Biofilms of sulfate-reducing bacteria on polyethylene terephthalate: the effect of bacillibactin-producing strains of Bacillus velezensis

Nataliia Tkachuk [*1], Liubov Zelena [2]

[1] Department of Biology, T.H. Shevchenko National University "Chernihiv Colehium"

[2] Department of Physiology of Industrial Microorganisms, Danylo Zabolotny Institute of Microbiology and Virology of National Academy of Sciences of Ukraine

Published: 08 May 2021 by **MDPI** in **1st Corrosion and Materials Degradation Web Conference** session **Microbiologically Influenced Corrosion**

10.3390/CMDWC2021-09938 (registering DOI)

Abstract:

Poly(ethylene terephthalate) (PET) is very resistant to degradation by microorganisms, the ability to biodegrade PET is inherent in a small number of species. Among the microorganisms isolated from the plastic surface and biofilms there are representatives of sulfate-reducing bacteria of the genus *Desulfovibrio*. Bacteria *Desulfovibrio oryzae* were identified, which are participants in the damage of metal construction in soil. We used *D. oryzae* as a model organism to study biofilm formation on PET, although they did not have a degrading ability with respect to PET (according to the results of gravimetric analysis). Antibiofilming properties are known for *Bacillus velezensis* bacteria as their ability to produce siderophore bacillibactin. Siderophores are Fe(III) chelators, and chelating agents affect the stages in biofilm development. The ability to form bacillibactin is characteristic of *B. velezensis* NUChC C1 and NUChC C2b. The aim of this study was to investigate the intensity of biofilm formation of *D. oryzae* on the PET surface by the influence of bacillibactin-producing *B. velezensis*. The duration of exposure of PET samples (10×10 mm) in Postgate's "C" medium with culture of *D. oryzae* NUChC SRB1 under the influence of the supernatant from MPB cultures of *B. velezensis* NUChC C1 and NUChC C2b was 50 days. A biofilm assay (indirect measurement of bacterial biofilm biomass by crystal violet adsorption/desorption) was used. Siderophore-producing strains of *Bacillus velezensis* inhibited (2 times) the formation of bacterial biofilms on the polymeric material PET with its long-term exposure in a culture of sulfate-reducing bacteria under conditions of sufficient iron supply. Bacillibactin-producing strains prevent the development of bacterial biofilms on the poly(ethylene terephthalate) surface. This may be one of the reasons for the prolongation of the process of PET biodegradation in natural ecosystems.

Keywords: bacillibactin; biofilm; poly(ethylene terephthalate); sulfate-reducing bacteria