Development of Sheer Zebrafish Using Mutants Defective in Pigmentation Genes
OTT ID# 1084

TECHNOLOGY

Optical clarity of the embryo is rightfully touted as one of the principle advantages in using zebrafish as a model organism for studying development. While the developing embryo remains transparent for the first 24 hours of development, melanin starting at around 24 hours post fertilization begins to obscure microscopic observation of the developing embryo, until in the adult the internal organs are completely hidden from view. Chemicals (e.g. 1-phenyl-2-thiourea) can be used to extend the period of viewing, but the chemicals can affect development. Albino mutant fish deficient in melanin production lack some pigmentation, but in the end the other two types of remaining pigments, iridophores and xanthophores obscure the view of adult internal organs. Several fish species (e.g. glass catfish) exist which are clear or transparent as adults, suggesting that pigmentation is not vital for survival.

Dr. Tomasiewicz has developed triple homozygous mutant fish, known as sheer zebrafish, which are characterized by their optically transparent quality throughout life. His laboratory has crossed mutants transparent (tra), albino (alb), and pfeffer (pfe) in which homozygous mutants are each defective in synthesis of different pigments (iridophores, melanin, and xanthophores respectively). Transparent zebrafish enable studies requiring the observation of cellular processes and interactions, and allow for manipulation of cells in adult fish. Sheer fish also allow for observation of all of the internal organs in the adult fish. These transparent fish are ideal for the study of fluorescent proteins, especially when studying the effects of environmental toxicants on neurodegenerative and other disease processes where optical clarity is at a premium.

APPLICATIONS

In sheer zebrafish the effects of environmental toxicants on internal organs or tissues can be visualized directly without sacrificing the fish, allowing investigators to follow the pathological progression resulting from exposure in single animals. Because the fish are relatively clear the disease progression can be followed using time lapse photography. Used in conjunction with tissue specific expression of fluorescent proteins, the effects of toxicant exposure on cells can be followed in real time. Study of diseases such as cancer would also greatly benefit from the visualization of tumor progression. These fish will also be great education tools for teaching cell biology, anatomy, and physiology.

FEATURES/BENEFITS

- **Better visualization** – Triple homozygous mutant fish are optically transparent throughout life
- **Real time studies** – Processes can be observed in real time without sacrificing the fish
- **Direct visualization** – Internal organs or fluorescently-tagged cells of adult fish are directly observed
- **Ideal for teaching** – Zebrafish are an excellent system for providing active/experiential approaches to teach developmental biology, genetics, neurobiology, and behavior
INVENTOR

Henry Tomasiewicz

Dr. Henry Tomasiewicz is the director of the Aquatic Animal Models Facility Core located at the NIEHS-Children’s Environmental Health Institute and associated with the University of Wisconsin-Milwaukee. He received two B.S. degrees from Michigan State University in Biochemistry as well as Microbiology and Public Health. He obtained his Ph.D. in Biochemistry at the University of Colorado where he studied the regulation of DNA replication during cell division in E. coli. Dr. Tomasiewicz conducted postdoctoral research with Dr. Terry Magnuson and Dr. Urs Rutishauser at Case Western Reserve University where he knocked out the Neural Cell Adhesion Molecule (NCAM) gene in mice. He also worked as a postdoctoral researcher in the laboratory of Dr. John Woods in the Department of Cell Biology at Emory University where he studied the role of the microtubule-associated protein tau in human neurodegenerative disorders, including Alzheimer's disease patients.

INTELLECTUAL PROPERTY

Sheer fish are available upon request through a Material Transfer Agreement.

For further information please contact:

Jessica Silvaggi
Licensing Manager
UWM Research Foundation
1440 East North Avenue
Milwaukee, WI 53202
Tel: 414-906-4654
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