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seminar

Wednesday, 23rd February, 9.30am, Online

*Host: Dr. Sergio Moya*

# Pathogenesis of kidney stone disease and the possible therapeutic opportunity

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Kidney stone disease is a common urological condition presenting with abnormal calcified masses in the kidneys. These calcified masses are primarily composed of calcium oxalate (CaOx). Lithogenesis of CaOx stone is driven by urine supersaturation and CaOx crystallization. Therefore, determination of total capacity of urine to crystalize CaOx is clinically useful for estimating the risk of CaOx stone formation. Citrate, on the other side, is a stone inhibitor, as it competitively combines with calcium and prevents CaOx crystal formation. Citrate salt formulation, specifically potassium citrate, is a currently used medication for preventing CaOx stone formation and recurrence. Efficacy, side effect and compliance, however, are still the main problems of the use of potassium citrate. Development of new therapeutic entities for stone disease is still needed, and to do so mechanism of CaOx stone formation as well as its pathogenesis must be clearly understood. Our in vitro and human studies demonstrate that oxidative stress, inflammation, and fibrosis are critically involved in the pathogenesis of kidney stone development. We also demonstrate that oxalate and CaOx crystals induce senescence and accelerate telomere shortening in renal tubular cells. We develop a new beverage formulation and show that it effectively inhibits CaOx stone formation in the experimental rat model, and it can extend lifespan and delay onset of aging in *Caenorhabditis elegans* model. Because nanotechnology has a great potential in disease diagnosis and treatment. We propose here the ideas that nanoparticles could be clinically useful for the treatment of kidney stone disease either as citrate/antioxidant carriers, oxalate absorbers, oxalate degraders, or citrate-oxalate exchangers.