



# UAB Zebrafish Research Facility

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## Abstract

Contemporary biomedical research relies heavily on the use of experimental animal model systems that recapitulate mammalian biological processes. The zebrafish (*Danio rerio*), is an important model organism for the study of vertebrate development and disease, organ function, behavior, toxicology, cancer, and drug discovery. Recently, the National Institutes of Health has ranked zebrafish as the second most frequently used developmental model system for Health and Human Services funded research. Zebrafish produce a large number of offspring at low cost, accommodating performance of large genetic or molecular screens. The zebrafish genome has been sequenced, and protocols are established for transgene expression, gene expression knockdown, and other genetic manipulations. Zebrafish embryos and early larvae are optically transparent, enabling non-invasive visualization of developing organs and biological processes *in vivo* at high resolution. The UAB Zebrafish Research Facility (ZRF) occupies ~5000 net square feet in the Research Support Building and includes a recirculating aquaria system (Aquanearing Inc.) with centralized water conditioning and purification supplying 27 racks (>2200 3 L aquaria). The ZRF is adding six new racks with a robotic feeder (Techniplast), which will allow earlier maturation and phenotyping of mutants. The ZRF Procedural Laboratory includes five embryo processing stations (dissection microscopes, injectors, micromanipulators), incubators, a pipette puller, and a two fluorescent microscopes, as well as other equipment needed for embryo manipulation and fish work. A Noldus EthoVision station allows computerized behavioral analysis of adult and larval zebrafish, and a Loligo Swim Tunnel System accommodates assessments of swimming behavior and respirometry. A separate quarantine facility is located on the 4<sup>th</sup> floor of RSB. The ZRF welcomes all UAB investigators interested in working with zebrafish.

## Recirculating Aquaria System



## ZRF Procedural Laboratories



5 Embryo Manipulation & Injection Stations

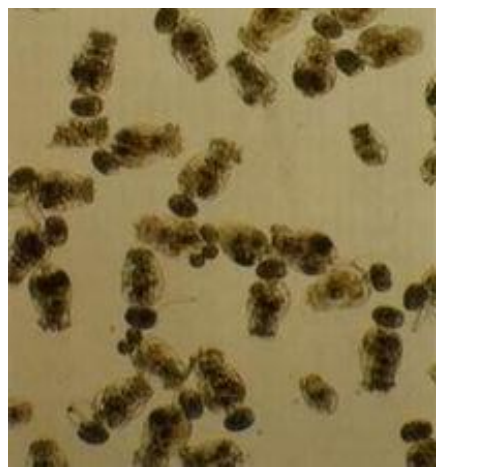


2 Fluorescent Microscope Stations

## Live Feeds



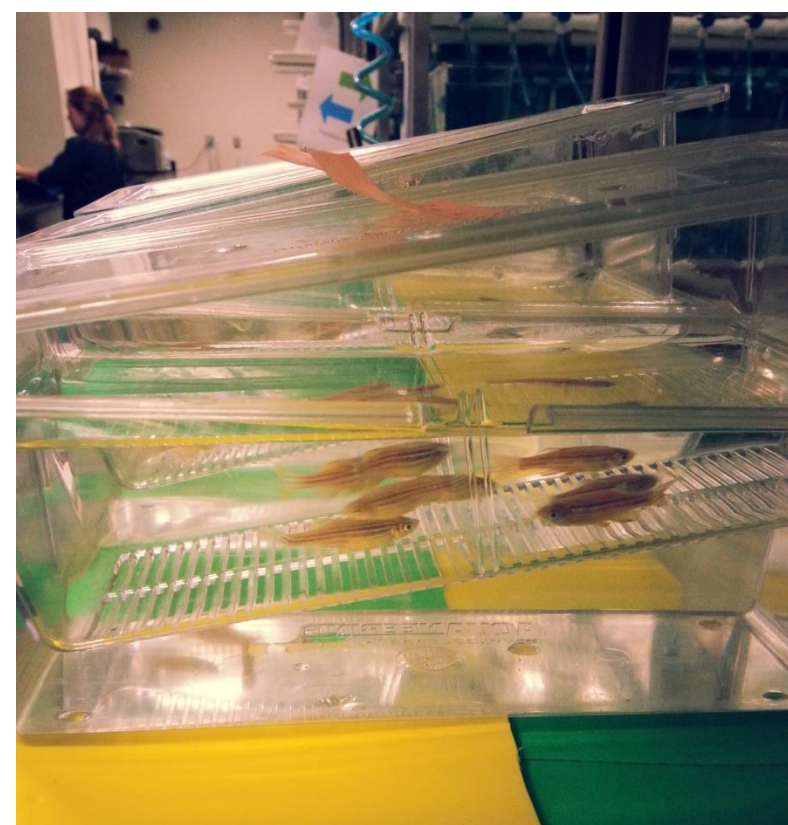
The facility has a live feeds preparation station (left) for growing Artemia (blue background, below, center) and rotifers (tan background, below right). Fish in the facility are fed specific age-appropriate diets including live feeds and commercially prepared products. Live rotifers are fed to very young fish, while older fish receive live Artemia.



## Advantages of Zebrafish Models

- Vertebrate organism with high genomic homology to man
- Inexpensive to obtain and maintain
- Short generation time, many offspring per mating
- External fertilization and embryonic development
- Rapid development of transparent embryos
- Well established transgenic technology
- Well established morpholino, TALEN, and CRISPR technologies
- Especially useful for large scale drug and toxicology screens

## Breeding



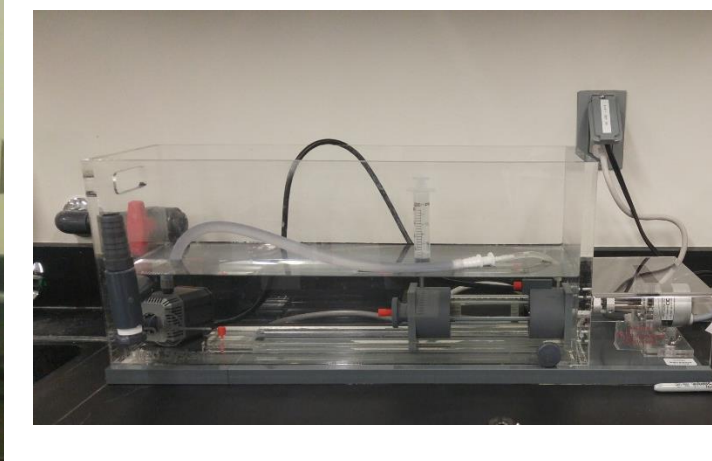
Fish are usually bred in static tanks off the recirculating water system (above left and right). Female fish are stimulated naturally to lay eggs at dawn, or when the room lights come on each day. Breeding tanks contain a colander-like insert that allows eggs to fall through into the space underneath the insert where adults cannot cannibalize them. The males release sperm into the same space, and fertilization occurs. Embryos can be collected and incubated in liquid embryo media in Petri plates. At 5 days post fertilization, hatched fry are developed enough to go into a fish tank for first feeding with rotifers. The facility maintains wild type AB fish and can provide embryos to investigators wishing to perform work with embryos but not needing to maintain older fish.



Zebrafish Embryos and Fry



Noldus EthoVision XT Workstation for Behavioral Analyses



Loligo Swim Tunnel and Respirometer

## Zebrafish Husbandry Education

The first comprehensive Zebrafish Husbandry Education Program offered in the world was initiated in 2014 as a collaboration between UAB, Gadsden State Community College, and the Zebrafish Husbandry Association (ZHA). The goal of this Program is to standardize and optimize husbandry practices at different laboratories and institutions internationally in order to minimize research variation. The curriculum was developed by leaders in zebrafish husbandry and has 2 parts: (1) an online semester-long course offered each spring and fall, and (2) a 3-day hands-on Short Course offered annually at UAB. In addition, major aquatic products vendors donated housing systems and other equipment for use in the Short Course. The UAB ZRF is honored to have been involved in development and implementation of this new and innovative training program that is providing intensive training on the husbandry of zebrafish on a national and international level. As of fall 2019, we have hosted 6 Short Courses with a total of 139 participants and 8 online courses with a total of 309 participants. Eighteen participants have taken both. Participants have joined us from 15 countries.



2019 Short Course Instructors and Participants and UAB Teaching Spaces

## ZRF Staff Specialists



Patty Oden



Wayne May



Katie Dorris

## UAB Webpage address:

<http://www.uab.research/administration/offices/ARP/Pages/Zebrafish-Research-Facility.aspx>

### Contributors

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Alabama Drug Discovery Alliance  
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Center for Clinical and Translational Sciences  
College of Arts and Sciences  
Comprehensive Arthritis, Musculoskeletal, Bone and Autoimmunity Center  
Comprehensive Cancer Center  
Cystic Fibrosis Research Center  
Department of Biology  
Department of Cell Biology  
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Department of Neurobiology  
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