Angiogenesis is one of the six critical biological hallmarks required for the development and progression of cancer. Vascular-targeted treatment strategies in combination with chemotherapy have demonstrated clinical benefit but further research is required to improve treatment scheduling, elucidate resistance mechanisms and identify new targets for the development of novel therapeutic agents. Whilst the mechanisms controlling angiogenesis initiation are well-characterised, the pathways regulating vascular remodelling and maturation are less well-understood.

Pre-clinical in vivo tumour modelling is an integral component of cancer research, despite evidence that some agents effective in pre-clinical studies do not translate into patient benefit. Models allowing the study of tumour angiogenesis, both in terms of mechanisms and treatment response will be discussed, including the advantages and limitations of xenograft, isograft, orthotopic and transgenic approaches to monitor angiogenesis in primary and metastatic disease. We routinely use xenograft and syngeneic tumour models in addition to the spontaneous mammary tumour transgenic mouse model (Polyoma Middle T oncprotein, PyMT) which allows evaluation of angiogenesis in preinvasive disease. Specialised models for detailed angiogenesis analysis including the dorsal skinfold chamber will also be reviewed. Based on the skinfold chamber we have developed a new model of bone metastasis which may allow angiogenesis to be studied, with further development. Integral to such models are the modalities used for imaging the tumour microenvironment, such as optical microscopy (fluorescent and multiphoton), ultrasound and magnetic resonance imaging.