

PUBLICATION DETAILS JANUARY 2026 – MARCH 2026



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Journal Article: Urolithiasis: Therapeutic Management and Experimental In-Vivo Models—A Comprehensive Review

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Abstract:

Urolithiasis is a common and recurrent disorder of the urinary system characterized by the formation of calculi in the kidneys, ureters, bladder, or urethra, primarily due to supersaturation of urinary solutes such as calcium oxalate, calcium phosphate, and uric acid. The rising global prevalence of urolithiasis is associated with dietary habits, lifestyle changes, genetic predisposition, and metabolic abnormalities, posing a significant clinical and economic burden. Despite advancements in surgical and lithotripsy techniques, recurrence rates remain high, emphasizing the need for effective pharmacological interventions. Experimental in vivo models play a crucial role in understanding the pathophysiology of stone formation and in evaluating the antiurolithiatic potential of novel therapeutic agents, particularly those derived from natural sources. Several in vivo models are used to simulate human urolithiasis, with ethylene glycol-induced hyperoxaluria in rodents being the most common. Other models include sodium oxalate, ammonium chloride, and zinc disc implantation. These models help evaluate biochemical changes, crystal deposition, renal histopathology, oxidative stress, and inflammation. They also provide insight into mechanisms such as inhibition of crystal nucleation, growth, and aggregation, as well as promotion of crystal dissolution and diuresis.

Journal name: Liberate journal

Article URL: <https://doi.org/10.5281/zenodo.18650639>