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Technology watch

GHOST FISH

The zebrafish has become a useful model for studying stem-cell and tumour biology, but the opacity of the skin of the adult fish has limited the *in vivo* analysis of stem-cell populations to embryogenesis. Now Leonard Zon and co-workers describe a new transparent adult zebrafish that allows high resolution (~5 μm using confocal microscopy) *in vivo* analysis of stem cells and possibly other cell types.

The transparency of the new mutant fish, which is named *casper* for its ghost like appearance, is due to the complete lack of melanocytes (which absorb light to protect subdermal structures) and iridophores (which reflect light away from the internal organs). Using green fluorescent protein (GFP)-labelled kidney marrow cells transplanted into irradiated *casper* recipients, the authors can image at a single-cell resolution the engraftment of the haematopoietic stem-cell population in live animals. By contrast, GFP-labelled transplanted cells could not be visualized in wild-type recipients. Furthermore, after transplanting melanoma cells into irradiated *casper* mutants, the authors observed tumour engraftment, proliferation and metastatic progression within 5 days following transplantation (in wild-type recipients, tumours are only visible after 3–4 weeks). The combination of increased sensitivity and high resolution imaging, with the advantage of zebrafish being amenable to genetic manipulation, makes the adult transparent zebrafish an ideal model for the analysis of stem or tumour cells *in vivo*.

ORIGINAL RESEARCH PAPER White, R. M. *et al.* Transparent adult zebrafish as a tool for *in vivo* transplantation analysis. *Cell Stem Cell* **2**, 183–189 (2008)

FLUORESCENT CYCLING

Atsushi Miyawaki and colleagues report a new fluorescence-based technique — fluorescent ubiquitylation-based cell-cycle indicator (Fucci) — that can be used to study the cell-cycle dependency of numerous cellular events.

The new method relies on the precisely regulated cell-cycle dependent proteolysis of two factors, Geminin and CDT1, which ensure that replication occurs only once during a cell cycle. The levels of CDT1 are highest during the G_1 phase, whereas the levels of Geminin are highest during the S, G_2 and M phases. By fusing a red-emitting fluorescent protein to CDT1 and a green to Geminin, the authors developed fluorescent probes that mark the cell nuclei in red or green depending on whether individual cells are in G_1 phase or in S, G_2 or M phases. They then generated stable cell lines and transgenic mice that constitutively express Fucci probes. Using a combination of time-lapse imaging and the Fucci technology, the authors monitored the spatiotemporal patterns of cell-cycle dynamics during the epithelial-mesenchymal transition of cultured cells and the development of tumours in mice. Furthermore, they studied the migration and differentiation of neural progenitor cells on brain slices from Fucci mice. This method is likely to have extensive applications in basic and clinical research.

ORIGINAL RESEARCH PAPER Sakaue-Sawano, A. *et al.* Visualizing spatiotemporal dynamics of multicellular cell-cycle progression. *Cell* **132**, 487–498 (2008)