Abstract

Microplastics are small plastic particles characterized by irregular shapes and diameters ranging from 0,1 to 5000 μm. Their widespread use across virtually every aspect of human life results in their presence in water, soil, and air across all regions of the globe. Microplastics have been detected in animal feed, bottled beverages (including drinking water and beer), salt, vegetables, fruits, and even animal-derived products (meat, honey). Polyethylene terephthalate (PET) is a plastic commonly used in the food industry, particularly for food packaging. The gastrointestinal tract serves as one of the primary barriers against microplastics, which may induce inflammation. Its proper function is supported, among other factors, by the enteric nervous system, which regulates secretion, vasodilation, and motility. The biologically active substances synthesized and secreted by it participate in neuroimmunoregulation. It may be altered by pathological factors or xenobiotics, such as microplastics.

To determine whether PET microplastics at doses of 0,1 g/day and 1 g/day affect the function of the enteric nervous system of the small intestine, six biologically active substances (cocaine and amphetamine-regulated transcript, galanin, neuronal nitric oxide synthase, substance P, vesicular acetylcholine transporter, and vasoactive intestinal peptide) were selected. The percentage of neurons immunoreactive to these markers was analyzed using immunofluorescent staining. Additionally, the concentrations of five selected cytokines (interleukin 1β, interleukin 6, interleukin 8, interleukin 10, and tumor necrosis factor α) in the ileal wall were measured using ELISA test.

The effects of the 0,1 g/day dose varied depending on the section of the small intestine and the enteric plexus examined. Reductions, increases, or no statistically significant differences were noted for this dose.

A dose of 1 g/day did not alter the population of CART-positive neurons (ileum, myenteric plexus) or nNOS-positive neurons (jejunum, outer submucosal plexus). In other cases, statistically significant changes (increases or decreases) were observed.

The effect of the dose of 0.1 g/day was different (no change, increase or decrease in the percentage of immunoreactive neurons) depending on the examined section of the small intestine and enteric plexus of the nervous system.

The results indicate that neither dose caused a statistically significant increase or decrease in the concentrations of the selected cytokines in the ileal wall.

The results confirm that microplastics affect the chemical coding of neurons of the enteric nervous system. The impact of microplastics depends on the administered dose and the specific section of the small intestine studied. The observed differences may result from changes in the physicochemical properties of the particles caused by their passage with digestive contents through the gastrointestinal tract and may be the result of the mechanical and/or chemical impact of microplastics.

Due to the ubiquity of microplastics, further research is recommended to evaluate the effects of microplastics with different properties (size, shape, type of polymer, primary or secondary) on the bodies of humans and animals.

Keywords: microplastics, *Sus scrofa domesticus*, enteric nervous system, cytokines, neurotransmitters, PET