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IN VITRO ASSESSMENT OF SKIN IRRITATION POTENTIAL OF GRAPHENE BASED MATERIALS USING RECONSTRUCTED HUMAN EPIDERMIS (RhE)

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INTRODUCTION

Graphene-based materials (GBMs) are employed in a wide range of fields, including electronic and biomedical applications due to their extraordinary physicochemical properties[1,2,3]. The main risk to human health posed by GBMs is associated with the occupational exposure[4], being the inhalation and dermal contact the most relevant routes of exposure[5]. In this context, around 90 % of skin diseases associated with occupational settings are represented by irritant and allergic contact dermatitis[6].

Considering the possible risks in the work environment due to the skin irritation potential of these materials, the cutaneous toxicity of a group of GBMs, including **small flakes graphene (SFG)**, **large flakes graphene (LFG)** and **graphene nanoplatelets (GNplatelets)** was evaluated following the **Organization for Economic Co-operation and Development (OECD) guidelines**.

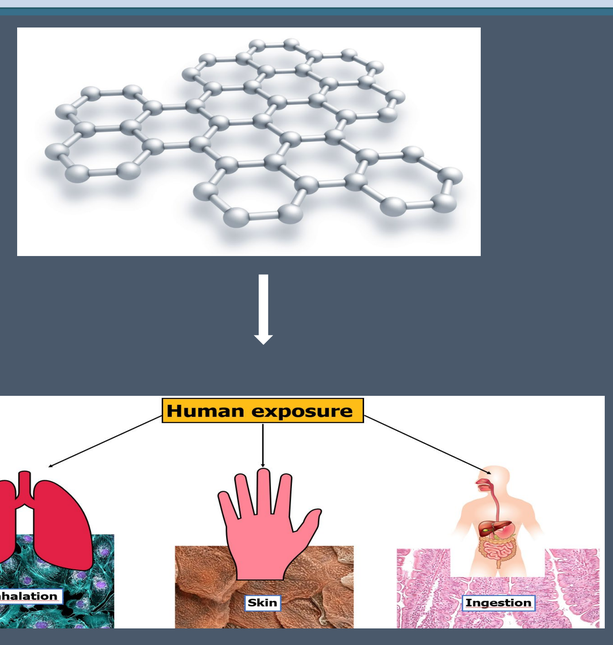

Figure 1: Routes of exposure to the Graphene.

METHODS

- The **skin irritation potential** of the small flakes graphene (**SFG**), large flakes graphene (**LFG**) and graphene nanoplatelets (**GNplatelets**) was determined using ***In Vitro* EpiDerm Skin Irritation Test**.
- Tissues were exposed to 25 mg of GBMs during 1 h.
- The viability was analysed by MTT assay, and it is expressed as a percent of negative control (PBS).

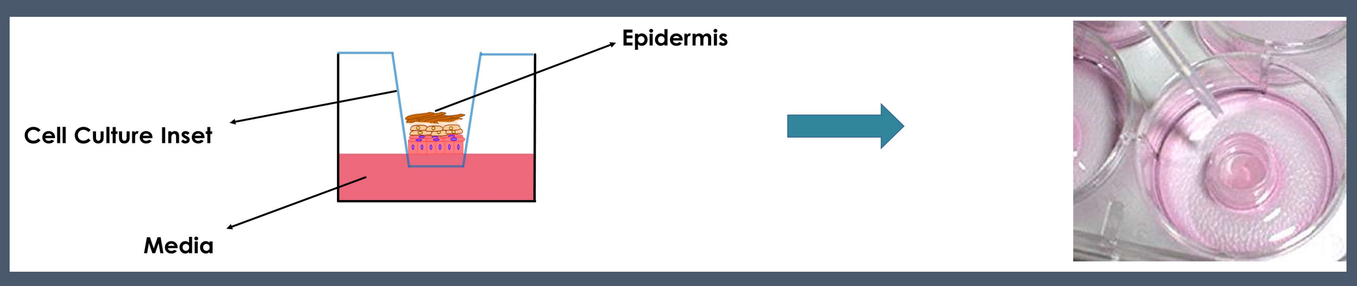

Figure 2: 3D-Reconstructed human epidermis model.

RESULTS

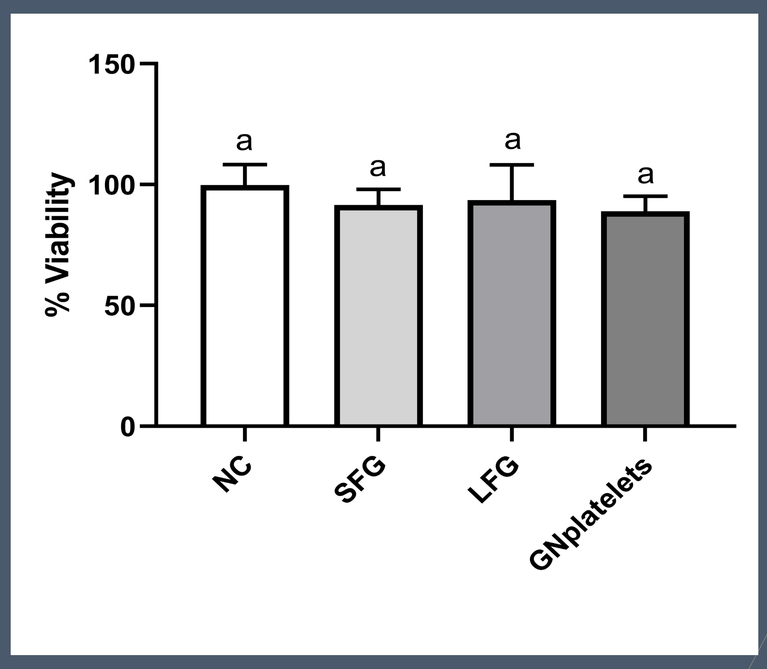

Figure 3. EpiDerm tissues were exposed to SFG, LFG and Gnplatelets during 1 h. Tissues treated with PBS were used as negative control. Data represented the mean ± standard deviation (SD). Differences were established using a one-way ANOVA followed by multiple comparisons test (Tukey test) and considered significant when $P \leq 0.05$. The same letter indicates no significant differences between treatments.

CONCLUSIONS

- **None** of the **GBMs** caused a **reduction** in the **tissue viability** over 50 % when compared to the controls.
- According to **EU and Globally Harmonized System of Classification and Labelling Chemicals, GHS**, (R38 / Category 2 or no label) **none** of the **GBMs could be considered an irritant** in the conditions tested.

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