

Abstract:

Study of the inhibitory effect of allicin on urinary catheter encrustation by *Proteus mirabilis* using synthetic bladder

Background and Objective: Stone formation and catheter encrustation are important complications of *Proteus* infections. Urease enzyme of *Proteus* is leading cause of catheter encrustation. Inhibition of urease activity can prevent *Proteus* urinary infections complications. In this study, we investigate inhibitory effect of allicin on crystallization and urinary catheter encrustation in synthetic bladder model.

Methods: Allicin purified from garlic extract using the semi-preparative HPLC method. Inhibition of synthetic urine crystallization by *P.mirabilis* urease enzyme activity performed in tubes in the presence of different allicin concentrations, control without allicin and Iodoacetic acid (known urease inhibitor) for 24 hours. Parameters that evaluated include pH changes, turbidity, calcium and magnesium ions and microscopic observation of crystals. In other part of experiment, the effect of sub-MIC concentrations of allicin on catheter blockage in synthetic bladder model in the presence of same controls studied. Parameters that evaluated include pH changes, time of encrustation and flow of urine. Catheters encrustation displayed by imaging and eventually catheters calcium and magnesium ions measured.

Results: In crystallization inhibition part of study, allicin significantly reduced the rate of pH increasing in urine in a dose dependent manner and following that, turbidity increasing and magnesium and calcium ions precipitation significantly reduced. In addition, a delay observed in crystals formation, as in 32µg/ml concentration until 24 hours incubation there is no crystals grown in synthetic urine.

In catheter blockage evaluation in synthetic bladder model, allicin significantly increased time of blockage in comparison with control without allicin in a dose dependent manner. The catheter encrustation time without allicin was 48 hours. Addition of allicin results in increasing of catheter encrustation time. Time of encrustation for 2, 4 and 8 µg/ml concentrations of allicin was respectively 61, 74 and 92 hours.

Conclusion: Results of this study showed that allicin successfully inhibits urease activity of *P.mirabilis* in sub MIC concentrations that results in catheter blockage time increased two folds.

Keywords: Allicin, *Proteus mirabilis*, Urease, Synthetic Urine, Synthetic Bladder, Crystallization, Catheter, Encrustation