

Mouse models remain the most effective preclinical model for studying cancer immunology and immunotherapy. However, there are major disadvantages to mouse models, and it has been found that they often do not accurately replicate the complex immune interactions and responses in humans.

Do some research and discuss at least one advantage and one limitation of mouse models in the field of cancer immunotherapy research. Suggest a way that mouse models could be improved or discuss an alternative preclinical model.

According to a review published recently in CellPress [1], for each benefit in using a mouse model there are limitations, including:

- Mouse models can help to identify genes involved in tumor initiation and progression. However, tumor genotypes in mice may not always mimic those found in human.
- Mouse models can help to assess tumor response to drugs. However, the response observed in mice may not always directly translate to how human tumor would respond.
- Mouse models are generally inexpensive, but tumors in mice may take a long time to develop.
- Model can replicate progression from adenoma to adenocarcinoma. However, it has been observed in these models that tumors rarely proceed to metastasis.

Current mouse models, including both allograft and autograft, face significant limitations. A major challenge in allograft models is the issue of HLA compatibility which is somewhat mitigated in autograft models. However, autograft have constrained by the limited availability of immune cells from HSPCs patients [2].

An alternative approach could involve the development of artificial systems that stimulate specific immune system cells, such as T cells, or the use of 3D bioprinting to create tissues replicating tumor environments.

[1] M. H. Kucherlapati, "Mouse models in colon cancer, inferences, and implications," *iScience*, vol. 26, no. 6, p. 106958, 2023, doi: 10.1016/j.isci.2023.106958

[2] J. Chuprin *et al.*, "Humanized mouse models for immuno-oncology research," *Nat. Rev. Clin. Oncol.*, vol. 20, no. 3, pp. 192–206, 2023, doi: 10.1038/s41571-022-00721-2