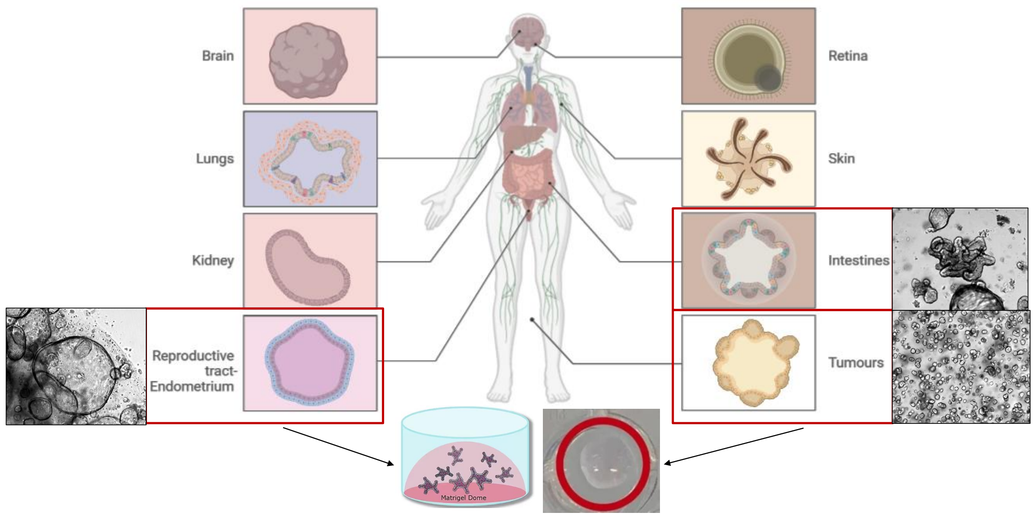
Accelerating Research with Organoid Disease Models Using Automated Imaging and Dispensing

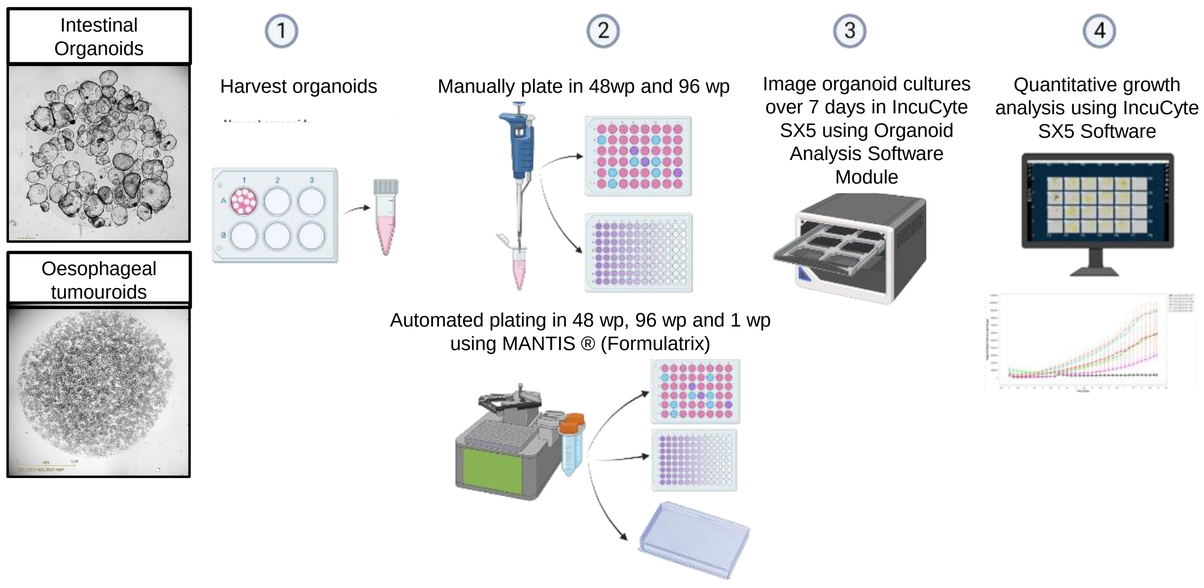
Maryna Panamarova, Lucy Holland, Cameron Collins, Chris Henderson, Francesco Iacoviello, Hema Lingala, Lesley Shirley, Amy Yeung

INTRODUCTION



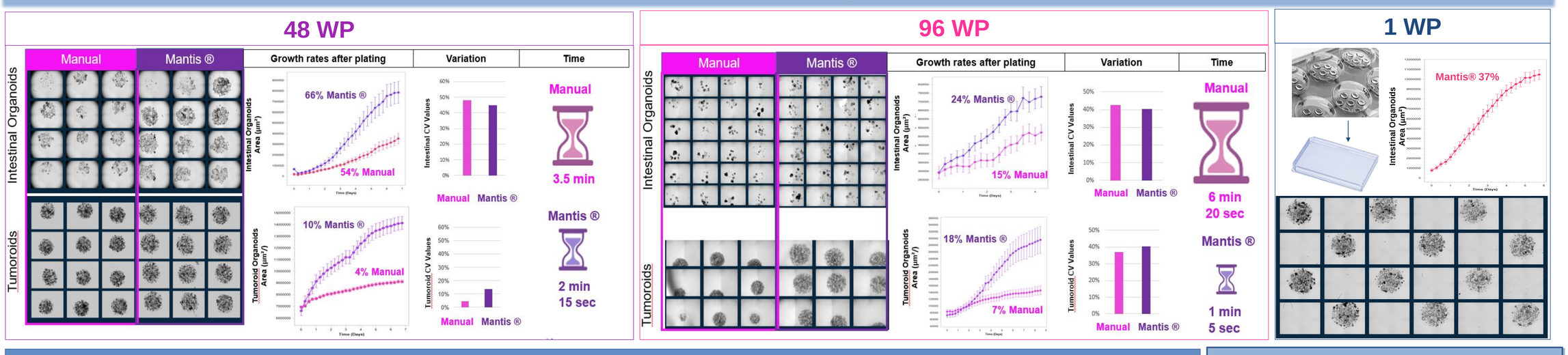
The culture of organoid models derived from adult stem cells involves embedding them into a hydrogel that provides essential structural support for their growth and differentiation. Manual plating of organoid-hydrogel suspension becomes increasingly difficult for high-throughput techniques such as screening, high-content imaging, extensive expansion, and quality assurance. The temperature-sensitive nature of most hydrogels necessitates rapid dispensing, precise positioning and exact volume of the matrix droplets to ensure reproducibility and enable maximum growth.

METHOD



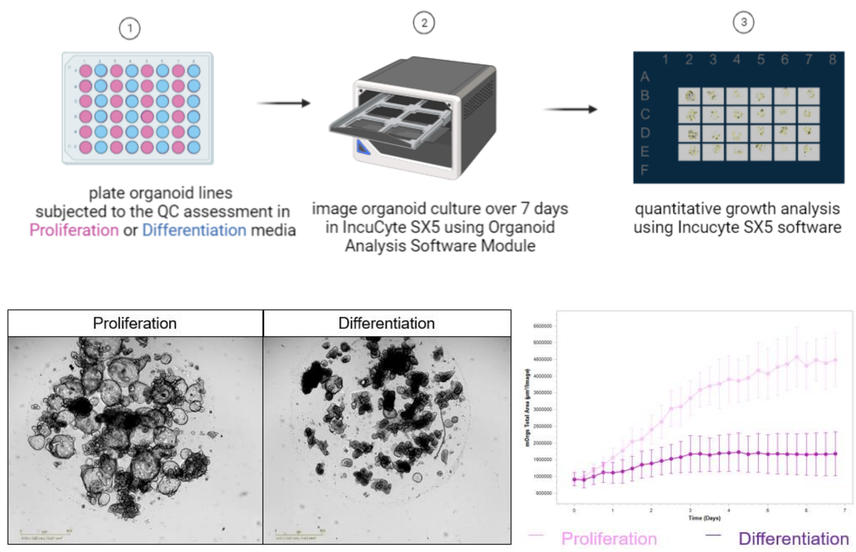
Intestinal and oesophageal tumour organoids were harvested and plated into micro well plates either manually or using an automated liquid dispenser MANTIS ® (Formulatrix). The organoid culture was then imaged on IncuCyte SX5 (Sartorius) for over 7 days and subjected to the kinetics growth analysis.

VALIDATION



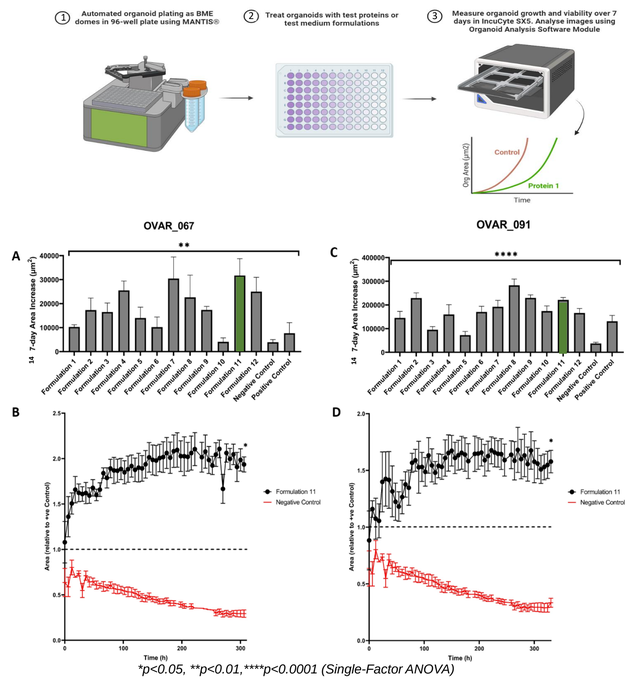
IMPLEMENTATION

QUALITY ASSURANCE OF INTESTINAL ORGANOID LINES FOR BIOBANK GENERATION



Newly derived intestinal organoid lines must undergo a quality assurance procedure to assess their capacity for proliferation and differentiation.
We introduced a live-imaging assay that captures morphological transformations of the organoids over time in the medium for propagation and differentiation. The kinetic measurements acquired during the assay are employed to assign a grade indicative of the line's potential. The insights gained from this grading process will inform decisions in subsequent experiments.

OVARIAN CANCER ORGANOID MEDIA OPTIMISATION



*p<0.05, **p<0.01,****p<0.0001 (Single-Factor ANOVA)

Generating organoids from ovarian tumours has a low success rate. A three-stage small molecule screening process was used to find the optimal concentration, identify the best formulation, and screen it across seven ovarian lines from tumours of different clinical origin. The new formulation was found more effective than the currently used ovarian media in over 70% of the lines tested.

CONCLUSION

The automated plating of the hydrogel-embedded intestinal and cancer organoids revealed

compared to the manual dispensing; however a number wells had small bubbles immediately after the dispense, which could prevent meaningful image acquisition straight after plating .

Effective automated dispensing using MANTIS ® (Formulatrix) in combination with live-cell image analysis on IncuCyte SX5 (Sartorius) opens up the possibility of running high-scale organoid applications such as small molecule screens, quantitative quality assurance processes and high-volume expansion experiments.

WELLCOME GENOME CAMPUS

Cellular Modelling
Cellular Operations