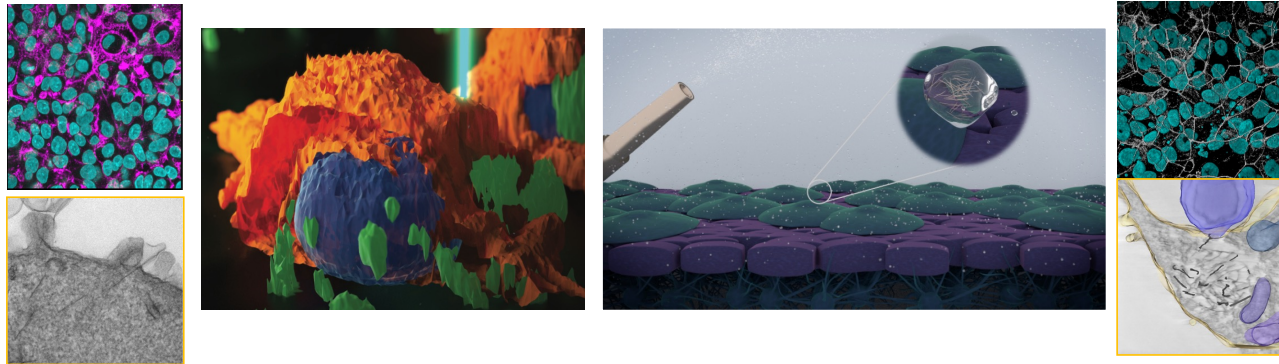
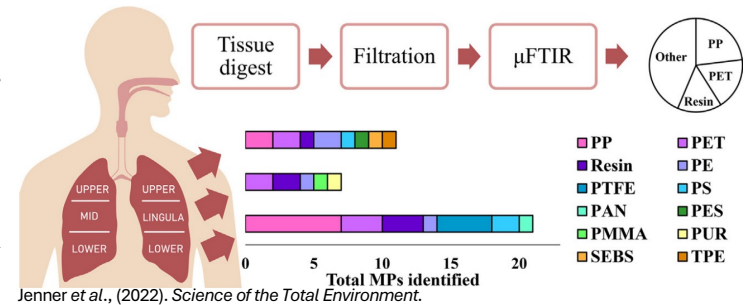
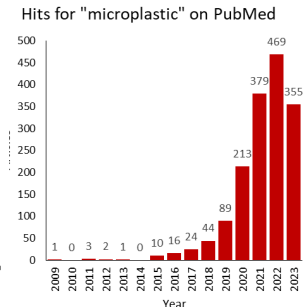
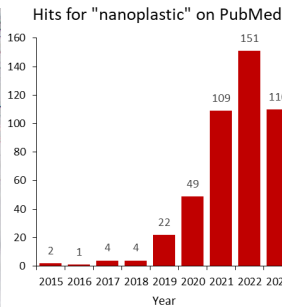


An *in vitro* perspective towards a realistic understanding of the inhalation hazard of MNPs



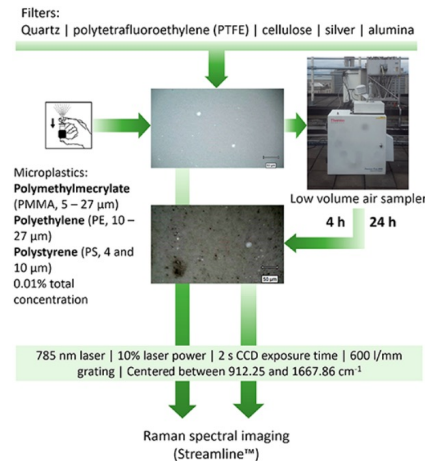
Prof. Martin Clift, *In Vitro* Toxicology Group, Swansea University

Micro/nanoplastics: A source of lung toxicity



Raman Spectral Imaging for the Detection of Inhalable Microplastics in Ambient Particulate Matter Samples

Stephanie L. Wright,* Joseph M. Levermore, and Frank J. Kelly



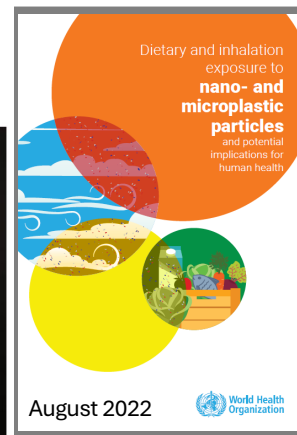
Wright & Kelly, (2017). *Environmental Science & Technology*

Microplastics found deep in lungs of living people for first time

Particles discovered in tissue of 11 out of 13 patients undergoing surgery, with polypropylene and PET most common

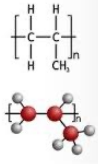


Microplastics now contaminate the entire planet, from the summit of Mount Everest to the deepest oceans. Photograph: David Kelly

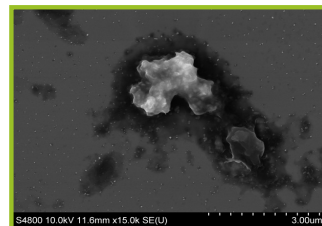
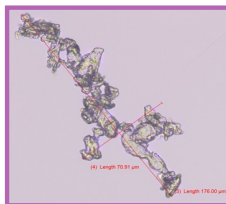
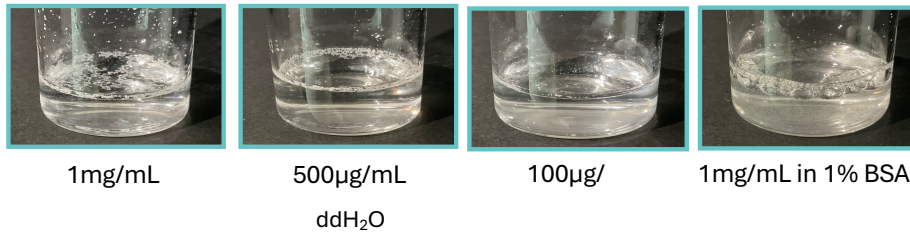


Preliminary Experimental Approach - Facemasks

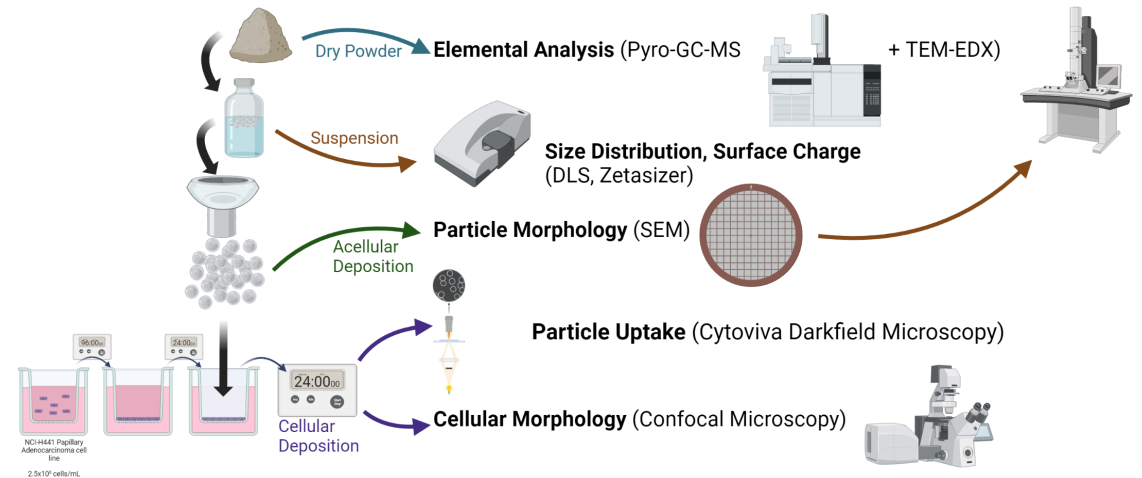
Polypropylene



com - 2091891097

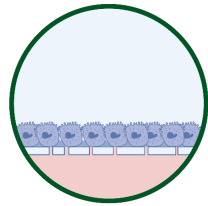


Lewis Hodgetts



Natural Environment Research Council

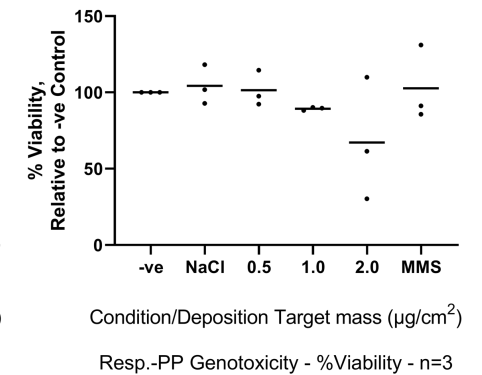
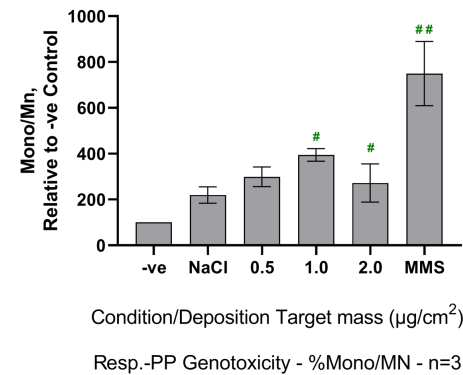
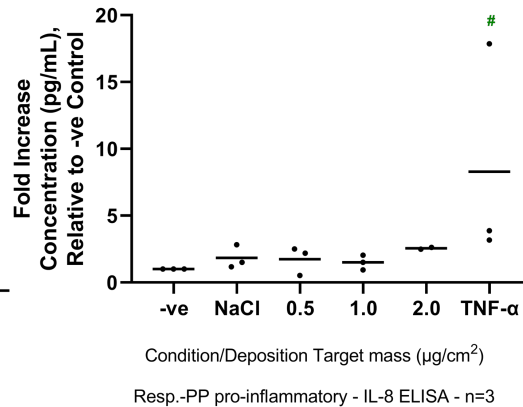
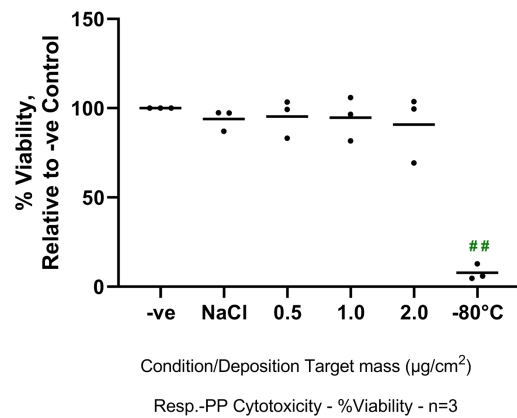
Preliminary Experimental Approach - Facemasks



Epithelial (Type-II) Cells
(NCI-H441)



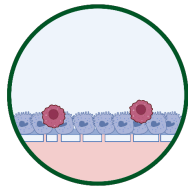
Respirable PP



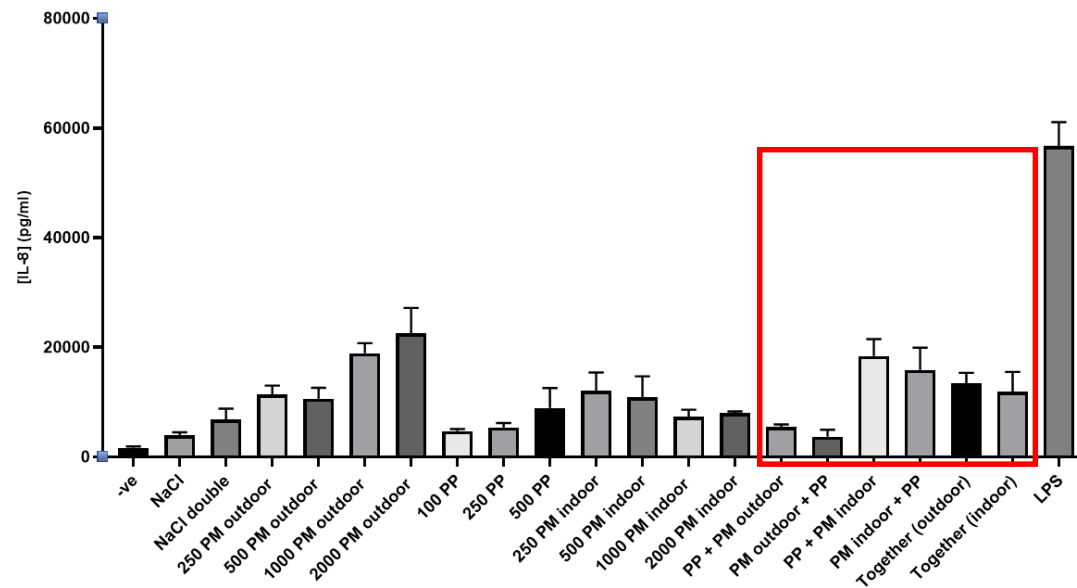
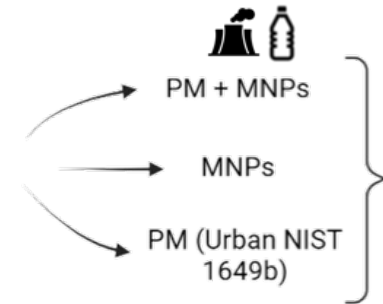
Lewis Hodgetts

n=3; * $p < 0.05$ (-ve control); # $p < 0.05$, ## $p < 0.01$ (NaCl)

Preliminary Experimental Approach – Co-exposure



Epithelial (Type-II) Cells
(NCI-H441)
Macrophage cells
(dTHP-1)



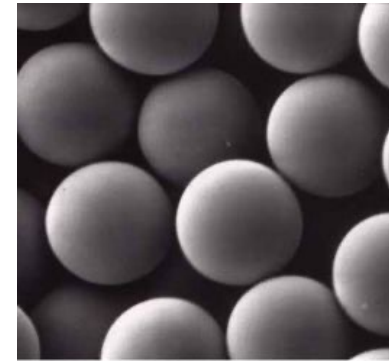
Olivia Whittle-Wright

n=3

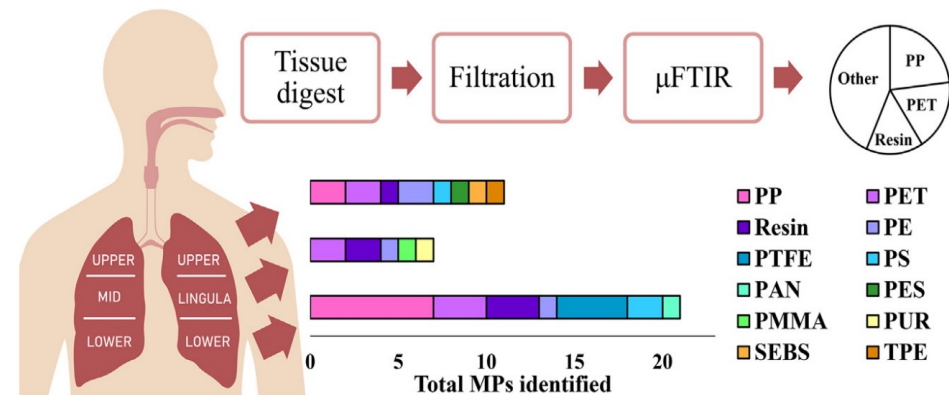
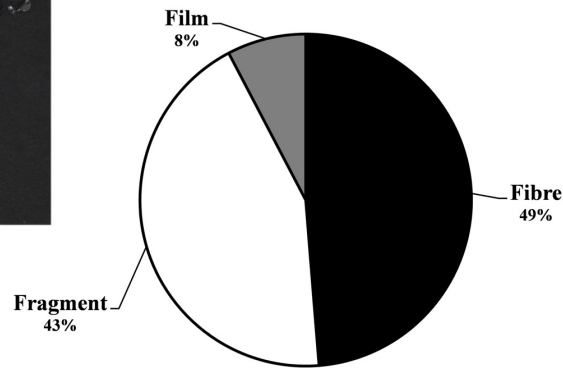
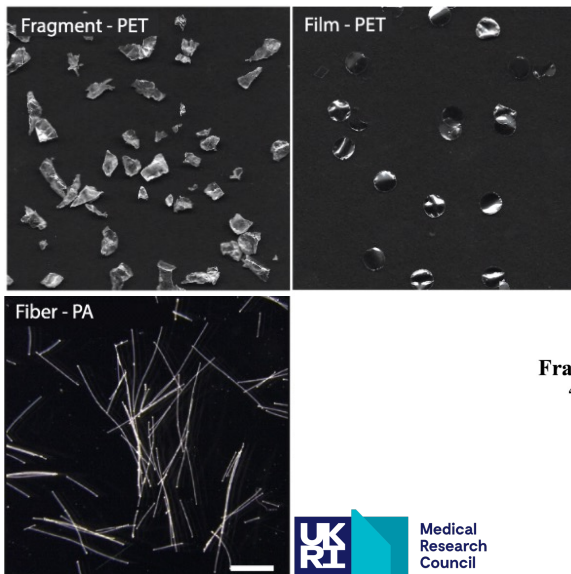
Which MNP to use?

Polystyrene used in more than 96% of MNP research...

Yet only represents 6% of the plastic found in the environment



SEM Image of PS Microspheres

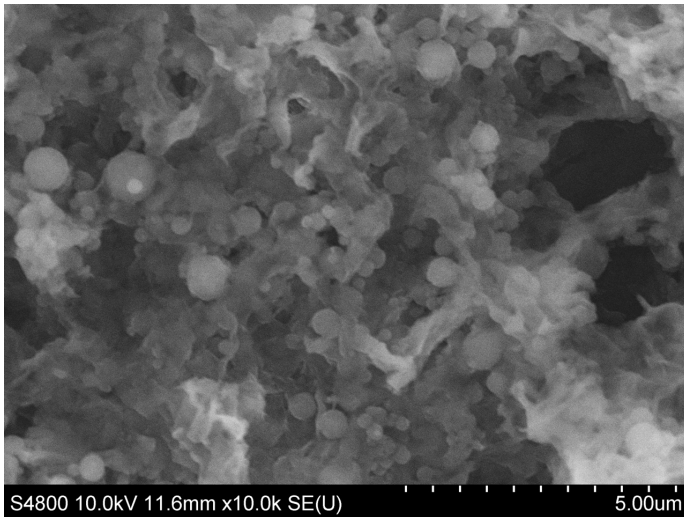


Jenner et al., (2022). Science of the Total Environment.



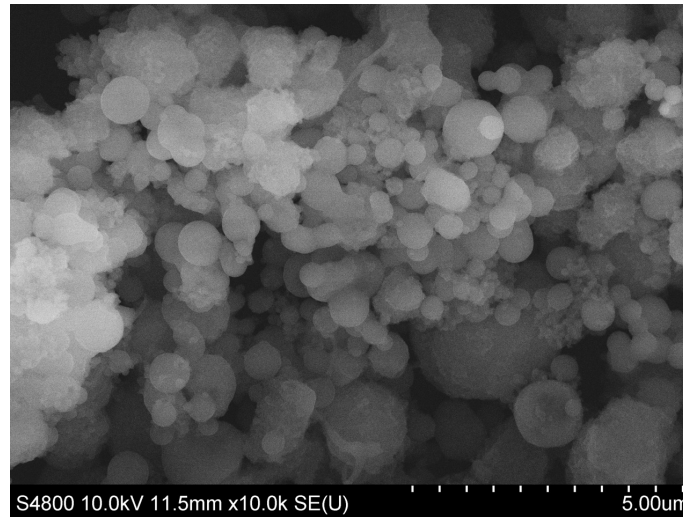
MNP Samples

Polyamine



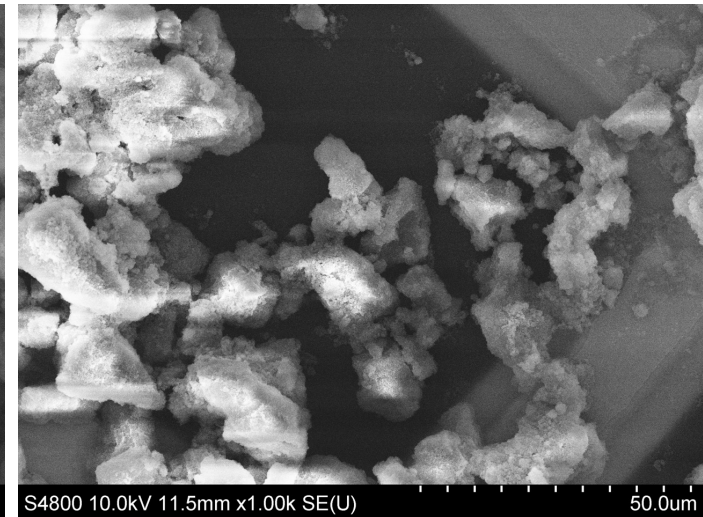
Ave.~2155 nm

Polyethylene Terephthalate



Ave.~ 1287 nm

Polystyrene



Ave.~ 1029 nm

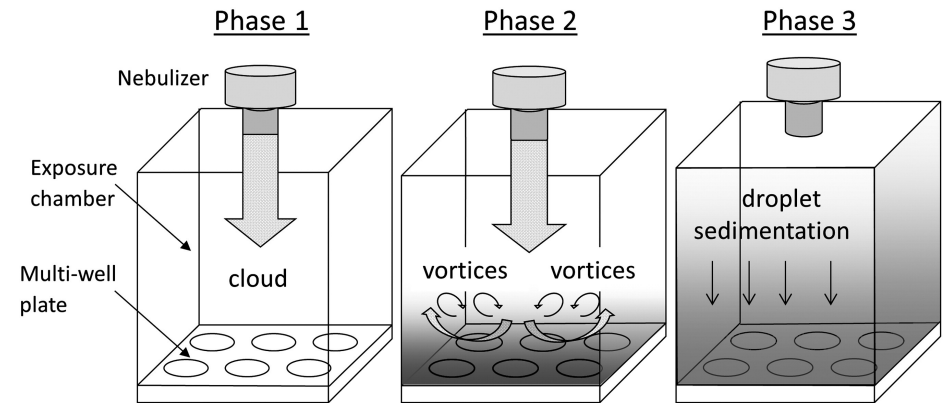
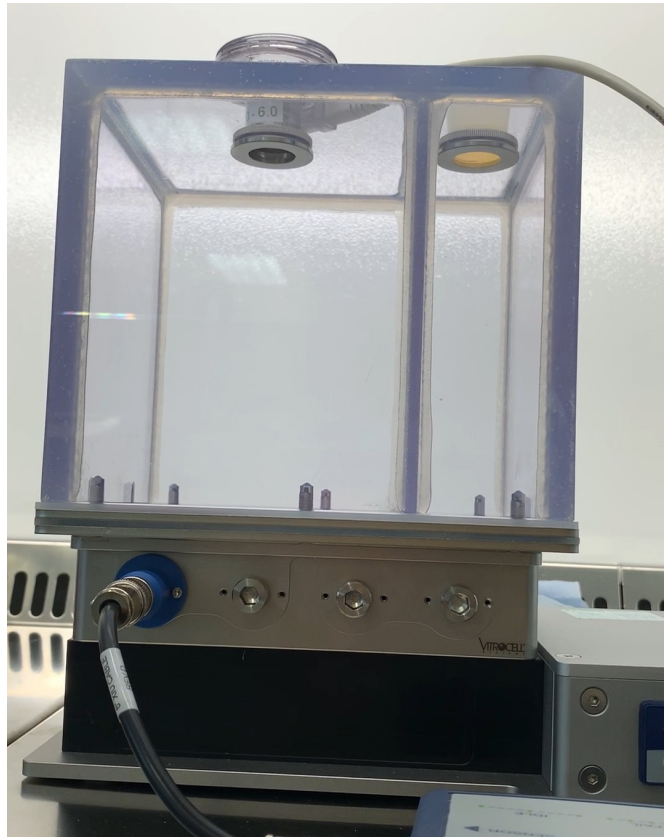
Dr. Joshua Bateman

UNPUBLISHED DATA – NOT FOR SHARING

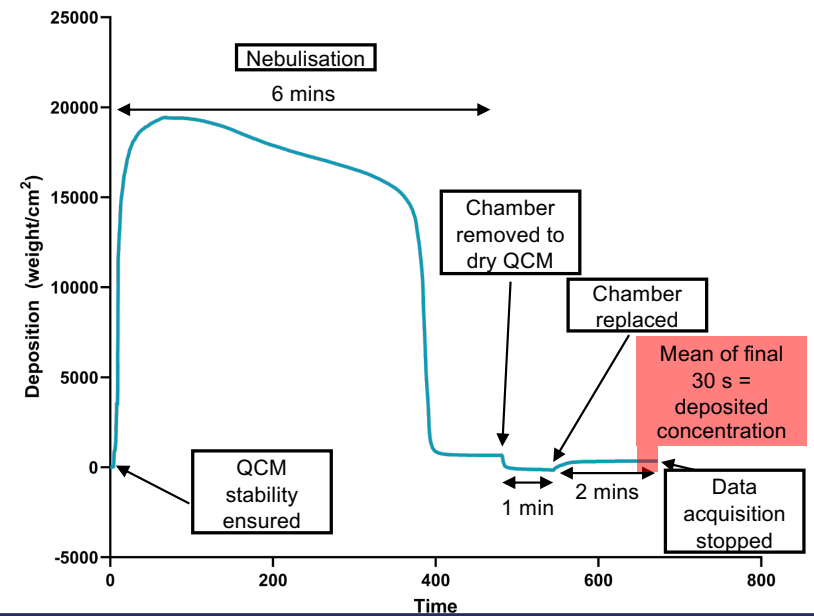


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VitroCell Cloud

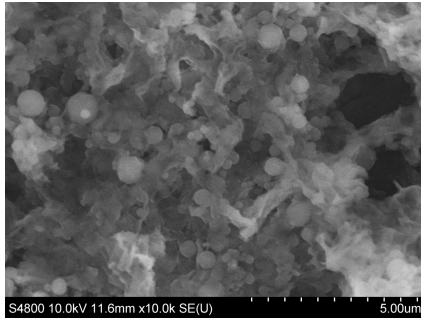


Lenz et al. (2014). *Am J Respir Cell Mol Biol.* **51**; 4.

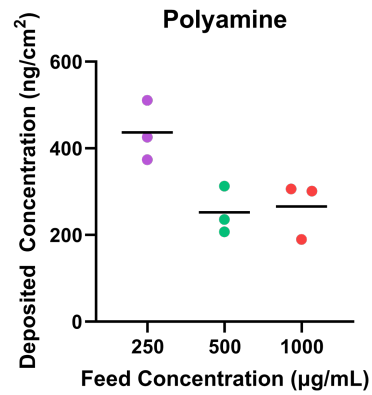


MNP Samples

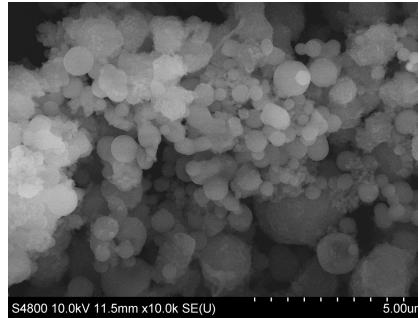
Polyamine



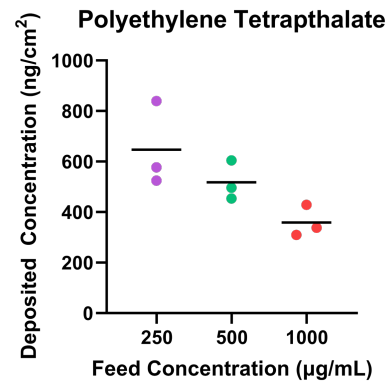
Ave.~2155 nm



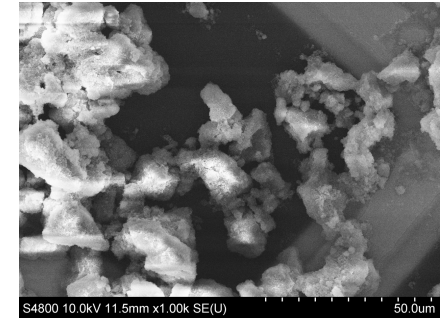
Polyethylene Terephthalate



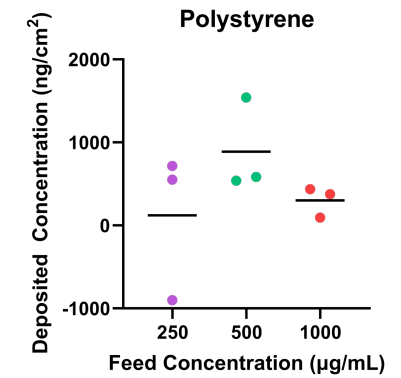
Ave.~ 1287 nm



Polystyrene



Ave.~ 1029 nm



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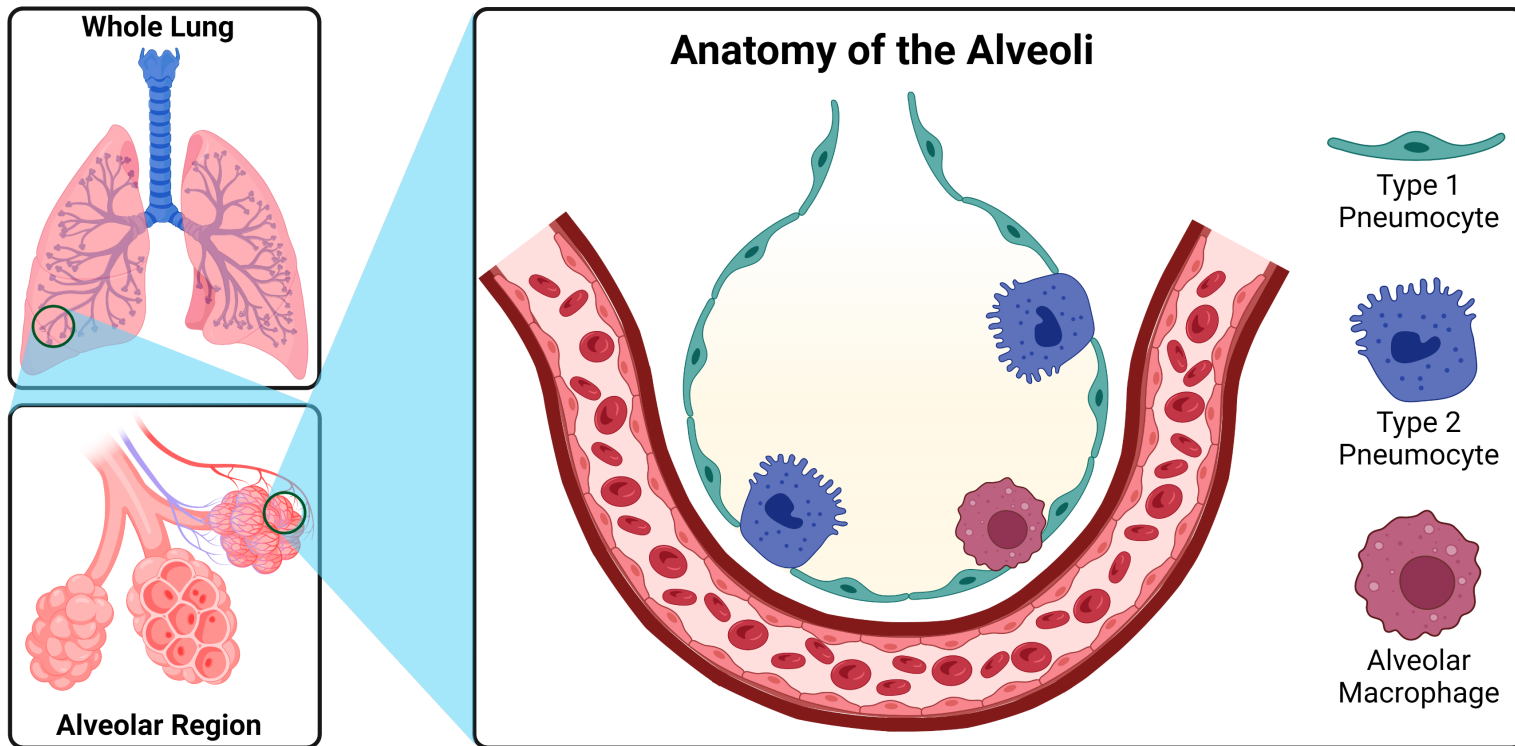
n=3

UNPUBLISHED DATA – NOT FOR SHARING

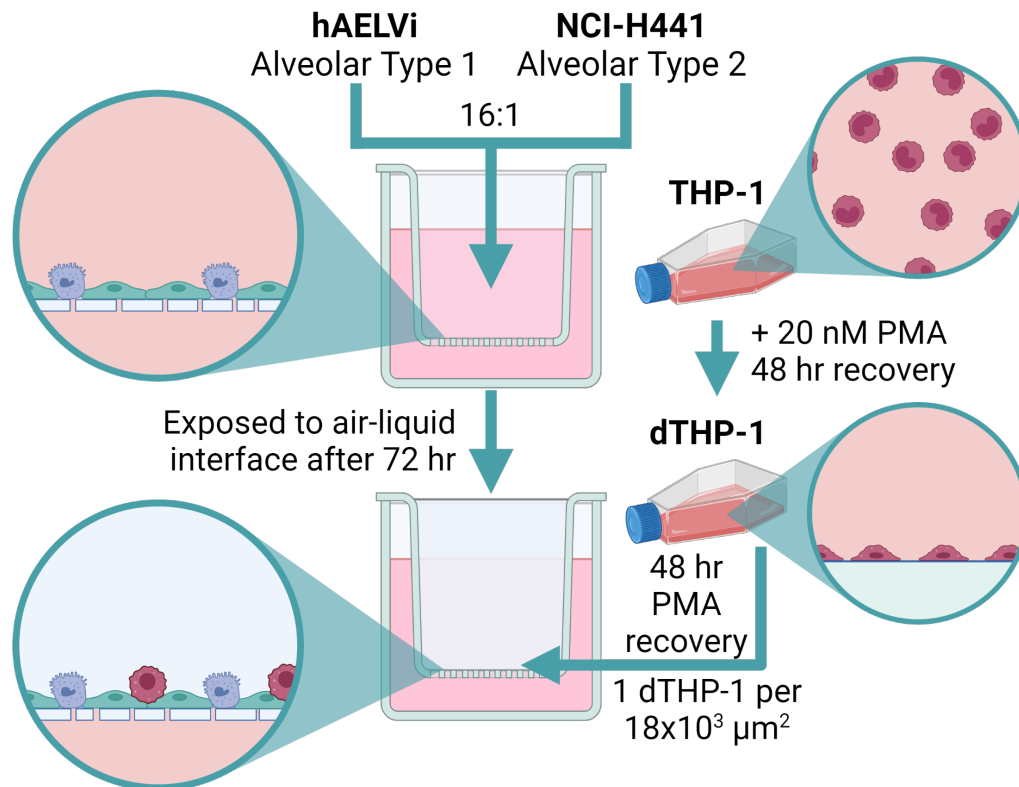


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Models of the Human Alveolar Region



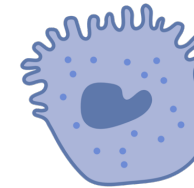
Methods – Triple Cell Co-Culture



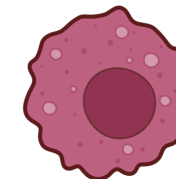
Created with BioRender.com



Type 1 Pneumocytes
CI-hAELVi
(InSCREENeX)



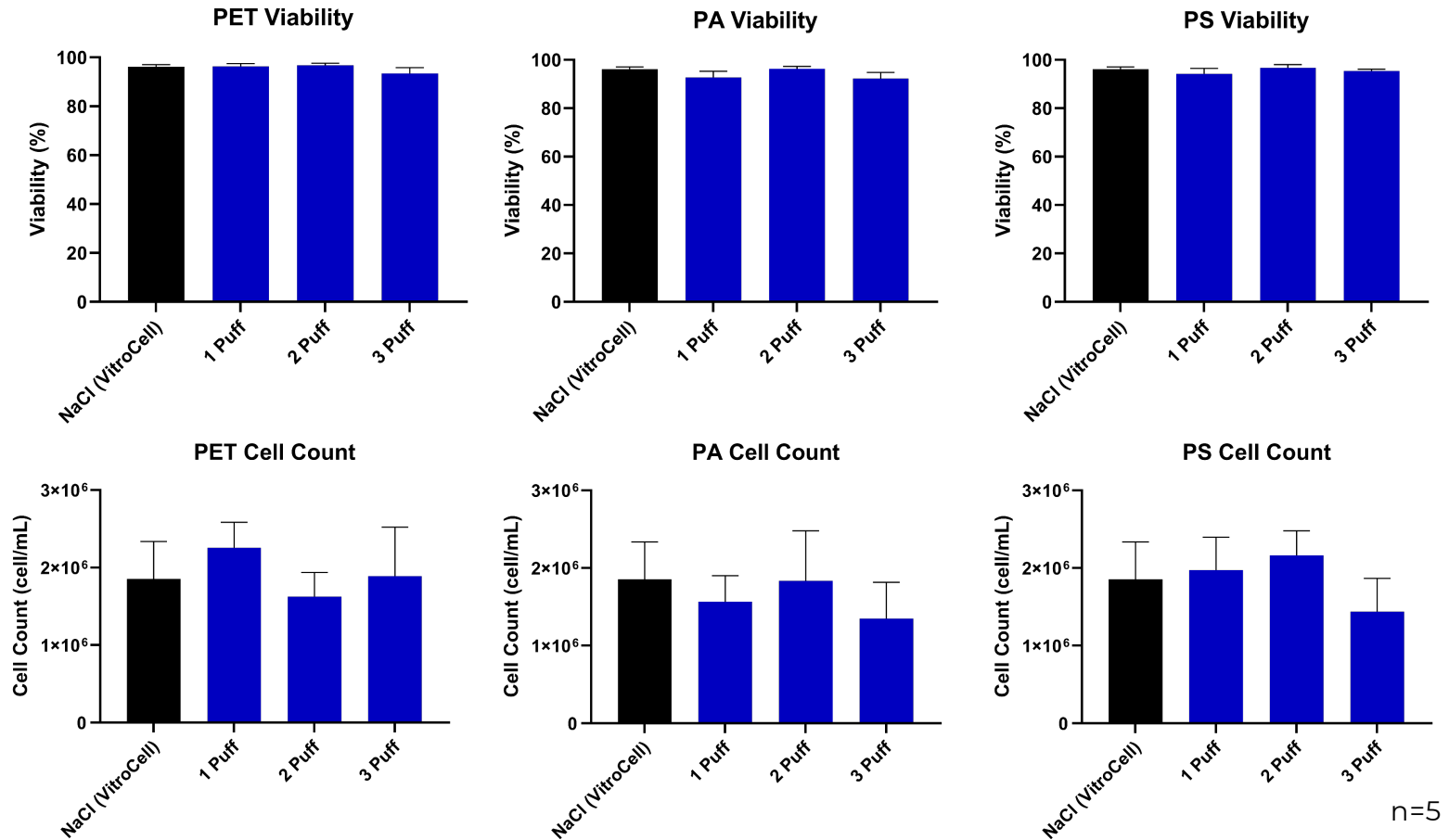
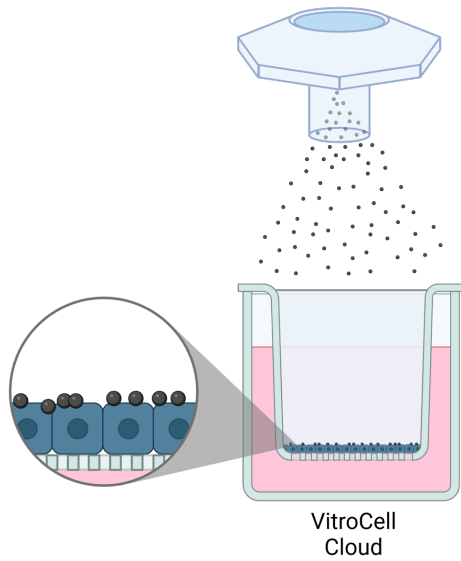
Type 2 Pneumocytes
NCI-H441 (ATCC HTB-174)



Alveolar Macrophages
THP-1 (ATCC TIB-202)
differentiated using
Phorbol 12-myristate
13-acetate (PMA)



Triple Cell Co-Culture MNP Exposure



n=5

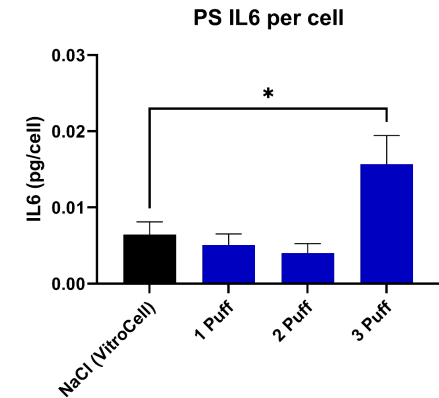
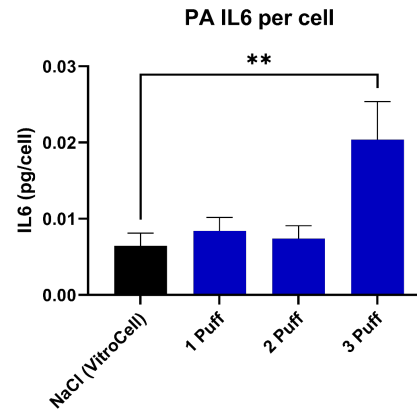
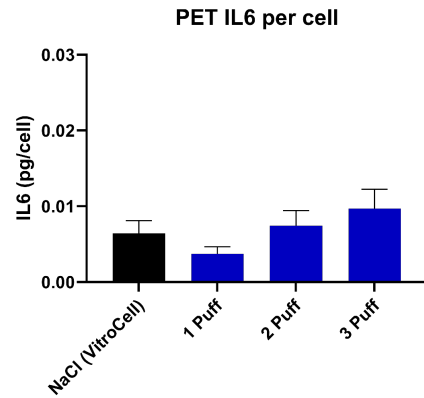
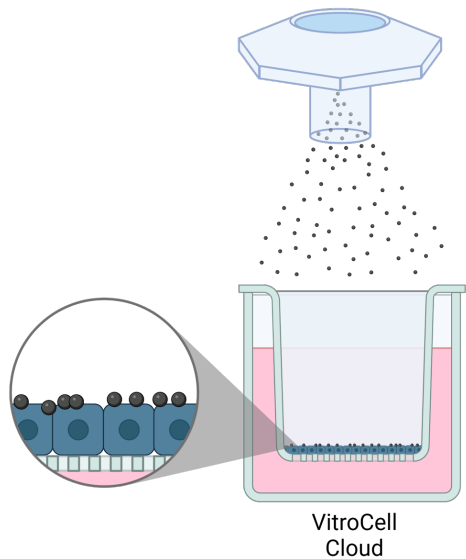
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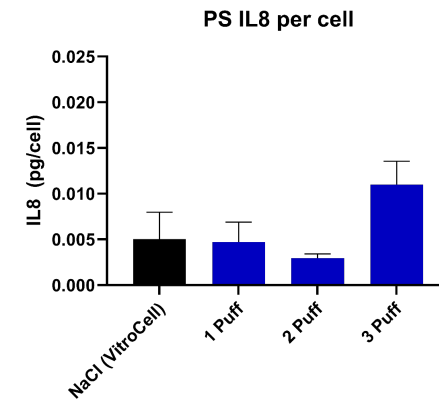
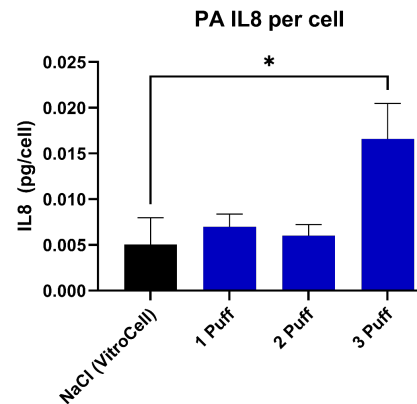
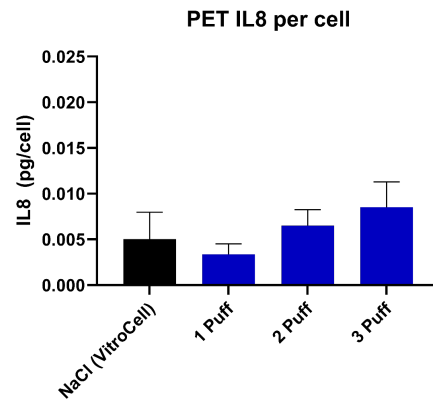


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Triple Cell Co-Culture MNP Exposure



n=5; *p<0.05; **p<0.01



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Summary and Outlook

- A method has been developed to allow realistic exposure of realistic MNPs to a realistic lung model
- The choice of MNP is important
 - MNP type alters pro-inflammatory response
 - Greater need for focus in this area given the downfalls of much of the preceding research
- There is an indication of when exposed with additional pollutants, the hazard of MNPs alters.
- Ongoing research into the chronic impact, as well as effects upon diseased states and aged MNP exposures.



Acknowledgements



Dr. Stephanie Wright
Dr. Ian Mudway
Eric Auyang



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Current: Dr. Kirsty Meldrum, Joshua Bateman, Sian Brooks,
Cynthia de Courcey

Past: Dr. Harriet Risby, Dr. Sarah Mitchell, Dr. Joana Moura,
Dr. Samantha Llewellyn, Caitlin Maggs, Olivia Whittle-Wright,
Ella Christoforou, Lewis Hodgetts, Katie Marchant

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