Inhaled nanoplastics as vectors for Benzo(a)pyrene: Unveiling a synergistic mechanism of airway toxicity

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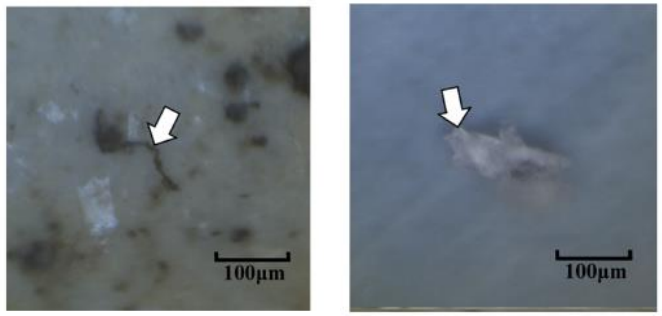
Microplastics in lung tissue

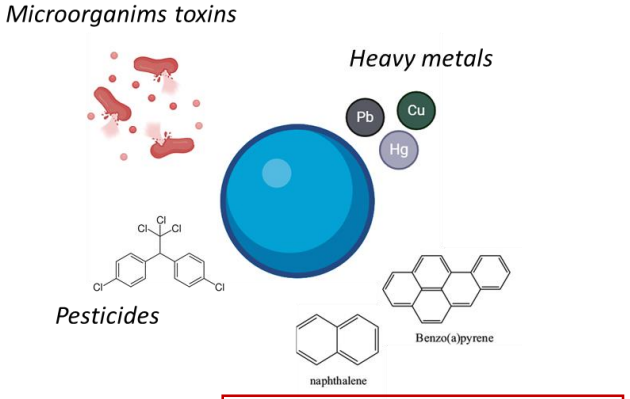
(Jenner et al. 2022)



Polyethylene terephthalate (PET)

Polystyrene (PS)

Interaction of micro and nanoplastics with airborne contaminents



Polycyclic Aromatic Hydrocarbons (PAHs)

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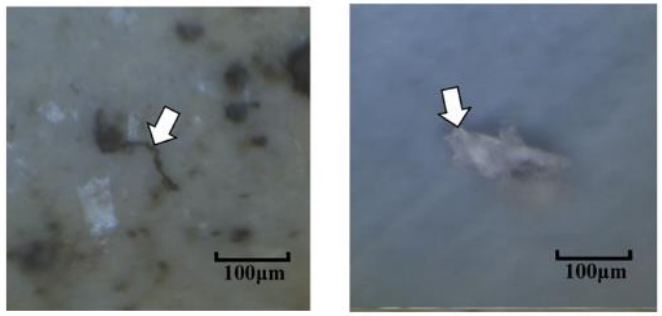

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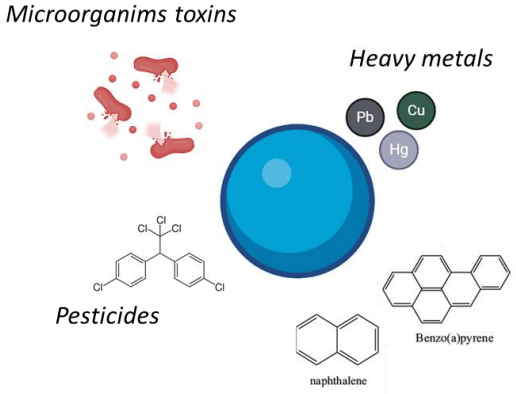
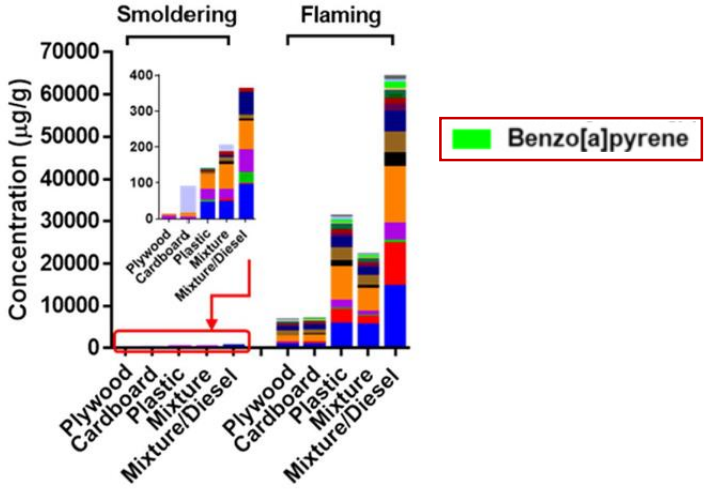


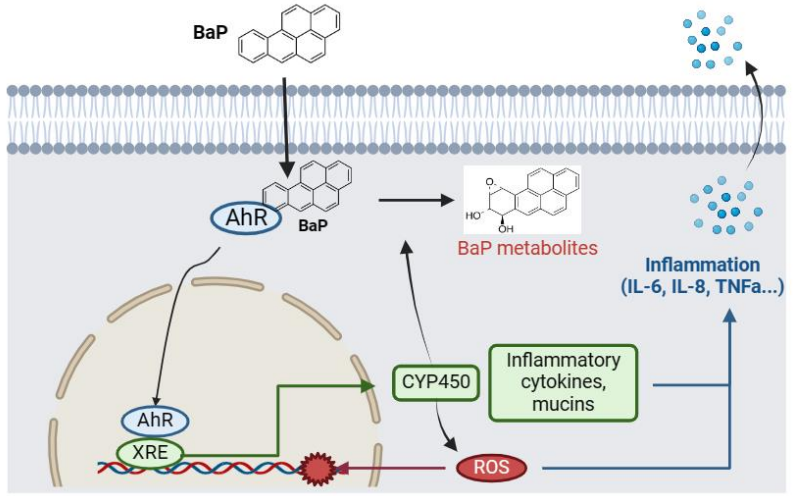
Polycyclic Aromatic Hydrocarbons (PAHs)

Release of 16h PAHs generated by waste incineration

(Kim et al. 2021)



Activation of Aryl Hydrocarbon Receptor (AhR)-Pathway by BaP



→ Effects and Fate of nanoplastics (NPs) and NPs-associated contaminants in the bronchial epithelium?

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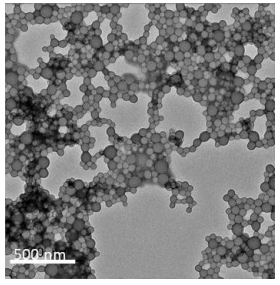
Coating PET NPs with BaP

PET (15 µg/cm²)

BaP (0.17 nmol/cm²) = 10µM



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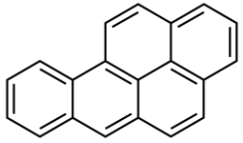
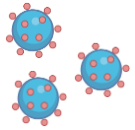
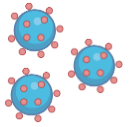




BaP-coated PET

PET NPs



BaP@PET

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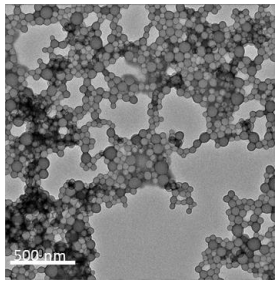

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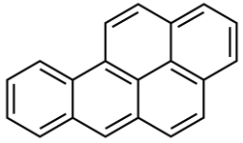

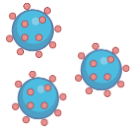

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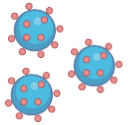
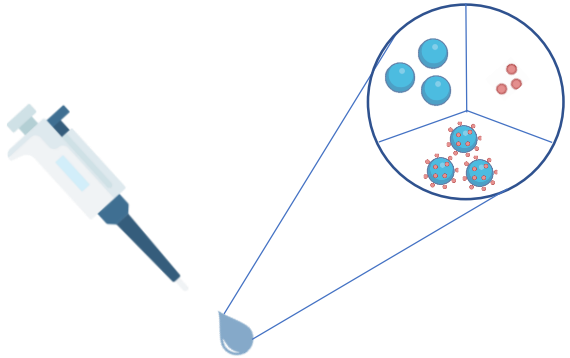
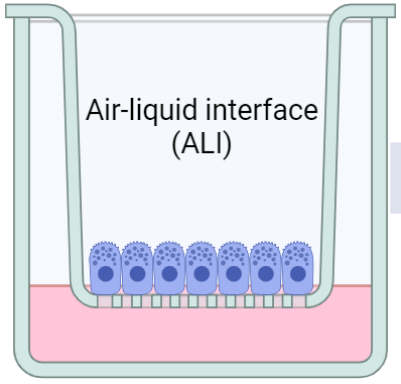


BaP@PET

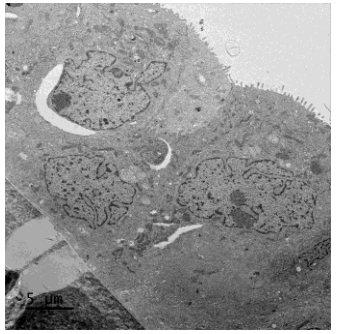
In vitro Inhalation Toxicological Assessment





Calu-3 cell line

6h, 18h and 24h



- Internalization
- Cytotoxicity
- Barrier Integrity
- CY P450 induction
- Oxidative stress
- Inflammation

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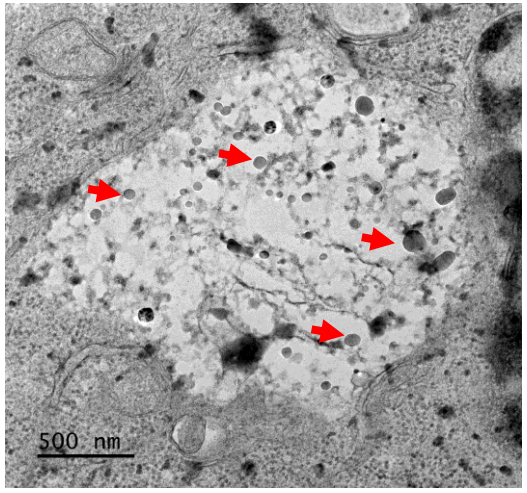
Effects and Fate of nanoplastics (NPs) and NPs-associated contaminants in the bronchial epithelium?

Internalization

Transmission Electron Microscopy

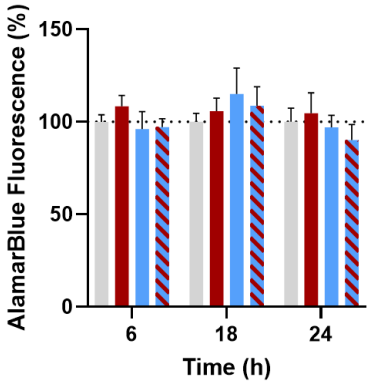
PET NPs (45 µg/cm², 24h)



PET NPs are internalized without altering cell viability and barrier integrity

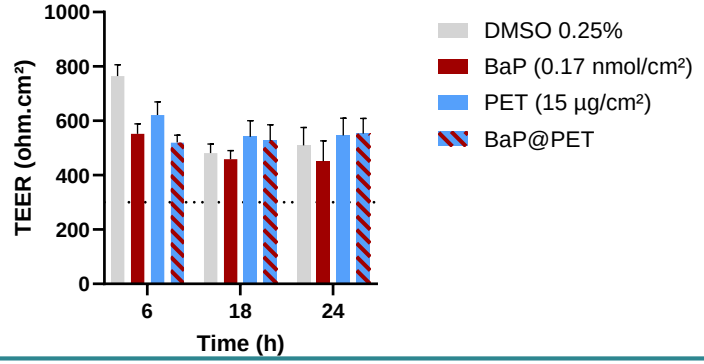
Cell viability

AlamarBlue Assay



Barrier Integrity

Trans Epithelial Electrical Resistence



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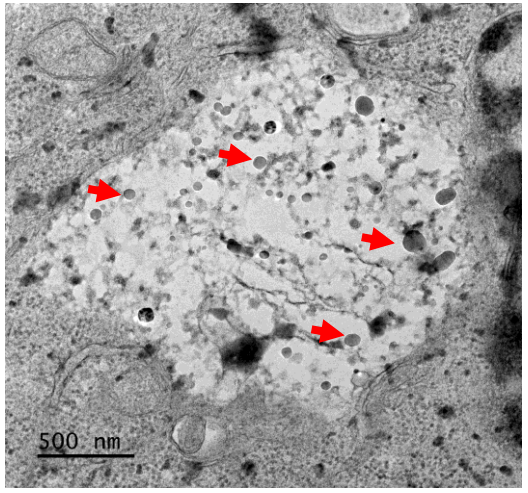

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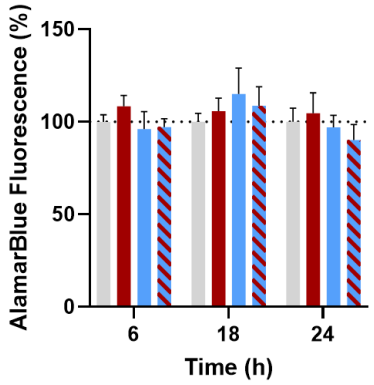

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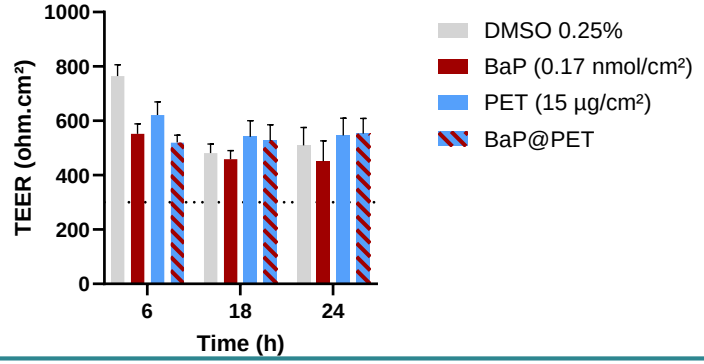
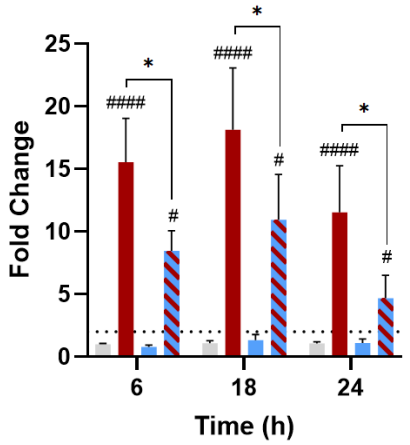


Cytochroms P450 Induction

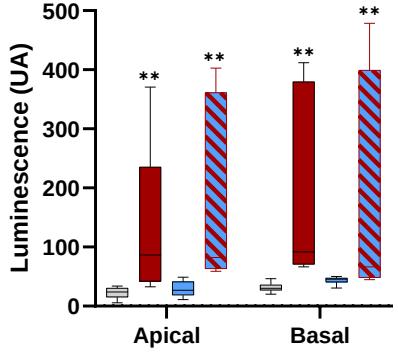
RT-qPCR

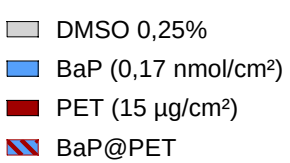
CYP1A1 mRNA



P450-Glo Assay

CYP1A1/1B1 Activity
(at 18h of exposure)





BaP is bioavailable when adsorbed onto PET NPs

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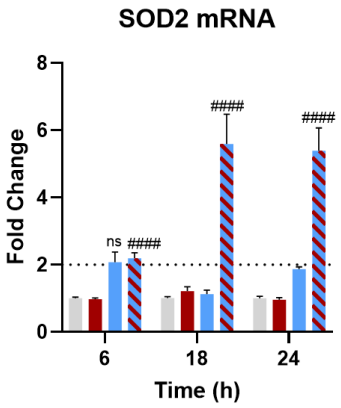
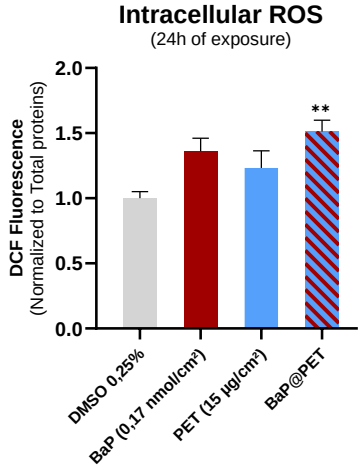
Antioxidant response and ROS production

RT-qPCR



CM-H2DCFDA



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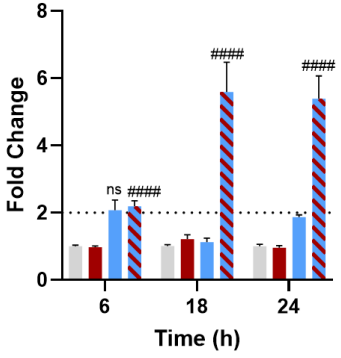

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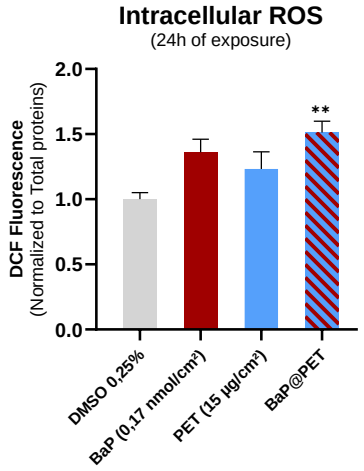

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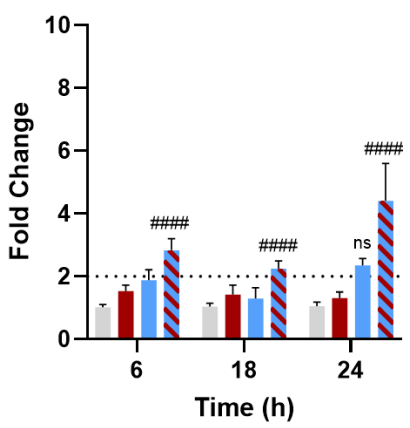
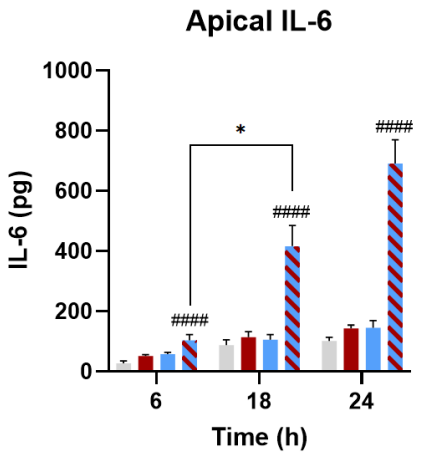
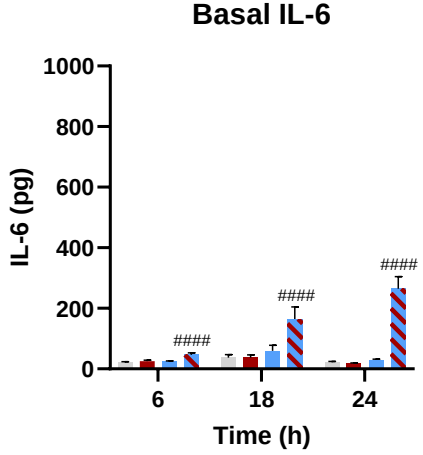
Pro-inflammatory response

RT-qPCR



ELISA





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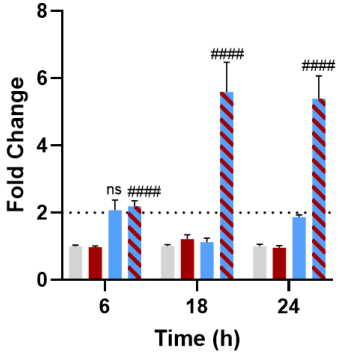

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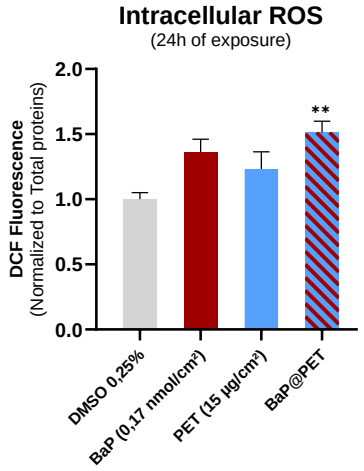

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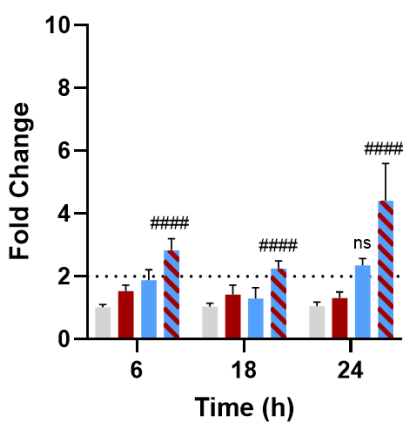

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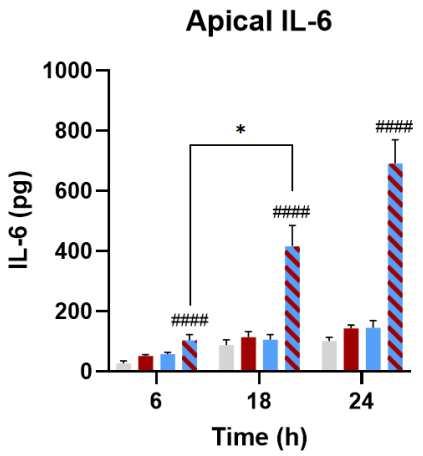

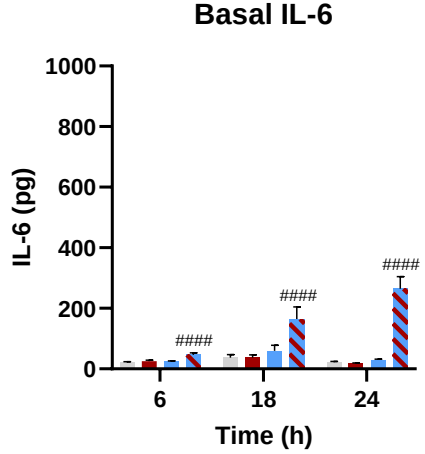

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Distinct mechanism of airway toxicity when BaP is adsorbed on PET NPs

Singaling pathways, BaP metabolization pathway…