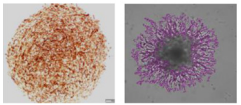
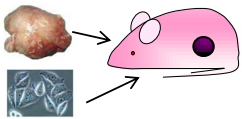
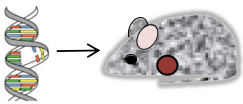
| | TYPE OF MODEL | ADVANTAGES | DISADVANTAGES | IMPROVEMENTS |
|---|---|---|---|---|
| IN VITRO | 2D monolayer | • Standardised format<br>• Widely used, simple<br>• Suitable for cell panels<br>• Suitable for proliferation, signalling pathways, genetic manipulation | • No ECM/stromal cells<br>• Non-physiological<br>• Static conditions<br>• High oxygen/nutrients<br>• Long-established lines<br>• Homogeneous | • ECM substrates<br>• Host cell co-culture<br>• Flow conditions<br>• Hypoxic conditions<br>• Primary cell cultures |
| IN VITRO | 3D spheroid suspension or matrix  | • Multiple assay platforms<br>• ECM &/or stromal cells<br>• Suitable for clonogenicity, migration, invasion etc<br>• Polarity & architecture<br>• Nutrient & $O_2$ gradients | • More complex/ expensive<br>• Lower throughput<br>• Some assays require imaging capability<br>• Static conditions | • Tag cells for tracking in heterotypic cultures<br>• Host cell co-cultures<br>• CSC assays<br>• Primary cell cultures |
| IN VIVO | Human tumour xenotransplants  | • S.c is standard model<br>• Simple quantitation<br>• Tissue environment, blood supply, host cells<br>• Suitable for drug trials | • Ectopic growth site<br>• No immune responses<br>• Mouse physiology<br>• Relatively expensive<br>• Cannot study cancer initiation/prevention | • Orthotopic site (mfp)<br>• 'Humanised' hosts<br>• Metastatic models<br>• Primary human cancer transplants (PDX) |
| IN VIVO | Genetically-modified mice (GEM)  | • Clinically-relevant genes<br>• Anatomically correct<br>• Natural development<br>• Immunocompetent host<br>• Can study initiation, prevention and therapy | • Difficult/expensive to run<br>• Tumours sporadic/ slow<br>• Limited heterogeneity<br>• Mouse tumours and physiology<br>• Seldom metastasise | • Primary transplants to increase reproducibility<br>• Additional mutations to increase malignancy |