Using zebrafish to model human disease

Anila Iqbal and Christopher Wilkinson

School of Biological Sciences, Royal Holloway-University of London, Egham, TW20 0EX

Why use zebrafish?

These small fish share many genes with us and these genes look very similar to the human versions. They develop many organs and tissues in the same way.

If we are investigating a rare disease in humans and find a gene responsible, its quite easy to find the fish equivalent gene and then interfere with its function. What we then see go wrong in fish, we can propose probably happens in people too.

Fish eggs

We often use fish eggs for these experiments. These are small enough that we can deal with many of them but still large enough that we can manipulate them easily. For example, we can inject chemicals to boost the levels of certain proteins or to remove them.

Fish eggs develop rapidly. By two days, they have eyes, heart, liver and muscles. They are starting to develop a brain. However, they do not feel anything at this stage. Using them is therefore ethically preferable.

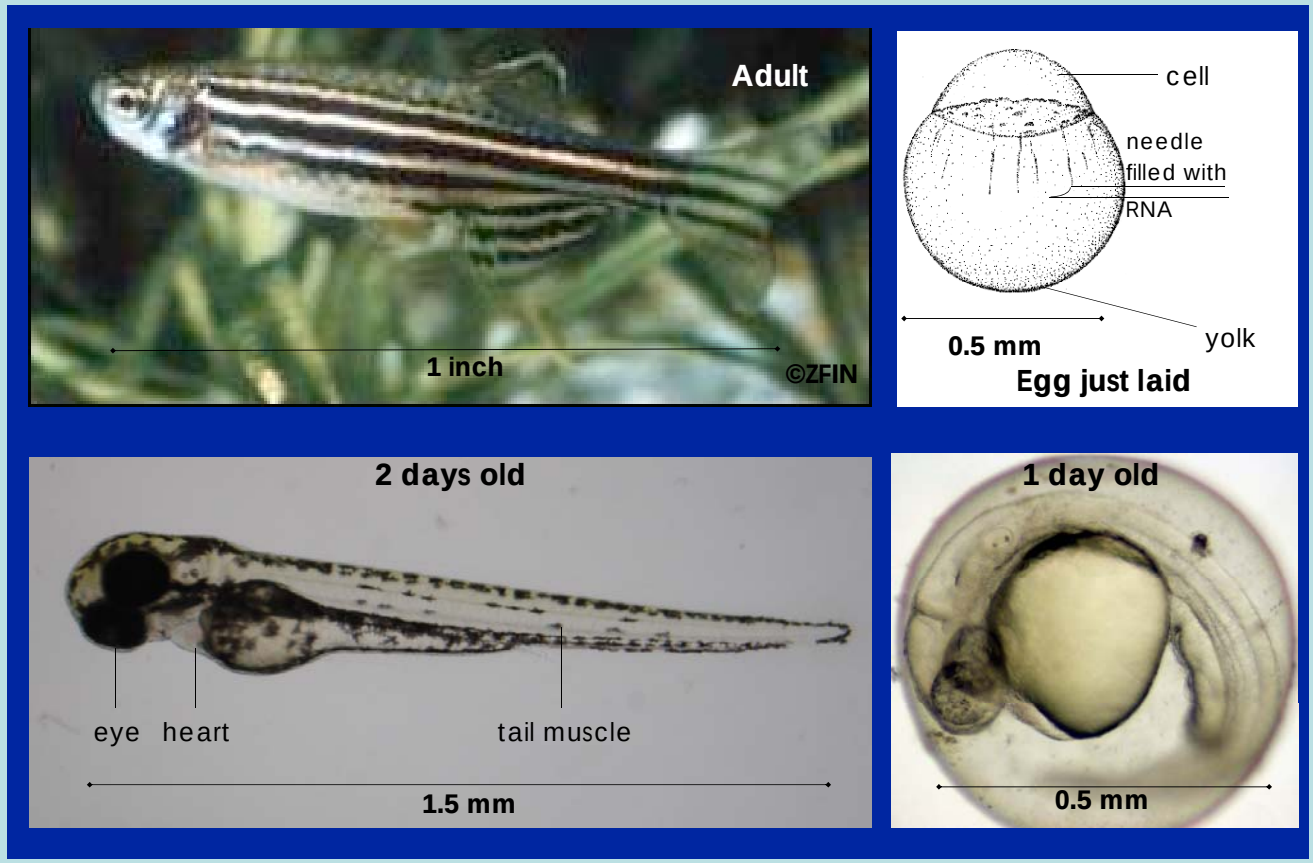
As can be see in the bottom right panel, early fish embryos are optically transparent. We can see what is going on inside them as they develop.

Haven't I seen them somewhere else before?

Zebrafish are often kept by amateur fishkeepers. You'll see them in many tropical aquaria. You'll also see spotted versions of them. They have a mutation in the melanophores that usually form the black stripes in the top left panel.

ABSTRACT

Zebrafish (*Danio rerio*) are increasingly being used to model human diseases. Although they are fish, they share many biological processes with humans so what we learn from zebrafish can be extrapolated to what is happening in humans. They also have a lot of advantages for experimental work, as we will discuss.



Zebrafish adults, eggs, embryos and larvae

Adult zebrafish(top left) are about an inch long. They lay eggs about half a millimetre in size (drawing, top right. These develop quickly, a day old embryo shown bottom right. After two days, the larval fish will hatch (bottom left). It will become adult- sized in 3 months.

Smaller than salmon, clearer than caviar, cheaper then either!