The Chick Embryo
As An Experimental Model for Cancer and Metastasis

Interest / questions about the model? Contact Anne Herrmann
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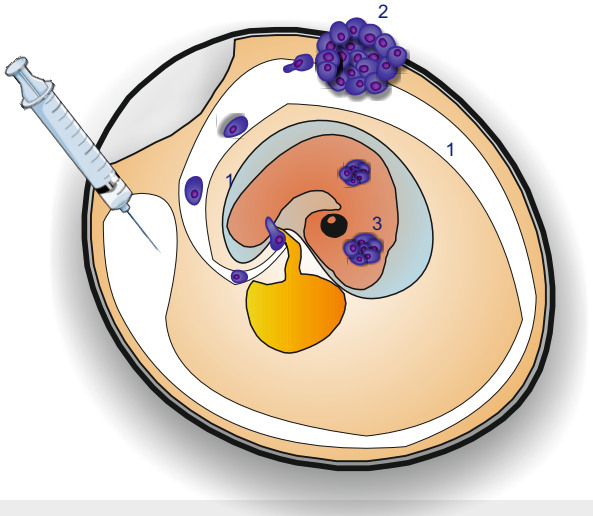
The Chick Embryo Model

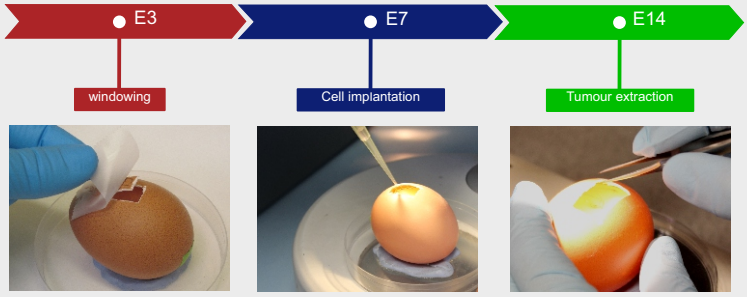
Advantages:

- 3R compliant model (classed as non-protected until E14)
- valid animal replacement technique
- easily accessible, highly vascularised chorioallantoic membrane (CAM)
- non-invasive engraftment of tumour cells (xeno- or allograft)
- immunodeficient at earlier stages of development
- suitable for long-term *in vivo* imaging
- easy administration of drugs
- transparent in the early stages of development
- readily accessible *in* or *ex ovo*
- nutritionally self-sufficient
- no husbandry required
- low cost



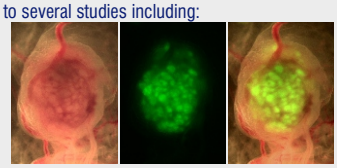
Primary Tumour

The chick embryo model is a powerful tool to study tumour formation and progression. It has been successfully used for the study of human breast, prostate, colorectal, cervical, head and neck carcinoma, melanoma, glioblastoma, neuroblastoma, medulloblastoma, fibrosarcoma and primary carcinoma. Due to its immunodeficency it readily accepts any xenograft and has also been used for murine melanoma, breast and lung carcinoma studies.

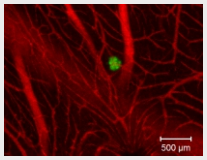


At E14 primary tumours can be extracted and subjected to several studies including:

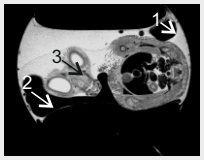
- imaging
- volumetric measurements
- fixation and consecutive H&E or IHC staining
- qPCR and microarray analysis



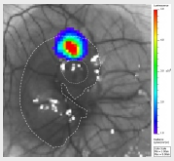
Tumour formation and progression can also be observed via intravital and preclinical imaging, such as MRI and bioluminescence.



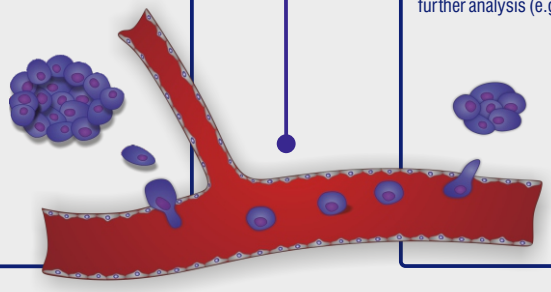
Intravital microscopy of neuroblastoma (NB, green) in an *ex ovo* cultured chick embryo at E9. Vasculature (red) was stained with rhodamine dextran prior to imaging.



Magnetic Resonance images (T, weighted) of a chick embryo *in ovo* at E14. Extra-embryonic tumour (1), yolk sac (2) and embryo anatomy (3) can be easily imaged and identified.



Bioluminescence imaging of tumour formed by NB cells expressing luciferase in *ex ovo* cultured chick embryo at E14. Dashed line indicates embryo outline. Colour scale indicates BL signal intensity.



Did You Know, That

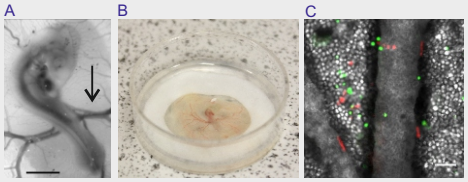
The University of Liverpool has a **chick embryo facility.** In addition, we are currently developing new non-invasive imaging methods to quantitatively determine primary tumour burden and metastatic spread.

The chick embryo model is also suitable for studying:

- angiogenesis
- pre-clinical drug testing
- developmental biology
- scaffold and biomaterial studies
- virology
- genetics

Vasculature

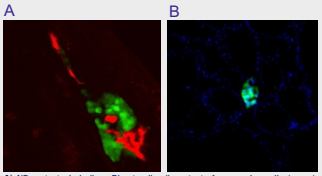
Intravenous injections allow the observation of tumour cell behaviour in the vasculature by intravital imaging.



A) *In ovo* injection of cells in the vitelline vein (arrow) of the chick embryo at E3. **B)** *Ex ovo* chick embryo at E3 prepared for intravital imaging **C)** Intravital image of two different cell populations (red and green fluorescence), which were co-injected in the vitelline vein to study their velocity and invasive behaviour.

Metastasis

Apart from tumour formation and local invasion around the primary tumour, metastatic spread to the organs of the chick embryo can be studied. Cells labelled with fluorescent proteins can be identified easily by dissection. Organs can then be removed and subjected to further analysis (e.g. sectioning, IHC, qPCR).



A) NB metastasis in liver. Direct cell-cell contact of aggressive cells (green) enabled meta-stasis of non-aggressive cells (red). **B)** Metastasis of NB cells (green) in the kidney.

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