

Alternatives to adult animals for *in vivo* experiments

By Rita Seabra

African Clawed Frog (*Xenopus*)

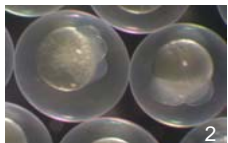
Xenopus is a useful model to study organ development in a vertebrate species. By manipulating gene expression it is possible to learn the role that specific genes play in organ development. These experiments can identify abnormalities that may lead to disease later in life. For example, some human heart problems are thought to have their origin in embryonic developmental defects.

This organism may be similarly valuable in toxicology, for the assessment of hazardous wastes or human toxicants.

Larval frogs have the ability to regenerate their tails but, as larvae develop, they lose this capacity. Larvae thus provide a unique opportunity to investigate mammalian tissue repair.



Frog eggs have provided an essential system in which to study signal transduction pathways (how cells convey external and internal signals) and understand basic cell biology.



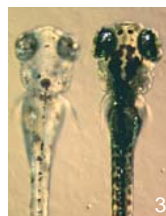
Zebrafish (*Danio rerio*)

Zebrafish larvae are a very common model, with the advantage of being transparent and amenable to various genetic alterations. It offers the opportunity to manipulate and observe organ development *in vivo*.

Human tissues (for example cancer cells) can be successfully transplanted to zebrafish, making it a valuable system to study human cancer cells and mechanisms through which they spread.

Blood vessel development can also be examined – this model offers the opportunity to screen for potential anti-angiogenic compounds (which inhibit blood vessel growth) and are promising anti-cancer therapies.

Zebrafish are also useful in toxicology to identify drugs that may have harmful effects on humans.



The 3Rs (Replacement, Reduction & Refinement) have been widely adopted but there is still a call for *in vivo* experiments. When such research is necessary, embryos and larvae of certain species can replace adult animals. Large numbers of individuals can be kept in simpler housing, making experiments cheaper and more manageable.

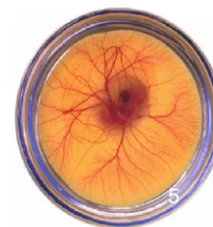
Chicken (*Gallus spp*)

Most of the experiments with chicken embryos use a well vascularised membrane that surrounds the embryo – the chorioallantoic membrane (CAM).

Similarities between the CAM's vascular system and that of the human retina allow it to be used as an eye model. It has been useful to test surgical tools and techniques for retinal surgery and also to assess the ideal treatment options for age-related macular degeneration.

Because of its capillary network, this is a convenient model to test drugs that affect formation of blood vessels.

The CAM accepts grafts of human tissues, which means human cancer fragments can be transplanted onto the egg and used to study tumour progression and metastasis.



Evolutionary pressure has maintained certain developmental and physiological processes among species. When animal experiments are indispensable, early life stages of certain species can replicate human biological events. Such experiments may yield a great deal of data relevant to humans, without the need to resort to experiments on adult animals or mammals.

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