Micro- and Nanoplastics, 2025/2050: The Invisible and Neglected Epidemic Pollution That Threatens Food Security and Safety, the Environment and Human Health

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Plastics, microplastics and nanoplastics are potentially everywhere in the world.

Plastic pollution is inextricably linked to food safety, human health and climate change. They are an invisible and neglected threat to humans and the environment.

Plastics, microplastics and nanoplastics: microplastics (MPs), (1 µm to 5 mm); nanoplastics (NPs); (1 nm to 1 µm); exist in various forms and are based on fossil fuels (14% of global oil production); over 367 million tons were produced worldwide in 2020; total global production of plastics has reached 8.3 billion tons to date; 6.3 billion tons is plastic waste; by 2050, an additional 34 billion tons are projected; 12 billion tons of which will be plastic waste; 1 kg of plastic generates 4.2 kg of CO_2 over its lifetime (Ashworth, J., 7/2022); most plastic pollution comes from packaging materials, construction materials, household waste, medical waste, sports equipment, fishing gear, auto parts, electronic equipment, and agribusiness components (Ekner-Grzyb et al., 10/2022); are degraded by thermal, photo- and oxidative processes, by hydrolysis and by microorganisms,; are persistent and are estimated to take 250-1000 years to fully degrade; 6% are recycled; 19% are incinerated, and further contribute to global CO_2 emissions; most plastics end up in landfills or in the environment - in oceans, rivers, at both Earth's poles, on mountaintops, in snow, in soils, gardens, and farmland.

Keywords from a literature review, 3/2023:

Plants/Crops: A hidden and unknown biohazard (9/2020); impact (12/2022); response to (10/2022; 11/2022); crop yield impairment (5/2022; 11/2022); impact on seed production and quality (11/2022); reduce seed germination, seed vigour, and relative root elongation (10/2022); decline in crop gene expression (11/2022); threats to plants (10/2022); toxicity to plants (10/2022); risks to biota (2/2023); imminent concerns (10/2022).

Agriculture: Changing agricultural crops (5/2019); emerging environmental contaminants in agriculture (3/2022); "*White Revolution*" becomes "*White Pollution*"; emerging environmental pollutant in agriculture (3/2022); ravaging our agrosystem (2/2023); matter of concerns in farmlands (7/2022); risk for organic farming products (3/2022); found their way into our fruits and veggies (1/2023); environmental concerns (2022); environmental challenge in agriculture (2/2023); emerging threat to food security (5/2022); undermine food security (10/2022); emerging food contaminants challenge for food safety (1/2022); a call for action, FAO (2021; 2022).

Animals/Humans: Too early to say they pose a food safety risk (2016); daily intake by humans unknown (6/2019); evidence (9/2022); effects (3/2022; 9/2022; 10/2022); interactions (2/2022); entry into the human body (2/2023); found in human blood (3/2022; 5/2022); bioeffects (1/2021; 11/2021; 6/2022); absorption (10/2022); contamination (4/2020; 10/2021); accumulation (6/2020; 11/2021; 5/2022); increased nutritional risk (6/2020), "damages" human organs (9/2022), impairs vital functions (9/2022), causes metabolic disorders (2/2023); migrates to placenta and fetal tissues in rats (6/2022); jeopardizes male fertility (3/2021); 0.016 mg/kg/d of MPs leading to abnormal male semen quality (4/2022); may significantly impair male fertility (5/2022). - Can affect your dogs and cats (6/2022).

Call to Action: Climate change and plastic pollution are directly linked; rethinking the future of plastics; reduce to the minimum necessary; need for new plastics strategies; need for waste management plans; replacement with bio-based and bio-degradable plastics.

Appeal: Bring epidemic plastic, micro and nano plastic pollution under control as soon as possible!

The focus of the presentation is on impacts of MPs and NPs on plants/crops, agriculture, and food security/safety.