PlasticHealers: an interactive journey through the health effects of micro- and nanoplastics

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Effective science communication with younger audiences requires adaptable tools that bridge knowledge gaps while remaining accessible, engaging, and inclusive. Interactive digital activities offer a powerful solution, as they can be distributed widely (i.e., online or offline), translated into multiple languages, and used both in formal education settings and informal home environments. These tools can spark curiosity, encourage critical thinking, and make complex topics such as environmental mutagenesis understandable to children. However, their development also poses challenges, including the need to balance scientific rigor with user-friendly design, ensure digital accessibility, and foster meaningful reflection, not just passive learning.

Our initiative is framed within the H2020 project PLASTICHEAL, which aims to evaluate the health impacts of micro- and nanoplastics (MNPLs) through advanced mechanistic studies. The project explores how MNPLs interact with human biological systems, using in vitro and in vivo approaches to assess their toxicity and potential mutagenic effects. As plastic pollution grows, especially at microscopic levels, raising awareness about its potential health risks becomes essential, particularly among the younger generations, who will face its long-term consequences.

To address this, we developed an interactive digital activity designed for students aged 10–12 years. The storyline follows *Martina*, a young researcher from the Universitat Autònoma de Barcelona, who is investigating how MNPLs affect human health. Students assist Martina by choosing among various MNPL sources (such as glitter in cosmetics, synthetic fabrics, or tire abrasion) and follow the journey of plastic particles through different environmental pathways. Along the way, they explore how particle size determines the likely entry route into the human body (ingestion, inhalation, dermal exposure), and how researchers study these effects using laboratory models. The activity includes interactive tasks such as concept matching, size sorting, and pop-up quizzes, encouraging students to think critically and apply what they've learned in real time.

At the end of the activity, students are prompted to perform a group reflection, discussing strategies to reduce and prevent MNPL pollution and its health consequences. In parallel, we provided printable technical sheets for each participant to record their findings, answer guided questions, and consolidate learning outcomes. This blended approach of storytelling, interactivity, and hands-on reflection fosters meaningful engagement with science and empowers the next generation to take part in the environmental challenges of our time.

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