

## Assessment of genotoxic effects induced by real-life micro- and nanoplastics derived from orthodontic thermoplastics

H. R. Van Goethem<sup>1\*</sup>, A. Vergara<sup>1,2</sup>, I. H. Valido<sup>1</sup>, & S. Pastor<sup>1</sup>

<sup>1</sup> *Universitat Autònoma de Barcelona, Barcelona, Spain*

<sup>2</sup> *Pontificia Universidad Javeriana, Bogotá, Colombia*

\* [Hannes.vangoethem@uab.cat](mailto:Hannes.vangoethem@uab.cat)

The widespread use of clear orthodontic aligners and retainers has raised concerns regarding the potential release of polymeric nanoplastics during routine wear. In this study, we explored the potential cellular interactions and genotoxic effects of polyurethane nanoplastics derived from Invisalign retainer material in human oral cells. Polyurethane nanoplastic particles were generated manually in the lab from retainer material and characterized prior to experimental exposure.

Following incubation, cellular internalization of the particles was assessed, indicating that polyurethane nanoplastics could be taken up by oral cells under the experimental conditions tested. To investigate potential genetic effects, two commonly used genotoxicity assays were employed: the comet assay to evaluate DNA strand breaks and the micronucleus assay to assess chromosomal damage and genome instability.

Preliminary observations suggest an increase in markers associated with DNA damage in exposed cells compared with untreated controls. While these findings are still under investigation, they point toward the possibility that polyurethane nanoplastics released from orthodontic retainer materials may interact with oral cells and influence genomic stability.

Overall, this work provides early evidence that nanoplastic particles originating from polyurethane-based orthodontic retainers can enter oral cells and may contribute to genotoxic stress under experimental conditions. Further development of the study is required to confirm these observations and to better understand the potential long-term biological implications and safety of the polyurethane-based materials used in orthodontic appliances.

**Funding:** This research was funded by the Spanish State Research Agency (AEI) under project PID2023-146489OB-I00, in accordance with Order CIN/1025/2022, within the State Plan for Scientific and Technical Research and Innovation 2021–2023.