



Available and emerging non-animal models for human respiratory tract diseases

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Today's talk

- The human respiratory tract and the need for relevant models
- Our knowledge source on human respiratory tract diseases
- Our results
- Conclusions and Observations



Human airways are complicated!



- They are not only for beathing...
- ... they form a functional barrier, effective defences, efficient gas exchange
- The airways are a complex, complicated system of cells, cell secretions and products, with many different cell types working together







Airways feature	Mice	People
Breathing pattern	Nose (always)	Nose or mouth
Airways branching	Monopodial	Irregular dichotomous
Airways cells	Differences in type and number throughout the airways	
Immune response	Numerous differences	









Thousands of animals are used for respiratory disease research every year...

... despite the failure of animal data to give us
relevant answers for human respiratory diseases –

 *Asthma
 *Cystic fibrosis
 *COPD
 *Pulmonary fibrosis
 *Covid19?

* Mice are not naturally susceptible to any of these conditions







Different species/animal models might recreate different individual features of a human disease, but no single animal 'model' recreates the human condition





Our project:

Non-animal models for respiratory tract diseases Note that our research was all carried out PC (precovid19!)

Methods: Literature searches, plus outreach to researchers in the field. Publication years - 2008- 2019

Exclusion criteria: live animals, drug effects, novel formulations Separate searches for non-cancer (asthma, COPD, cystic fibrosis) and cancer

More info:

Report - https://ec.europa.eu/jrc/en/page/respiratory-tract-diseases-183208

Dataset - https://data.jrc.ec.europa.eu/dataset/176d71e6-5082-4b29-8472-b719f6bda323



Advanced Non-animal Models in Biomedical Research

Respiratory Tract Diseases





Results





Results – model categories





Results –**Cell/tissue types**



Cell types/lines



BSOMED²⁷

Results – Endpoints





BSOMED²¹

Results – Applications





Conclusions

- Baseline –healthy airways models needed/important
 - 69 publications describe "general" models
- Disease models
 - Recapitulate discrete, specific disease features
 - Utility in drug development
- Disconnect between lung models and lung cancer models
 - Issues with retrieving valid lung cancer models
 - Continued reliance on patient-derived xenografts





Conclusions

- What else is needed?
 - Lung injury (severity of animal models)
 - Disease diagnosis biomarker identification?
 - Mucosal models learn from other fields (ongoing?)
- Funding prioritise the advanced non-animal approaches
- Training (at every level)
- Promote/enable more commercial model use eg MucilAir (EPA) and OncocilAir
- Incentives?





Thank you

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