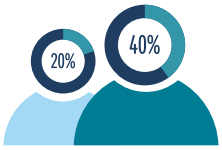
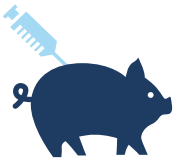
ADVANCED NON-ANIMAL MODELS IN BIOMEDICAL RESEARCH:

Immuno-oncology

EUROGROUP FOR ANIMALS



Although immuno-oncology has revolutionised cancer treatment, **only 20 to 40% of patients** respond positively to immunotherapeutic treatments.



Animal-based models have failed

to mimic patient conditions and predict responses to new therapies, mostly because human cancer artificially developed in animals leads to species-specific responses that often misrepresent human tumour biology.

The use of in vitro human-based models

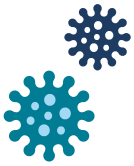
in immuno-oncology research is extensive, in particular to study cancer initiation and progression and to develop new approaches for cancer therapy.

Patient biopsies

are widely used to investigate cancer features, as well as immunotherapeutic approaches.

90% of immunotherapies entering clinical trials fail

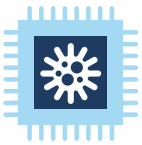
because of low efficacy and/or high toxicity, despite having undergone rigorous preclinical safety assessment.



The spatial organisation and dynamic interplay of the complex cell-to-cell interactions in tumours **are poorly mirrored** by conventional in vitro and in vivo models.

3D in vitro models

are valuable tools for immuno-oncology research since they are capable of modelling tumour complexity to mimic in vivo heterogeneity, native histologic architecture, response to therapeutics and unravel multilayered interplay overall.



Tumour on chip platforms

allow to recapitulate the interplay between immune and cancer cells, investigate the mechanisms underlying immunotherapy resistance and can be personalised by introducing patient-derived cells.

FUTURE DEVELOPMENTS

Models to study targeted aspects of immuno-oncology and predictive models

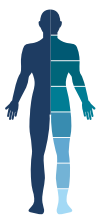
need to be further promoted.

The research community using non-animal models is turning to studies that can **dissect the molecular pathways, optimise the current strategies and create new therapies.**

The use of high-content technologies

such as omics should be encouraged to provide a broader and more in-depth view of the molecular dynamics, especially useful in dissecting the molecular interaction between cancer and immune cells.

In vitro systems need to **incorporate tumour-specific 3D complex structures** to allow for studies of crosstalk among cancer immunotherapy drugs, tumour cells, non-tumour cells and the tumour micro-environment.



The development of novel and improved human-relevant non-animal models

need to better mimic tumour biology and capture complex human physiology to study targeted aspects of immuno-oncology and to test new immunotherapies.

Source: Romania, P., Folgiero, V., Nic, M., Dibusz, K., Novotny, T., Busquet, F., Rossi, F., Straccia, M., Daskalopoulos, E. P., and Gribaldo, L., Advanced Non-animal Models in Biomedical Research: Immuno-oncology, EUR 30334/3 EN, Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-39986-5, doi:10.2760/393670, JRC125256