Acta Naturae 2015 vol.7 N2, pages 102-107

Thio derivatives of 2(5H)-furanone as inhibitors against Bacillus subtilis biofilms

Trizna E., Khakimullina E., Latypova L., Kurbangalieva A., Sharafutdinov I., Evtyugin V., Babynin E., Bogachev M., Kayumov A.

Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© 2015 Park-media, Ltd. Gram-positive bacteria cause a wide spectrum of infectious diseases, including nosocomial infections. While in the biofilm, bacteria exhibit increased resistance to antibiotics and the human immune system, causing difficulties in treatment. Thus, the development of biofilm formation inhibitors is a great challenge in pharmacology. The gram-positive bacterium Bacillus subtilis is widely used as a model organism for studying biofilm formation. Here, we report on the effect of new synthesized 2(5H)-furanones on the biofilm formation by B.subtilis cells. Among 57 compounds tested, sulfur-containing derivatives of 2(5H)-furanone (F12, F15, and F94) repressed biofilm formation at a concentration of 10 μg/ml. Derivatives F12 and F94 were found to inhibit the biosynthesis of GFP from the promoter of the eps operon encoding genes of the biofilm exopolysaccharide synthesis (EPS). Using the differential fluorescence staining of alive/dead cells, we demonstrated an increased bacterial sensitivity to antibiotics (kanamycin and chloramphenicol) in the presence of F12, F15, and F94, with F12 being the most efficient one. The derivative F15 was capable of disrupting an already formed biofilm and thereby increasing the efficiency of antibiotics.

Keywords

2(5H)-furanones, Antibacterial activity, Bacillus subtilis, Biofilms