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# Degradation of reduced graphene oxide in gastrointestinal fluids during *in vitro* digestion

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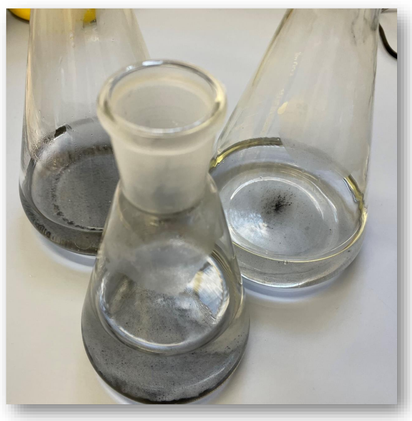
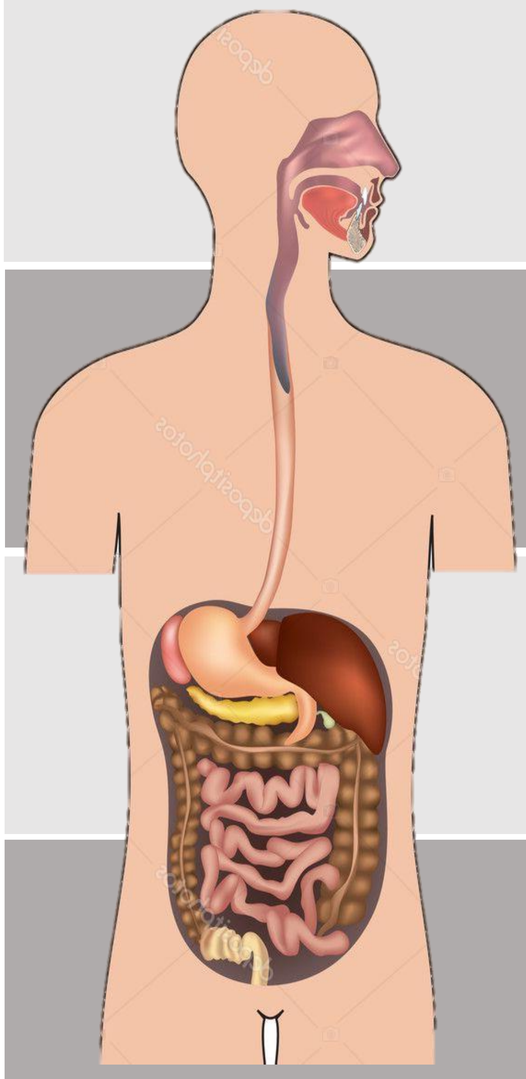
## Introduction

Over the past few years, there has been a growing interest for the use of graphene derivatives, such as reduced graphene oxide (rGO) in several areas, including food packaging applications due to its ability to provide enhanced mechanical and barrier properties. According to the recommendations of the European Food Safety Authority (EFSA)[1], it is required to assess nanomaterial degradation to check the potential exposure. The aim of this study was to determine the stability of rGO on the gastrointestinal system by means of an *in vitro* digestion model[2].

## Material and Methods



Samples:
3 rGO concentrations (50, 100, 200 µg/mL) were evaluated. Previously, they were sonicated for 1 h.




Scanning electron microscopy (a) (SEM) and ζ potential (b) characterization

**a)**

**b)**

## Results

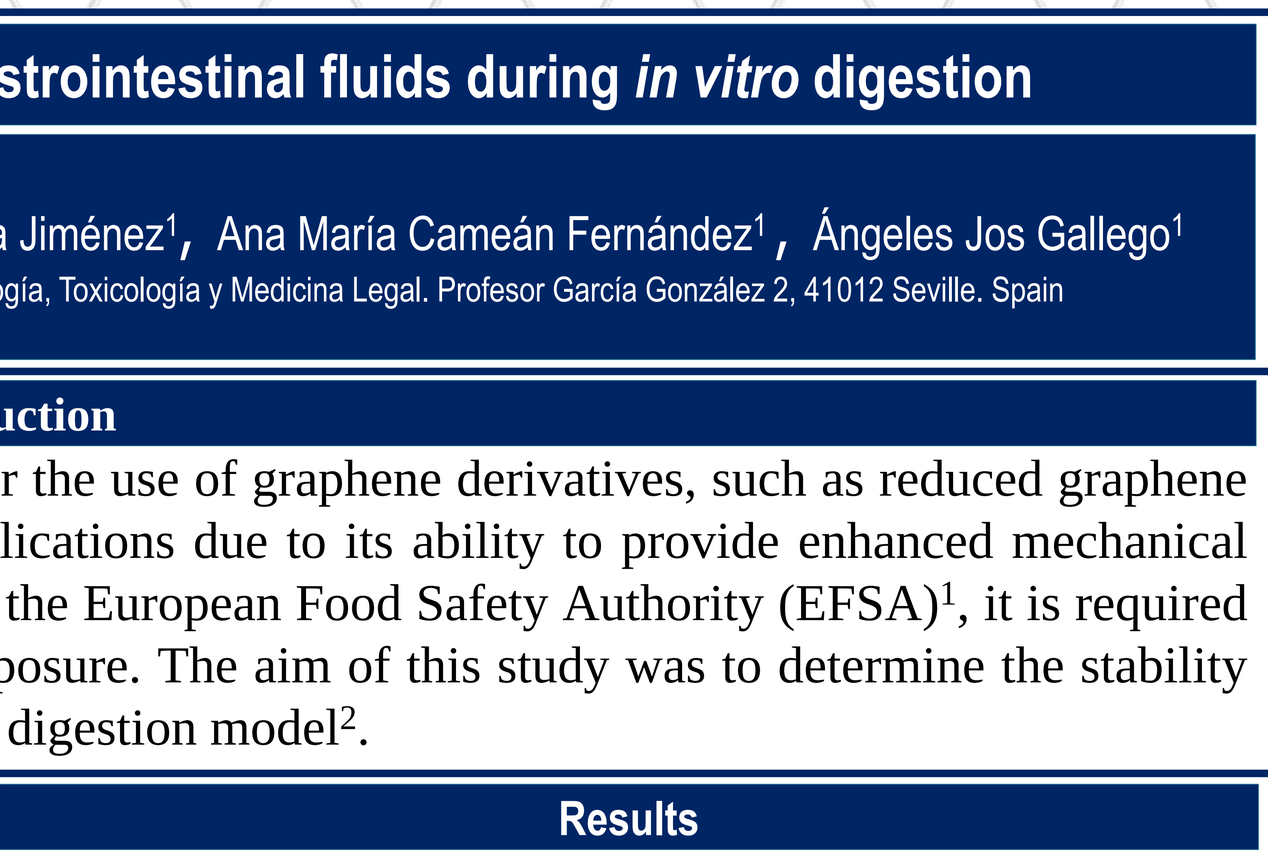
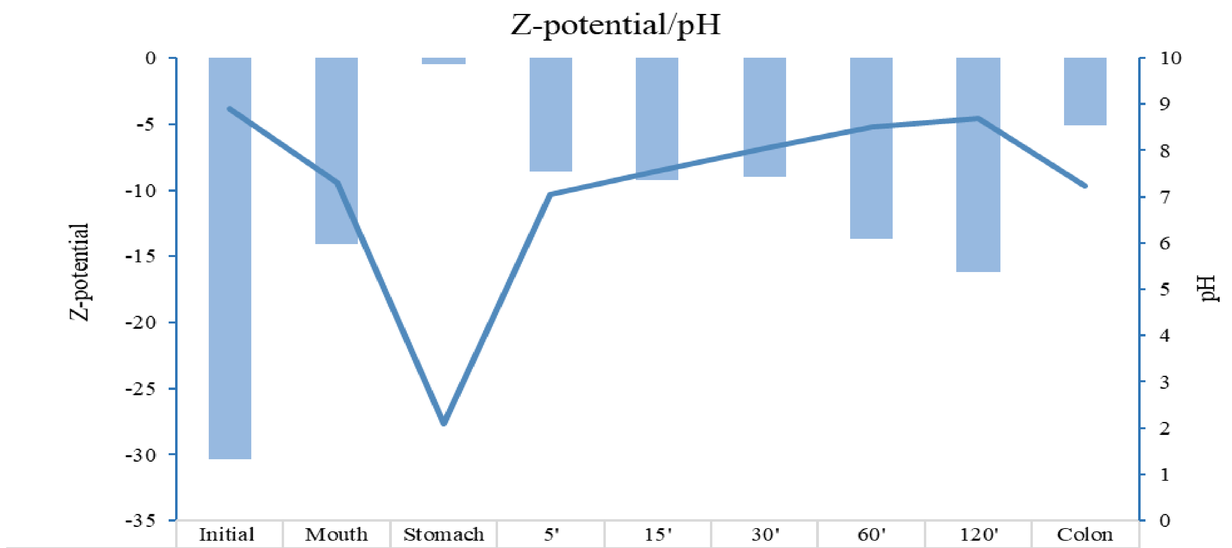



Fig. 2. SEM images of rGO through the different phases. a) undigested rGO, b) salivary, c) gastric, d) duodenal, and e) colonic. GO are visualized as agglomerated. These results show an aggregation state of rGO samples.




| | Initial | Mouth | Stomach | 5' | 15' | 30' | 60' | 120' | Colon |
|---|---|---|---|---|---|---|---|---|---|
| z Potential | -30.4 | -14.1 | -0.44 | -8.6 | -9.24 | -9 | -13.7 | -16.2 | -5.09 |
| pH | 8.9 | 7.3 | 2.1 | 7.04 | 7.55 | 8.04 | 8.5 | 8.7 | 7.24 |

Fig. 3. Values of ζ potential/pH. Values close to zero suggest particle aggregation.

## Conclusion

Thus, changes observed on the material can have an influence on its toxicity, aspect that should be further evaluated.

## Acknowledgement:

Project US-1259106 cofunded by Programa Operativo FEDER 2014-2020 and Consejería de Economía, Conocimiento, Empresas y Universidad de la Junta de Andalucía. And project P18-RT-1993 (PAIDI-2020, FEDER, Consejería de Transformación Económica, Industria, Conocimiento y Universidades, Junta de Andalucía Junta de Andalucía). Functional characterization, microscopy and Biology Services of CITIUS are acknowledged for technical assistance.

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## REFERENCES

[1] EFSA Scientific Committee, More S, Bampidis et al. 2021. Guidance on risk assessment of nanomaterials to be applied in the food and feed chain: human and animal health. EFSA Journal 2021;19(8):6768, 111.

[2] Díez-Quijada Jiménez, L., Guzmán-Guill´en, R., Cascajosa Lira, A., Jos, Á., Cameán, A.M., 2020. *In vitro* assessment of cyanotoxins bioaccessibility in raw and cooked mussels. Food Chem. Toxicol. 140, 111391

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