urine and likelihood of kidney stones. J Urol 2018; 199: 1262.

Khan SR: Reactive oxygen species as the molecular modulators of calcium oxalate kidney stone formation: evidence from clinical and experimental investigations. J Urol 2013; 189: 803.