



INTRODUCTION

Smoking and vaping

- Cigarette smoke contains thousands of chemicals known to harm to human health.
- An estimated 4.3M people in the UK use e-cigarettes, but the harm associated with e-cigarettes is less well known.
- Using animals for research into smoking is no longer permitted in the UK, so an alternative cell-based physiologically relevant model is required.

COVID-19

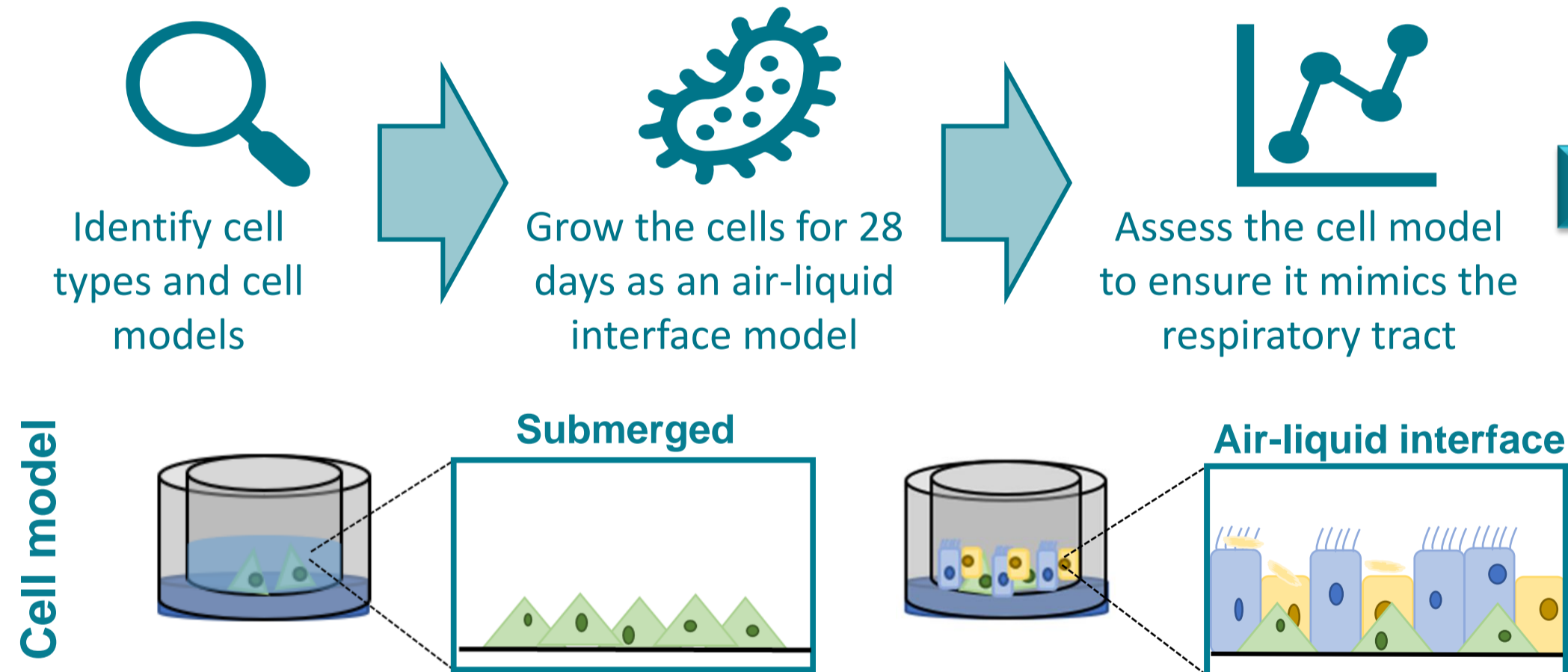
- SARS-CoV-2 virus continues to circulate globally and those at risk may still experience severe COVID-19 symptoms.
- It is essential to identify vulnerable populations at a greater risk of infection and severe disease to tailor advice and treatments.
- Evidence for association(s) between smoking/vaping and susceptibility to infection with SARS-CoV-2 is conflicted.

IMPORTANCE

To determine the association between smoking/vaping and risk of infection with SARS-CoV-2 to help guide policy and public health advice.

RESULTS

1) Air-liquid interface cell models sufficiently mimic the airways



2) Genes altered by cigarettes, e-cigarettes or nicotine interact with genes involved in viral entry (ACE2 or TMPRSS2) and thus may alter the risk of SARS-CoV-2 infection



Smoking/vaping-induced genes interact with:

- ACE2 across 129 pathways (e.g. viral entry and immune responses)
- TMPRSS2 across 28 pathways (e.g. viral entry and protein processing)

FUTURE WORK

3) Compare genes of interest before and after cigarette/e-cigarette exposure and SARS-CoV-2 infection

- Complete the review of the literature identifying genes of interest.
- Analysing genes of interest and the differences in their interaction pre- and post- infection will help to determine any changes in SARS-CoV-2 susceptibility.

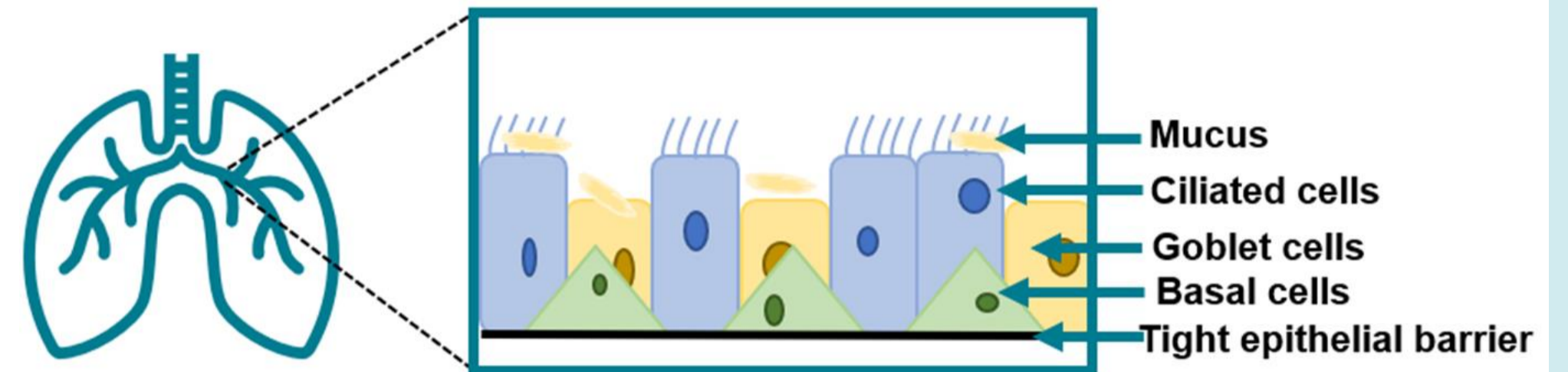
ACKNOWLEDGEMENTS

Many thanks to Emma-Jane Goode at UKHSA for her continued support during the cell model characterisation work.

PROJECT SUMMARY

1) Cell model

Develop and characterise a cell model that mimics the human airways.



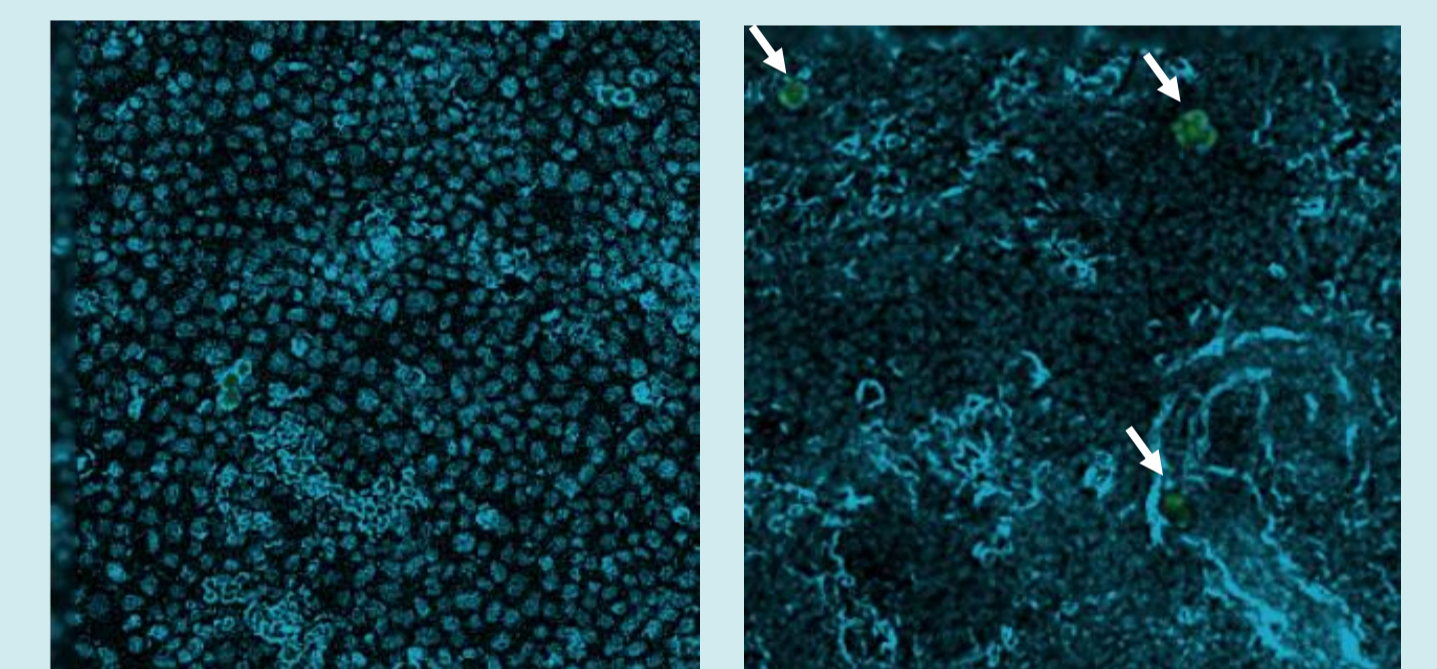
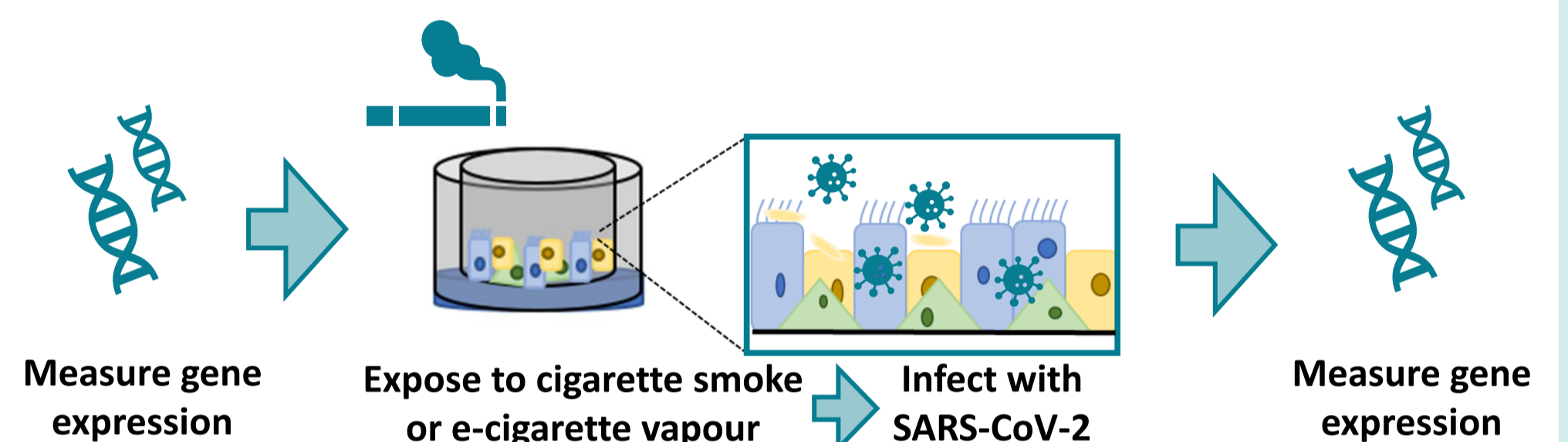
2) Review published literature

Identify genes associated with COVID-19 that are altered by cigarette smoke or e-cigarette exposure.

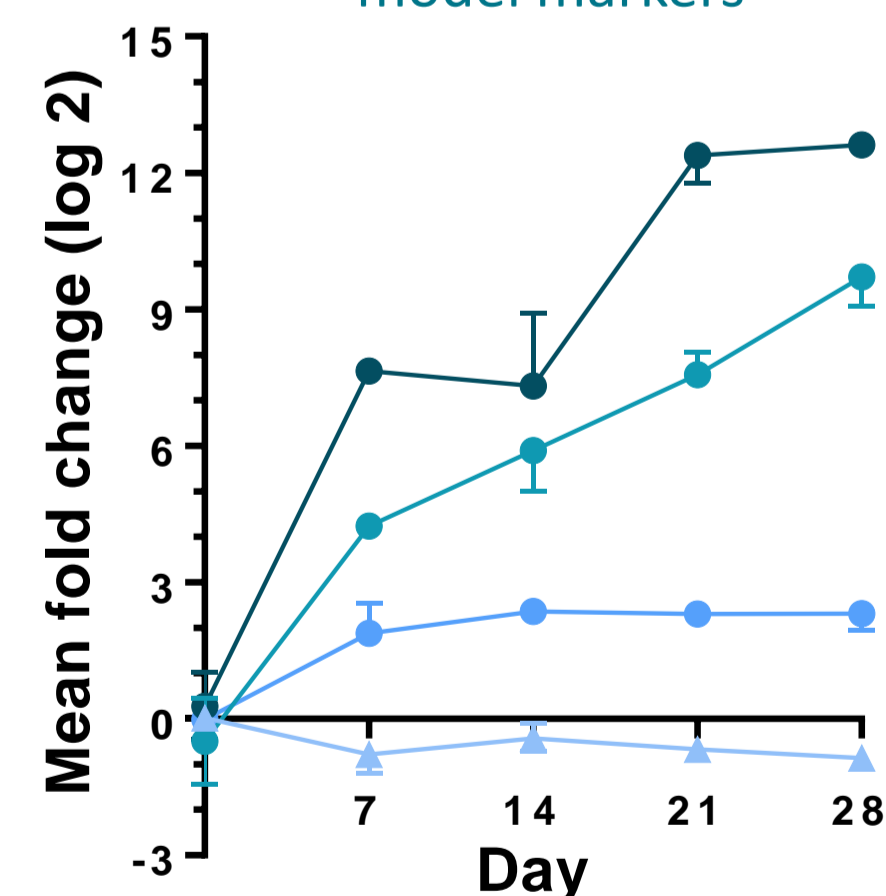


3) Main study

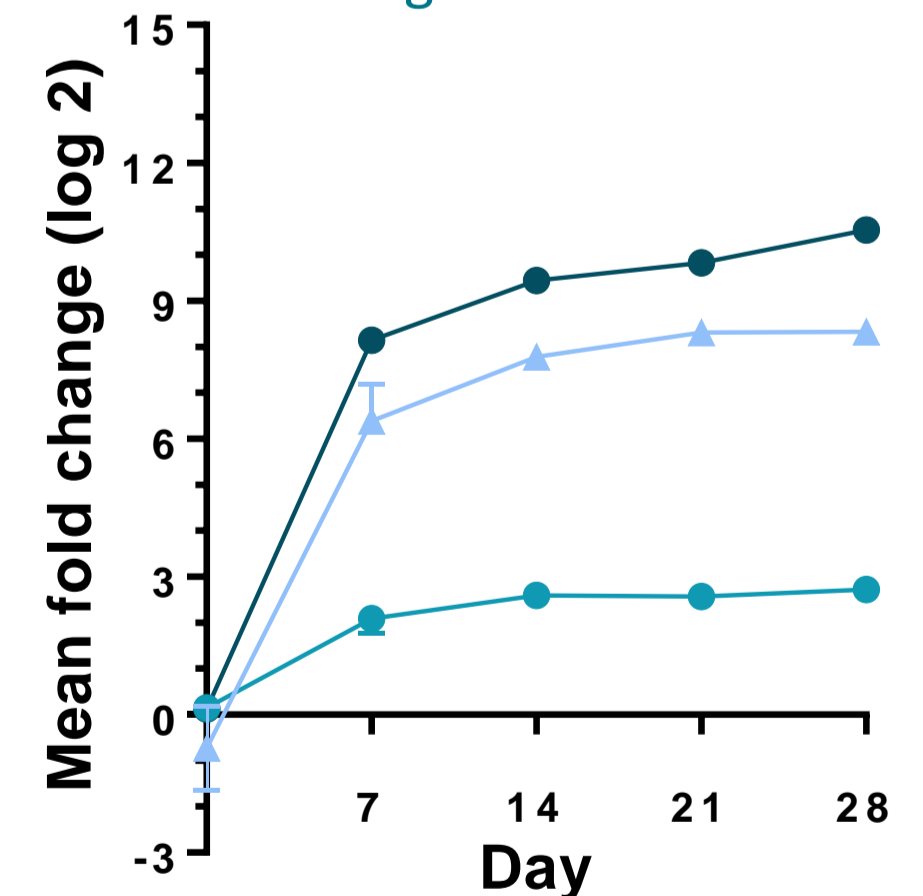
Assess the genes identified from the literature in the characterised cell model before and after smoke/vape exposure and SARS-CoV-2 infection.



Suitable levels of cell model markers



Presence of viral entry genes of interest



● FOXJ1 (ciliated cell) ● TJP1 (tight junction) ▲ ACE2 ● TMPRSS2
 ● MUC5AC (mucin) ▲ ITGA6 (basal cell) ● FURIN

CONCLUSIONS

- Air-liquid interface cell models enable non-animal research into the impact of smoking/vaping on susceptibility to SARS-CoV-2 infection.
- Reviewing published literature identified genes altered by cigarettes, e-cigarettes and/or nicotine.
- These genes form networks involved in SARS-CoV-2 viral entry (ACE2, TMPRSS2) and associated immune response(s), potentially linking smoking/vaping with altered COVID-19 susceptibility.
- Further investigations will inform public health advice and policy.