Novel 3D Culture of Breast Cancer Cell Lines for Evaluating Drug Efficacy

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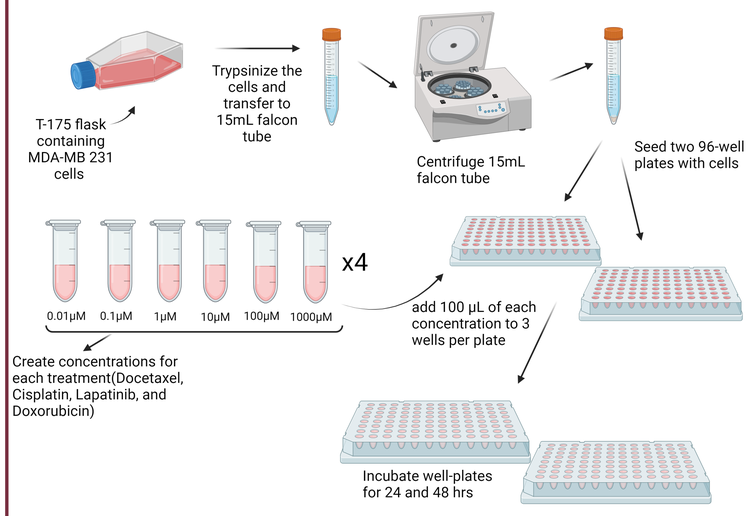
Introduction

Two-dimensional (2D) versus Three-dimensional (3D) cell culture has been a part of an important scientific debate as to which is better for modeling *in vivo* cancer cell biology and drug screening. While 2D cultures have been the main form of cell culture used for over a century, recently 3D cell culture methods have been shown significant promise for the future of cancer cell and treatment research. Each culture method comes with its advantages and disadvantages, but overall 3D cultures has proven to be more accurate at representing cells as they would appear in a *in vivo* tumor. Thus, they are more effective model for of cancer drug screening. Here, using a triple negative breast cancer cell line, 2D and 3D culture methods are explored to identify varices in anti-cancer drug response and to identify which is better suited for testing of cancer drug treatments.

	Advantages	Disadvantages
2D cell culture	• Standardised protocol • Cheap and simple • Can be automated • Compatible with high-throughput • Easily expandable • Compatible with various cell types	• Static conditions • No ECM and TME • No concentration gradient • Homogenous populations • Low physiological relevance • Not clinically predictive
3D cell culture	• Efficacy • Drug resistance • Cell-cell and cell-ECM interactions • Sensitivity similar to in vivo • Co-culturing • Heterogenous	• Static environment • Low TME mimicry • Challenges to automate for high content screening • Inefficient waste and nutrient diffusion

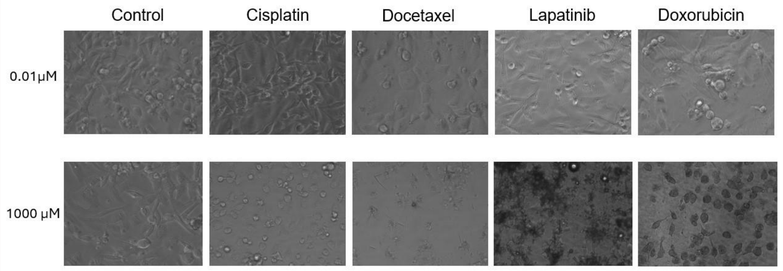
Methods

Seeding of MDA-MB 231 cells in 96-well plates and treated with anti-cancer drugs

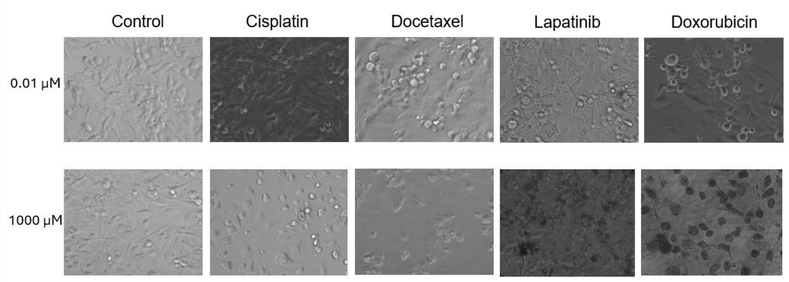


Results

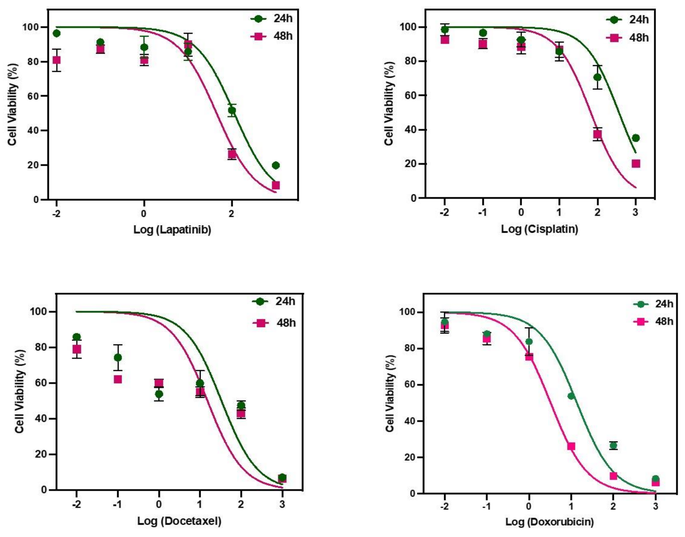
2D culture of MDA-MB-231 cells treated with anticancer drugs for 24 hours



2D culture of MDA-MB-231 cells treated with anticancer drugs for 48 hours



Results
Cytotoxicity studies- MDA-MB-231 cells- 2D cultures



Results(cont.)

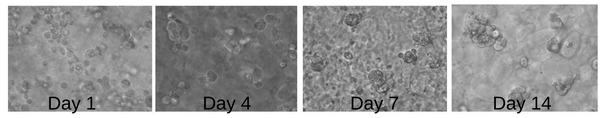
2D MBA-MD 231 cell cultures:

- All the drug treatments were more effective at a higher concentrations, particularly between 100-1000 μM, and cell toxicity is directly proportional to drug concentrations and incubation time.
- Docetaxel & Doxorubicin are the most effective drugs for the 2D MDA-MB 231 cell cultures

3D MDA-MB 231 cell cultures:

- 3D cell culture experiments are currently on-going; however, preliminary results indicate that 3D culture of breast cancer cell lines yield cell/cell aggregates that more closely resemble native tumor tissue observed *in vivo*.

Results
Brightfield images of MDA-MB-231 Cells + L



Conclusions

3D culture environments create more accurate representations of *in vivo* conditions than 2D cultures, resulting in cells obtaining shape and growth pattern *in-vitro*, which provides more accurate platform for cancer research and drug screening.

Acknowledgements

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References

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