

Background

- Asthma attacks kill three people in the UK each day.
- Exposure to pollutants can induce asthma symptoms, exacerbations and decreases in lung function.
- Exposure to particulate matter (PM) during pregnancy can increase the risk of developing asthma.
- Lung epithelial cells and alveolar macrophages work together and remove inhaled PM.

Hypothesis

- Early life exposure to PM causes innate immune memory and contributes to asthma.

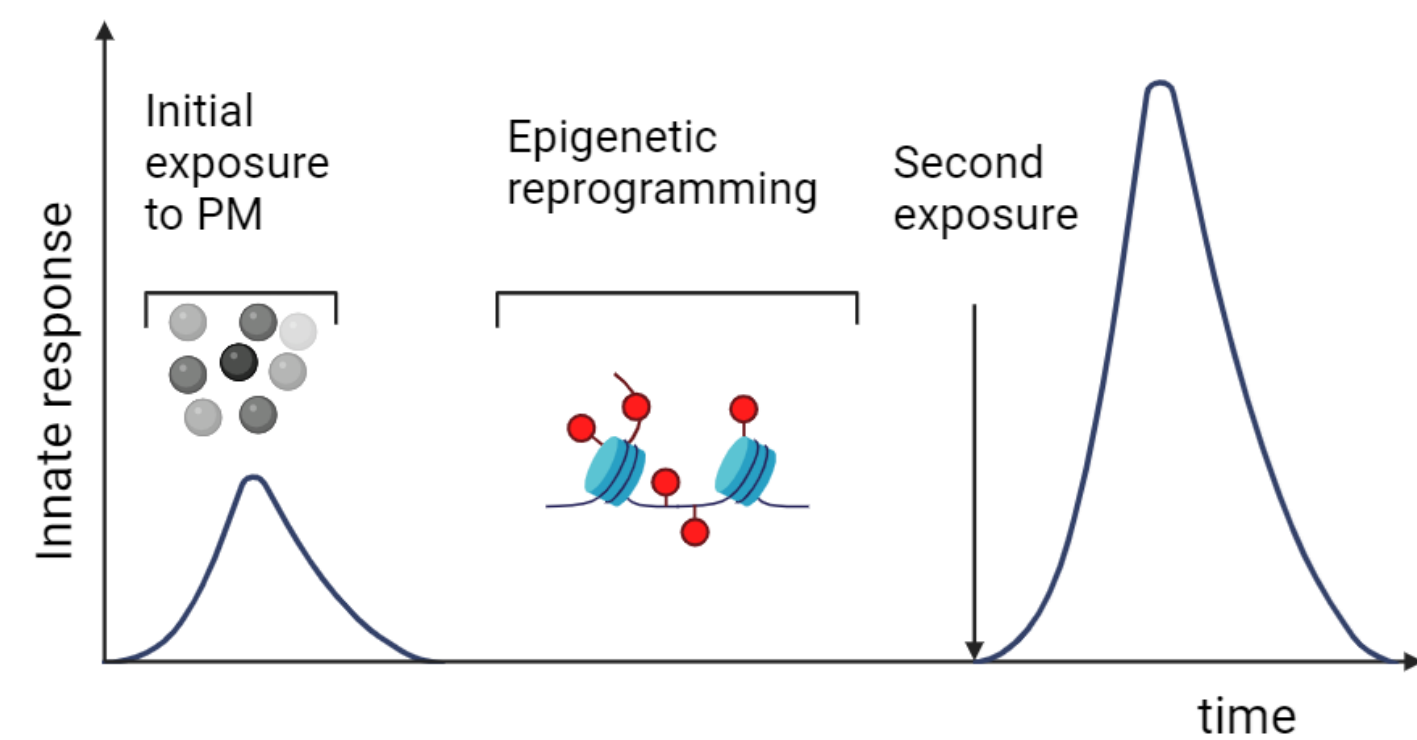
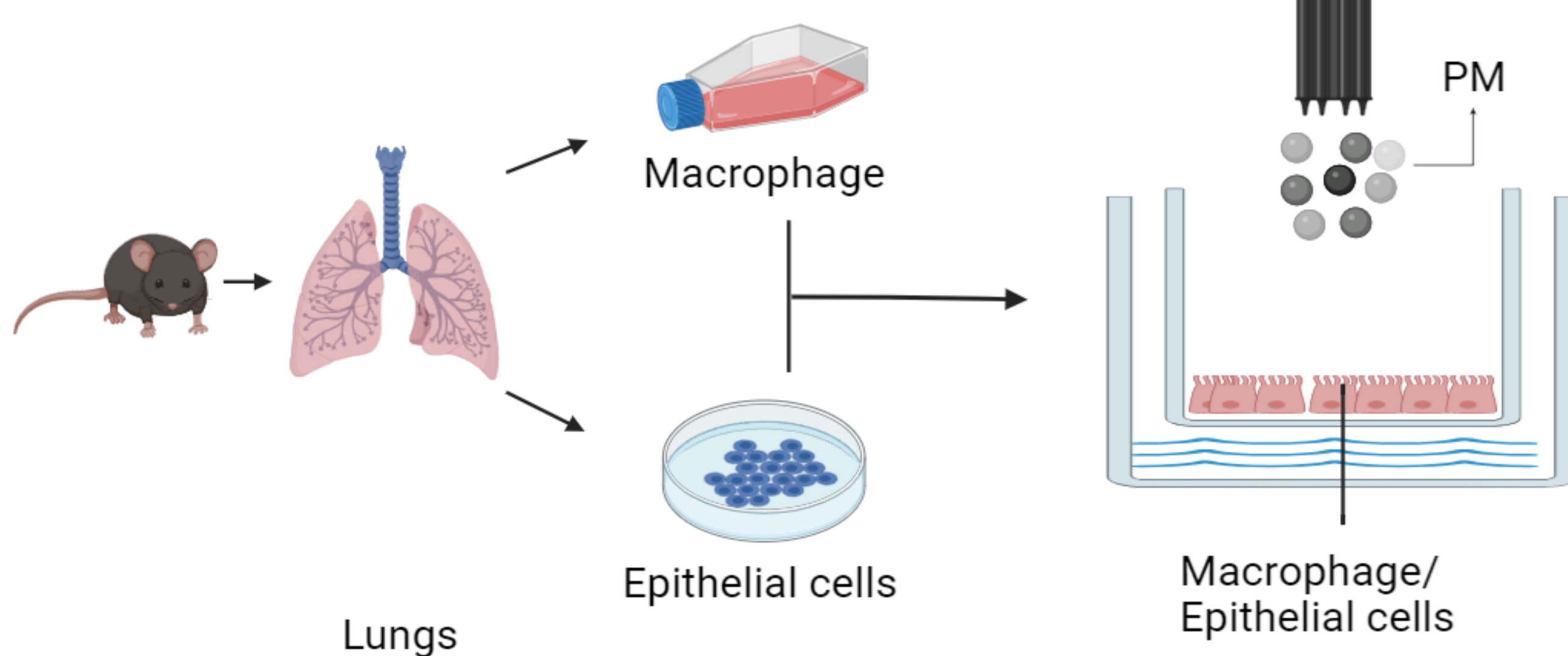


Figure 1.
Trained
immunity

Objectives

- **Objective 1.** To use particle sizing instruments for determining the particle size distribution in a liquid sample.
- **Objective 2.** To assess epithelial and macrophage *in-vitro* responses to primary and secondary stimulation with PM.
- **Objective 3.** To examine early life *in-vivo* responses to aerosol pollutant particles within the lung.

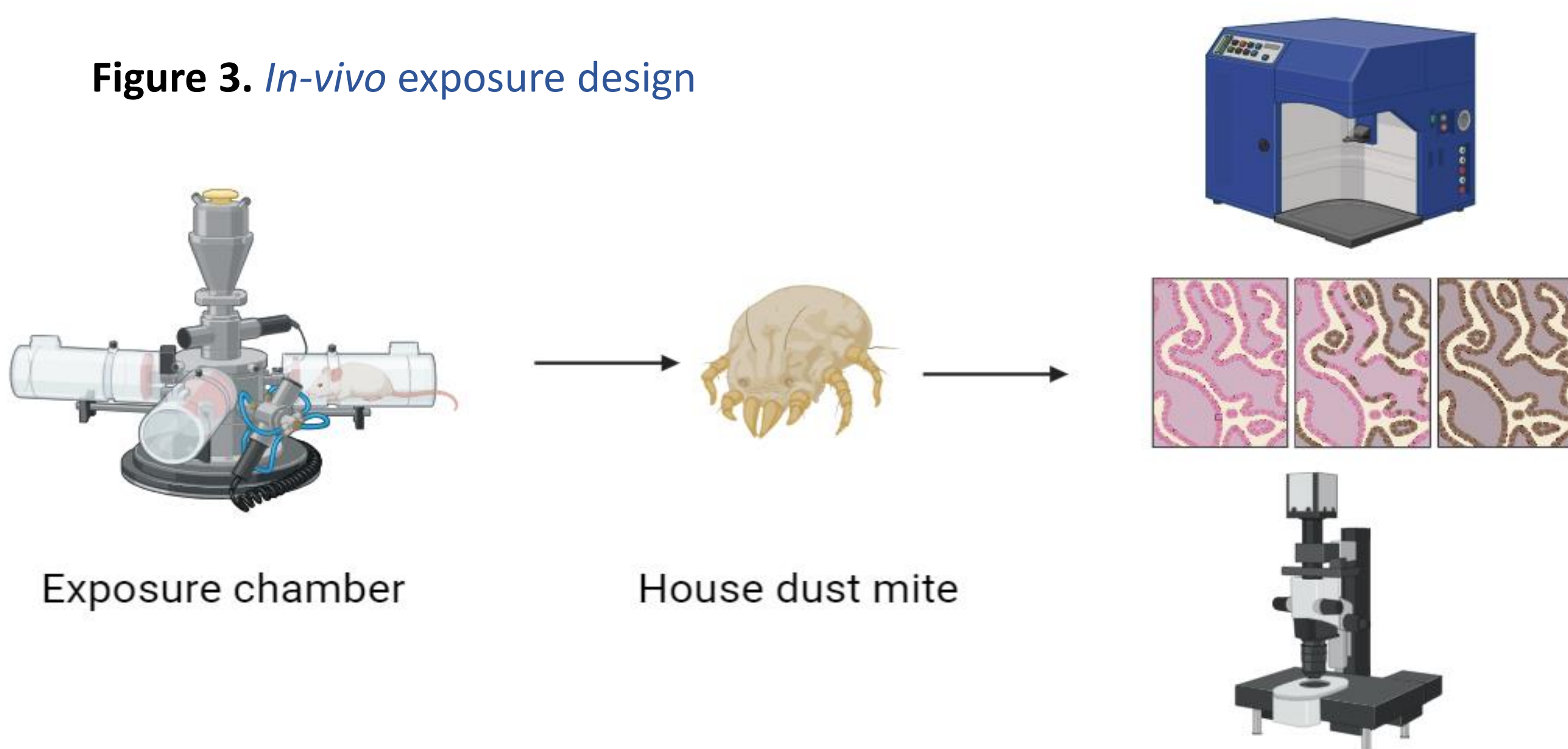
Figure 2. *In-vitro* exposure design



Objective 2

- The cells will be exposed to house dust mite (HDM) to induce asthma.
- The inflammatory cytokines produced will be checked using ELISA and QPCR.
- Epigenetic changes in cells will be analysed using ATAC sequencing.

Figure 3. *In-vivo* exposure design



Objective 3

- Neonatal mice will be exposed to PMs.
- Mice will be exposed to allergens such as HDM or extract of fungal products to induce asthma.
- Lung immune and epithelial cells will be isolated and analysed using flow cytometry, immunostaining, and microscopy.

Responsible innovation and policy

- Potential to lead to more evidence-informed public health guidelines and more effective prevention strategies against air pollution in relation to childhood asthma
- Adhesion to the Animal Rights Act of 1986, with Home Office project and personal licenses.
- Application of the 3Rs principle (Replace, Reduce, Refine) for animal research.

References

