

morph_ONE™

Cell painting for profiling alveolar macrophage responses

Service Description

ImmuONE offers a multiparametric cell painting tool that can be used to phenotype multiple cell parameters, enabling categorisation of individual cells against multiple characteristics for identification, classification and comparison of different cell populations.

The morph_ONE™ assay for *in vitro* alveolar macrophage responses can provide mechanistic insight for inhaled and/or systemic product safety assessment.

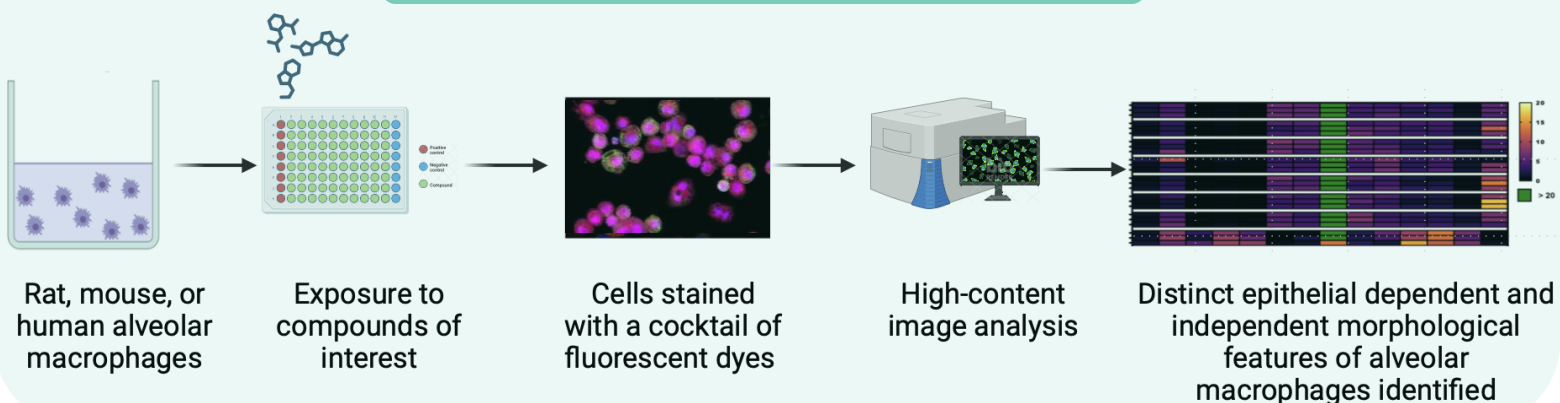
Key Features

- ✓ Compatible with many types of compound
- ✓ Individual cell analysis
- ✓ Phenotype profiles
- ✓ Benchmarking of compound responses with *in-house* database

Biological readouts

- ✓ Cell morphology: quantified cell and nuclear area, vacuolation profiles, sphericity, and shape analysis.
- ✓ Cell health: mitochondrial activity and membrane permeability
- ✓ Apoptosis markers

morph_ONE experimental protocol



Client Value

The morph_ONE™ assay offers a comprehensive *in vitro* assessment of morphometric and cell health characteristics of alveolar macrophages in response to inhaled substances. Our multiparametric cell painting tool enables precise phenotyping, categorisation, and comparison of individual cells based on multiple characteristics. This enhances safety assessments, identifying adverse effects and minimising candidate compound failures in later drug development stages.

Applications



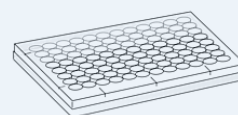
Safety assessment



Drug discovery



Inhalation studies



High-throughput screening



Inflammation analysis

Linking phenotypes to mechanism of action

The long-term effects of many products on lung health remain largely unknown.

- ✓ ImmuONE alveolar macrophage models exhibited different responses to inhaled drugs, cigarette smoke and compounds known to induce phospholipidosis and apoptosis (Figure 1).
- ✓ Cell painting of macrophage morphology proved effective in differentiating cellular responses.
- ✓ Phenotyping of multiple cell responses emerged as an approach for elucidating toxicity mechanisms.

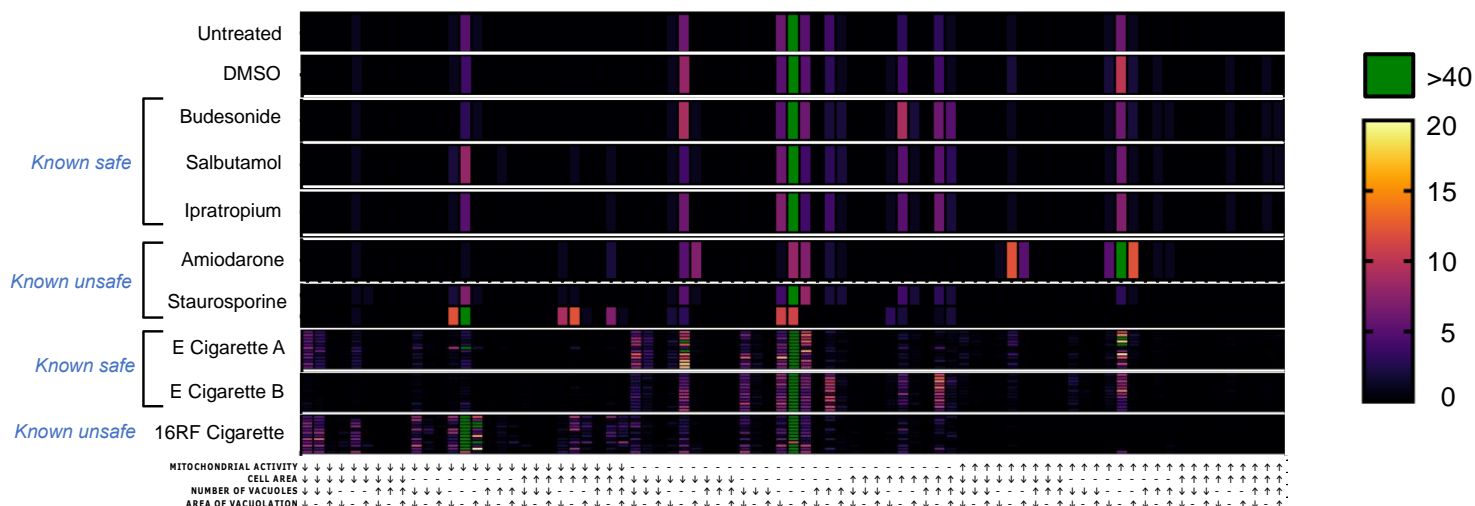


Figure 1: Heatmap indicating phenotypic assessment of alveolar macrophage-like cells. ImmuPHAGE™ models were exposed to a range of known safe and known unsafe inhaled compounds. Four cell characteristics (mitochondrial activity, cell area, vacuole number per cells and area of cell occupied by vacuoles) were expressed at three levels generating 81 possible phenotypes. Each square represents the % of the cell population with that given phenotype in one experiment.

In vivo to in vitro translation

The morph_ONE assay shows great potential as pre-clinical *in vitro* screening tool for safety assessment of candidate inhaled medicines. It is suitable for generating characteristic drug-induced macrophage response profiles, thus enabling differentiation of foamy macrophage phenotypes associated with phospholipidosis and apoptosis.

- ✓ morph_ONE provides a method for profiling human and rat alveolar macrophage responses *in vitro*.
- ✓ Rat alveolar macrophages were more sensitive to amiodarone exposure than human cells (Figure 2A).
- ✓ All alveolar lung macrophage cell models require analysis of cell sub-populations rather than average population data.

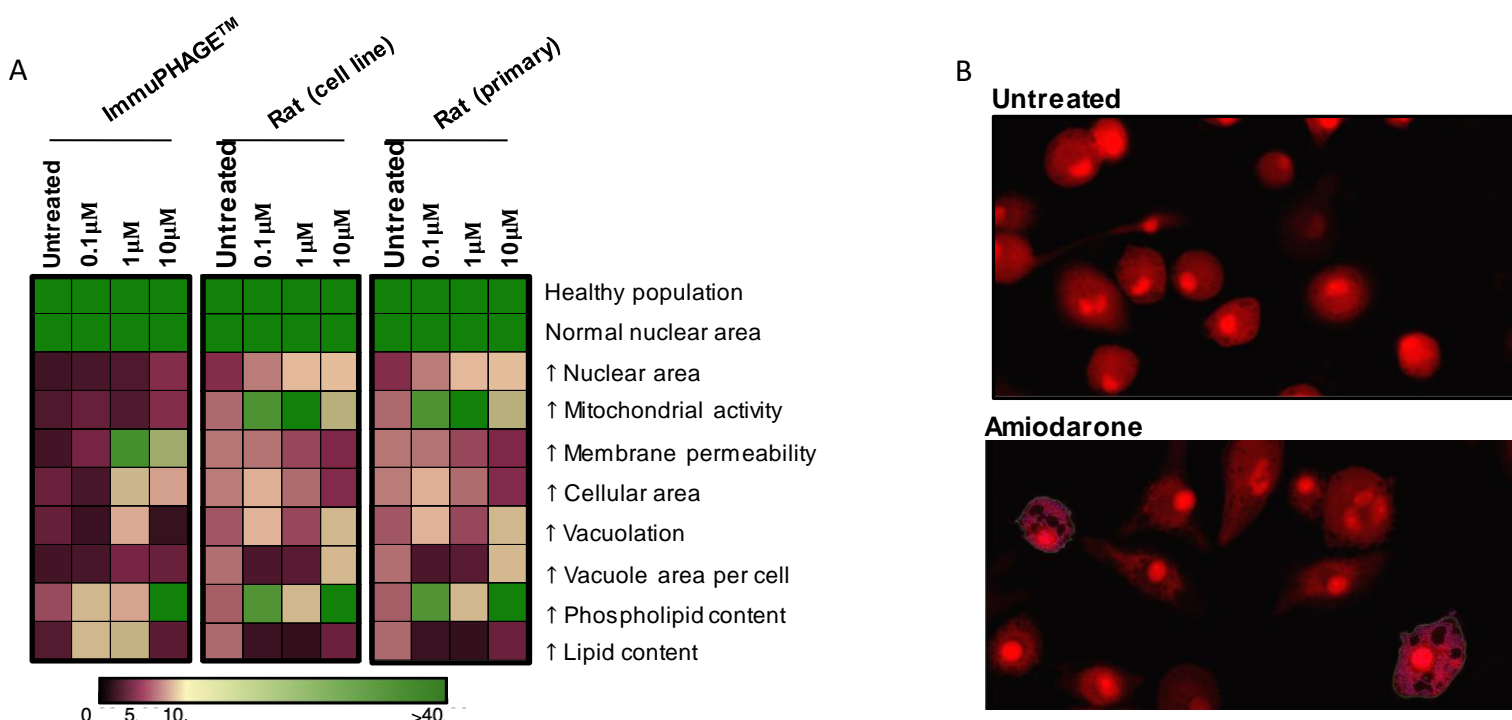


Figure 2: (A) Heat map indicating multi-parameter profiles (cell health, morphology and lipid changes) after amiodarone exposure to the NR8383 rat alveolar macrophage cell line, ImmuPHAGE™, and primary rat macrophages obtained from BAL (B) Representative images of ImmuPHAGE™ after amiodarone exposure. Lines around the macrophages indicate computer algorithm-based identification of cell morphology features.