Short communication

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Microplastics and water microbiota

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ABSTRACT. Recently, plastic pollution is still remaining the keen problem of the modern world and it takes enormous part defining mostly ecology disasters. Microplastics is one of the most often used chemical substance and it has penetrated into the most of distant corners of our planet and also it can be revealed both in a food and in other agricultural production. On studying recent peculiarities of marine microbiota, we had analyzed recent articles describing the latest data of interaction of marine microbiota and microplastics. There have been defined the main inhabitants of the plastisphere as the habitat associated with plastics and they were presented by various cyanobacteria, ciliates, eubacteria using microplastics as shelter, transport or food.

Keywords: microplastics, biodegradation of plastics, plastisphere, marine microorganisms, environmental pollution.

1. Introduction

Nowadays, plastic polymers are one of the most common pollutants. Since 1950 to 2015 year there had been being produced more the 6.3 billion tons of the primary and secondary (recycled) plastic waste, and recently 79% of them have being stored in landfills or have being revealed already in the environment. In 2010 as a result of the waste misuse there have been got from 4.8 up to 12.7 million tons of garbage. If there is no any changes in a way of recycling of plastics waste, there will have been increasing the total quantity of plastics garbage to the 2025 year (Rhodes, 2018; Jambeck et al., 2019).

Other problem is still remaining the universal penetration of a microplastics. It had been revealed in water (Cozar et al., 2014; Eriksen et al., 2014), in a mountain soil of Switzerland where the particles have been likely transformed by the wind, in Arctic ice (Scalenghe, 2018), in a sea fauna varying from fish till zooplankton (Auta et al., 2017) and even in a food (Toussaint et al., 2019; Kutralam-Muniasamy et al., 2020). So, in our research we have been concentrated on the spread of the plastic particle in an ocean water.

2. Matherials and methods

We had conducted analysis of the current study of plastic spread in the environment and we could summarize if in the mentioned further results.

3. Results and discussion

Zettler and co-authors have proposed the new definition - plastisphere as the new habitat defined with the spread of a plastic. Moreover, they have defined the content of microbiota associated with the particles of these synthetic polymers. On the surface of these particles there could be revealed photosynthetic filamentous cyanobacteria of *Phormidiu*m and *Rivularia*, *Bacillariophyte* (including genera *Navicula, Nitzschia, Sellaphora, Stauroneis* and *Chaetoceros*). In the same study there was noted that the genera of *Navicula, Nitzschi*a and *Sellaphor*a are capable to form biofilms.

Among the protozoans there were revealed stem ciliates infusoria of genera *Ephelota.* The *Ephelota* are the dwelling of ectosymbiotic rod bacteria. On the other stem infusoria there have been revealed bacteria, identified as sulfide-oxidizing gammaproteobacteria of genera of *Thiobios*, and bacteria of genera of *Vibrio* (almost 24% of all the common quantity). Usually, the representatives of this genera are rarely exceeding the concentration of more then 1% in environment (Zettler et al., 2013).

At the surface of polypropylene there were revealed: filamentous cyanobacteria *Phormidium* sp. (which is commonly seats on the bottom substrates), the *Pseudoalteromonas* are often associated with sea plants in nature, the alfa-proteobacteria *Hyphomonadaceae* is known with the capability to form the long holding threads named prothesis. The Hyphomonadaceae and

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their prothesis could be seen in microphotographs SEM and now it is considered that they are almost 8% of microbial association on the polypropylene.

At the surface the polysterol there is dominating of *Rhizaria*, on the polyethilentherephthalate there are the Stramenopiles, at the polyethylene there are the *Viridiplantaea, Stramenopiles* and *Alevolata*. On the all plastics there are many dinoflagellates, and among them there were almost no toxic species, except of *Alexandrium* sp. (0.04%), *Coolia* (0.01%) and *Prorocentrum* sp. (0.03%).

Also, there was interesting correlation as microplastics were contaminated mostly by Betaproteobacteria (25.4%), and in water there were mostly Gammaproteobacteria (orders Alteromonadales and Oceanospirillales) (73.9%) (Didier et al., 2017).

On the surface of the plastics there were revealed the depths, showing the destruction of polymers by microbial association and active division of cells (Zettler et al., 2013). The prevailing metabolic mechanisms were destruction of chlorcyclogexane, chlorbenzole, destruction of polycyclic aromatic carbon-hydrates and nitrotholuol degradation (Didier et al., 2017).

4. Conclusion

Plastics has the high capability of floating which defines the transport of microbes, including pathogenic ones, e.g. bacteria of *Vibrio* genera (Didier et al., 2017; Toussaint et al., 2019).

Plastics drift and various bacterial community help to the increasing of the horizontal transfer of bacterial genomes (Toussaint et al., 2019). So, in conclusion plastisphere is the new sphere of habitation of different microorganisms and it can servers as the substrate for some kinds of bacteria and a shelter for the others.

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