Breakdown nanoplastics from artificial turf systems

(Nedbrutna nanoplaster från konstgräsplaner)

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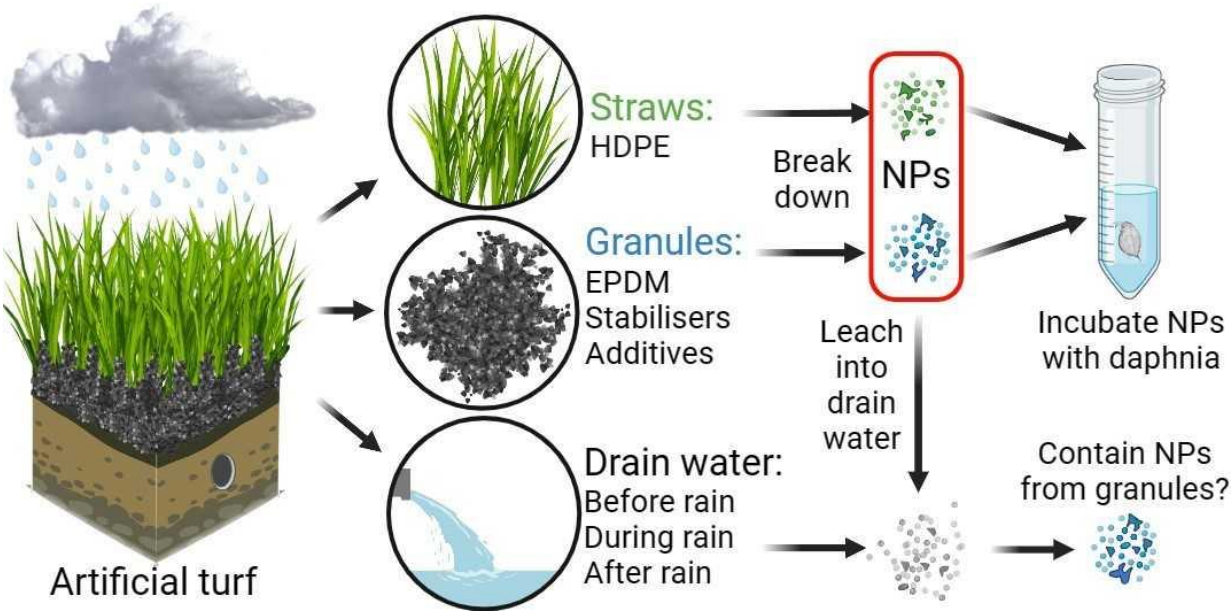

The increasing use of artificial turf systems in sports fields has raised concerns as the polymer would be degraded into microplastics and even smaller particles. Microplastics has been investigated before but very little is known about nanoplastics from football fields. Nanoplastics, which are less than 1 µm may cause different environmental problems as their small size will change how the particles interact with organisms and their exposure routes. For example, nanoplastics stay in dispersion and may therefore escape microplastic´s traps in the drainage water. This study aimed to assess the toxicity of mechanically made nanoplastics, from artificial turf polymers used in the field, and the presence of "natural" nanoplastics in the drainage water. We mechanically broke down high-density polyethene (HDPE) straws and ethylene propylene diene monomer (EPDM) rubber granules with a mixer. The nanoplastics were isolated by filtration. The nanoplastics sizes were around 110 nm (HDPE) and 140 nm (EPDM) determined by Nanoparticle Tracking Analyses (NTA). The chemistry was confirmed by Attenuated Total Reflection Fourier Transformed Infrared (ATR-FTIR) Spectrometry. No acute toxicity to zooplankton *Daphnia magna* was observed for nanoplastics from HDPE straws. In contrast, nanoplastics from the EPDM rubber granules exhibited strong acute toxicity to *D. magna*. Only breakdown nanoplastics from the surface of the EPDM granules were toxic as the toxicity disappeared after repeated breakdown of the same granules. Water samples collected from the drainage system were tested for the presence of nanoplastics (< 0.8 µm) and polymers and the results indicated the presence of trace amounts of EPDM in the environmental water samples, while HDPE was not detected. These findings contribute to the ongoing discussion on the potential environmental impact of artificial turf.