

Session: P025 Microbial pathogenesis and virulence

Category: 9a. Microbial pathogenesis & virulence

23 April 2017, 12:30 - 13:30
P0562

Cinnamaldehyde inhibits swarming motility and urease expression of *Proteus mirabilis* in a dose dependent manner

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Background: *Proteus mirabilis* is a frequently isolated uropathogen from complicated urinary tract infections (UTIs), especially UTIs that associated with long-term urinary catheterization. Virulence factors such as swarm cell differentiation and urease play a crucial role in the pathogenesis of infection with *P. mirabilis*. Cinnamaldehyde, which belongs to phenylpropanoid class of phytochemicals, has been showed to exhibit notable antibacterial activity against various bacterial agents, including *Proteus spp.* In this study, we examined the anti-pathogenic effects of cinnamaldehyde at sub-inhibitory concentrations against swarming motility and urease expression of *P. mirabilis*.

Material/methods: *P. mirabilis* HI4320 isolate was used for experiments. Cinnamaldehyde effect on swarming motility was evaluated on LB agar (2%) with cinnamaldehyde concentrations ranging from 100 µM to 1000 µM relative to control by measuring the swarming migration distance diameter in centimeters. Cinnamaldehyde effect on urease expression was assayed in LB broth culture (containing %0,1 urea) with cinnamaldehyde concentrations ranging from 100 µM to 500 µM relative to by a spectrophotometric assay using extracted soluble protein. All tests were performed in three replicates. Statistical significance was determined by comparing the results from media with and without cinnamaldehyde, using one way analysis of variance (one-way ANOVA) and Dunnett's test.

Results: Swarming migration distance was significantly inhibited at 300 µM concentration and gradually diminished at increasing concentrations (p<0,001). Similarly, urease expression was significantly inhibited at 300 µM and diminished at increasing concentrations (p<0,001).

Conclusions: Cinnamaldehyde exhibits an ideal therapeutic intervention by preventing swarming motility and impairing urease activity of *P. mirabilis*. Therefore, effectively inhibiting major virulence factors of this pathogen and having no toxic effect on human health, this compound has various potentials in terms of medicinal usage, e.g. urinary catheter surface coating, in preventing UTIs caused by *P. mirabilis*. Thus, the lifespan of catheters can also be extended by reducing catheter encrustation due to urease activity. Moreover, it can be useful for patients with an indwelling urethral catheter to take cinnamon containing foods in their diet.