عنوان مقاله:

Effects of Eugenol-Loaded Chitosan Biopolymer Nanoparticles on CYP۵۱A and CYP۵۱B Expression in Aspergillus fumigatus

محل انتشار:

فصلنامه عفونت، اپیدمیولوژی و پزشکی, دوره 8, شماره 1 (سال: 1400)

تعداد صفحات اصل مقاله: 9

نویسندگان:

Abozar Nasiri-Jahrodi - *Department of Mycology, Faculty of Medical Sciences, Tarbiat Modares University, Tehran ۱۴۱۱۵-۳۳۱, Iran*

Masoomeh Shams-Ghahfarokhi - *Department of Mycology, Faculty of Medical Sciences, Tarbiat Modares University, Tehran ۱۴۱۱۵-۳۳۱, Iran*

Mehdi Razzaghi Abyaneh - *Department of Mycology, Pasteur Institute of Iran, Tehran ۱۳۱۶۴, Iran*

خلاصه مقاله:

Backgrounds: Aspergillus fumigatus is a pathogen responsible for invasive aspergillosis and the main leading cause of death in immunosuppressed individuals. The present study aimed to evaluate the impact of eugenol-loaded chitosan nanoparticles on the expression of CYP۵۱a and CYP۵۱b, two well-known genes responsible for triazole drug resistance in A. fumigatus. Materials & Methods: The minimum inhibitory concentration (MIC) of eugenol-loaded chitosan nanoparticles, chitosan, eugenol, and itraconazole was determined based on the Clinical and Laboratory Standards Institute M۳۸-E۳ method at concentrations of ۴.۶-۲۴۰۰, ۱۱.۷-۱۲۰۰۰, ۲-۲۰۴۸, and ۱-۲۵۶ µg/mL, respectively. The expression of CYP۵۱A and CYP۵۱B was evaluated in A. fumigatus exposed to ۰.۵, ۱, and ۲× of MIC concentration of NPs and itraconazole using the real-time polymerase chain reaction. Findings: The obtained results showed that eugenol-loaded chitosan nanoparticles sucessfully reduced A. fumigatus fungal growth at ۳۰۰ µg/mL concentration. MIC of chitosan, eugenol, and itraconazole was measured to be ۶۰۰۰, ۲۵۶, and ۴ µg/mL, respectively. The results of real-time PCR also revealed that eugenol-loaded chitosan nanoparticles increased the expression of both CYP۵۱A and CYP۵۱B in a dose-dependent manner. The expression of fungal CYP۵۱A and CYP۵۱B at mRNA level was significantly increased ۱.۲۶, ۱.۹۳, and ۳.۱-fold as well as ۱.۲, ۲.۱, and ۲.۴-fold at concentrations of ۱۵۰, ۳۰۰, and ۶۰۰ µg/mL, respectively (p<.۰۵). However, it seems that the prepared nanoparticles had a lower impact on the expression of these genes compared to itraconazole. Conclusion: Overall, these findings suggest that the treatment of A. fumigatus with eugenol-chitosan nanoparticles could increase the expression of the CYP۵۱ gene, suggesting the anti-fungal property of these nanoparticles.

کلمات کلیدی:

Eugenol-loaded chitosan nanoparticle, Aspergillus fumigatus, CYP۵۱A, CYP۵۱B, Gene expression.