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Microbial communities in soil and antimicrobial resistance

Statement of the Problem: The World Health Organization has identified antibiotic resistance as a serious threat to human health across the world. The observed increase in the frequency of antibiotic-resistant bacteria has resulted from the increased use of antibiotics in medicine and agriculture, resulting in the reduction of organisms that do not possess antibiotic resistance genes. The fluoroquinolones are one of the most used classes of antibiotics. Enrofloxacin belongs to the class of fluoroquinolone antibiotics that have been intensively used for the treatment of bacterial infections in veterinary medicine. In the environment, enrofloxacin can undergo degradations by different processes including photolysis, biodegradation and oxidation by mineral oxides but it is not sensitive to hydrolysis. Despite these degradation mechanisms, environmental half life time of enrofloxacin is very long. This long environmental persistence of enrofloxacin can affect the growing and the activity of the soil microbial communities.

Results: Soil respiratory responses were inhibited at the high enrofloxacin concentrations (1000 mgkg-1) in the soils and were increased at the lowest concentration (10 mgkg-1). The maximum level of soil toxicity was 67.21% at concentration of enrofloxacin 1000 mgkg-1, in the control this parameter was 8, 56%. It should be noted, the soil with a high concentration of antibiotic was characterized by a low content of nitrogen-fixing microorganisms and a high number of oligotrophic and spore-forming microbiota. In vitro experiments were isolated 5 bacteria absolutely resistant to all tested antibiotics. Among AR microorganisms were anaerobic bacteria: Clostridium difficile, Clostridium perfringens and aerobic bacteria: Enterococcus faecalis, Yersinia enterocolitica, Enterobacter cloacae. Other dominant bacteria were characterized by a high or moderate level of antibiotic resistance. In experiments In vivo from the soil, were isolated 7 bacteria resistant to all tested antibiotics. They were representatives of aerobic microbiota: Bacillus licheniformis, Serratia fonticola, Hafnia alvei, Bacillus cereus, Pantoea agglomerans, Bacillus megaterium and anaerobic bacteria - Clostridium difficile. In natural conditions, from the soil of model ecosystems were isolated mostly bacteria of the genus Bacillus. All of them are antibiotic resistant and are the causative agents of foodborne infections and pose a threat not only to the environment, but also to human health.

Conclusion: Results of investigations have not only theoretical value, but practical as well. The presence of enrofloxacin in the soil, especially in high concentrations, cause negative changes in microbial community, reduces the respiratory activity of the soil and is one of important factors in the formation of soil resistome.

Biography

Symochko Lyudmya is a specialist in environmental microbiology and soil ecology. Since 2008 she has focused on autecology and synecology researches of soil microbiota. She explores the soil resistome and the role of natural and transformed ecosystems as reserves of antibiotic-resistant microorganisms. She developing and improving existing methods of bioindication and biotesting the edaphotops in different biogeocenosis. She is an author of over 120 scientific publications and 55 in professional journals.

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