

WORKSHOP: “Defined Reference Diets for Zebrafish and Other Aquatic Biomedical Research Models: Needs and Challenges”

WORKSHOP DRAFT AGENDA

ORIP/DPCPSI/OD-NIH Workshop

Monday, July 30, 2018

6701 Democracy, 9th Floor Conference Room 987/989, Bethesda, Maryland

Purpose of the Meeting: Aquatic animal species, such as zebrafish (*Danio rerio*), are powerful models for studying human development, behavior, genetics, and disease. The ability to produce transgenic and mutant lines provides biomedical researchers with many options for developing models of human diseases and for developing relevant therapeutic approaches. Different facilities and laboratories use a variety of diets and feeding protocols to maintain these models. In many laboratories zebrafish are reared with a combination of live feed (*ex vivo*) and/or one of many undefined commercial diets. Commercial diets used in zebrafish husbandry differ significantly in ingredient and nutrient composition and often contain preservatives, lakes, dyes, antinutritional factors, or bioactive food compounds. Studies indicate that the length, weight, sexual maturation, fecundity, and mortality of zebrafish can vary significantly with different diets. Unfortunately, impacts of diet on zebrafish health and behavior and corresponding implications for zebrafish research outcomes are not well described. Currently, the daily dietary nutrient requirements of almost all nutrients have not been investigated. There is also no consensus among aquatic facilities, researchers, and commercial vendors on nutritional requirements at various life stages (*i.e.*, larval, juvenile, and adult) or for particular research applications to minimize husbandry variations among aquatic facilities or laboratories. Complicit in this lack of consensus is a community-wide lack of understanding of the role of nutrition in animal development, health, and research outcomes. To address this gap, the Office of Research Infrastructure Programs (ORIP) is sponsoring a workshop to bring together members of the zebrafish scientific community, with expertise in zebrafish and other aquatic and relevant models, for a day of discussion. The workshop attendants will assess the needs and challenges of developing defined reference diets and optimized feed management strategies that will support normal zebrafish development and physiology, and will facilitate the analysis of phenotypes in a standardized nutritional environment. Standardization and education will promote rigor and reproducibility in some zebrafish studies **and enhance the use of zebrafish and other aquatic models in biomedical research.**

Objectives:

- 1) Review diet development strategies, where available, in other biomedical model species.
- 2) Assess the current nutrition status of zebrafish.
- 3) Describe the need for defined diets for maintenance and experimental stocks, including assessment of life stage requirements.
- 4) Discuss the potential impact of defined reference diets on genetic stocks used in biomedical research, their effect on development, physiology and expressivity of disease/mutant phenotypes.

- 5) Identify obstacles and evaluate strategies that may lead to a successful consensus, acceptance, and implementation of defined reference diets among the different scientific community stakeholders.
- 6) Define an educational approach to informing the community and associated partners (journals, organizations, granting agencies, etc.)
- 7) Determine whether/how the approach to develop a defined reference diet for zebrafish could be applied to other aquatic models, and animal models in general.

Workshop Organizing Committee (WOC) members:

Diana Baumann (Stowers Institute for Medical Research, MO)

Lilianna Solnica-Krezel (Washington University School of Medicine, MO)

John Rawls (Duke University School of Medicine, NC)

Robert Tanguay (Oregon State University, OR)

Zoltan Varga (ZIRC, University of Oregon, Eugene, OR)

Stephen A. Watts ([Chair](#); University of Alabama at Birmingham, AL)

NIH-ORIP Participants:

Willie McCullough, Thomas J. Smith, Desiree Vonkollmar, Sige Zou & Miguel Contreras

WORKSHOP: “Defined Reference Diets for Zebrafish and Other Aquatic Biomedical Research Models: Needs and Challenges”

Draft Agenda

8:00 am: Welcome. Stephanie Murphy, DCM Director, ORIP, NIH

8:10 am: Introduction and Charge. Dr. Stephen Watts, Chair, University of Alabama at Birmingham, AL

8:25 - 12:00 am. Session 1: Historic perspectives, current diets, ingredient considerations, and feeding management in the husbandry of zebrafish and other animal models: a comparative analysis. *Facilitators: Dr. Robert Tanguay and Dr. Stephen Watts*

- **8:25 – 9:05 am. (20 min presentation and 10 min discussion). Dr. Forrest Nielson, Grand Forks Human Nutrition Research Center, U.S. Department of Agriculture**
Title: The history of rodent nutritional research and the development of standardized diets: lessons learned.
- **9:05 – 9:45 am. (20 min presentation and 10 min discussion). Dr. Ronald Hardy, Professor, Director Aquaculture Research Institute, University of Idaho**
Title: The role of nutritional research in developing production aquaculture: applications to zebrafish culture.
- **9:45 - 10:15 am. (20 min presentation and 10 min discussion) Dr. William Ja, Associate Professor Neuroscience, Scripps Research Institute**
Title: The history of nutrition and diet development in *Drosophila and related insects*.
- **10:15 – 10:30 am. Break**
- **10:30 – 11:00 am. (20 min presentation and 10 min discussion) Dr. Delbert Gatlin, Regents Professor, Wildlife and Fisheries Sciences, Texas A&M University**
Title: The National Animal Nutrition Program: Relevance to zebrafish and lab animal models
- **11:00 – 11:20 (15 min presentation and 5 min discussion) Chris Lawrence, Boston Children’s Hospital, Harvard University**
Title: The role of feed management in promoting healthy nutrition in zebrafish
- **11:20 – 11:40 am. (15 min presentation and 5 min discussion) Mark Tye, Zebrafish Core Facility Manager, Univ. of Minnesota**
Title: Feed and Ingredient Safety: What we don’t know can hurt us

- **11:40 – 12:00 (15 min presentation and 5 min discussion) Dr. Robert Geisler, Karlsruhe Institute of Technology, Germany, European Zebrafish Resource Center**
Title: Nutrition as a variable in European research communities

12:00 – 1:00 pm. Lunch Break¹ (working lunch) Facilitators: Dr. Diana Baumann and Dr. Zoltan Varga, Stowers Institute and ZIRC
Title: Aquatic Community Survey / Current husbandry of zebrafish.

1:00 - 3:35 pm. Session 2: The impact of diet variation on health and experimental outcomes of zebrafish and other aquatic models. Facilitators: Dr. Lila Solnica-Krezel and Dr. John Rawls

- **1:00 – 1:20 pm. Dr. Steven Farber, Carnegie Institution for Science**
Title: The impact of diet on digestive physiology research in zebrafish.
- **1:20 – 1:40 pm. Dr. John Rawls, Duke University School of Medicine**
Title: The impact of diet on host microbiome.
- **1:40 – 2:00 pm. Dr. James Minchin, University of Edinburgh, Scotland**
Title: Obesity and adipose distribution in relation to nutrition
- **2:00 – 2:20 pm. Dr. Charles Kaufman, Washington University School of Medicine**
Title: Nutrition and cancer
- **2:20 – 2:40 pm. Dr. Liqing Zang, Mie University, Japan**
Title: Nutrition and diabetes
- **2:40 – 3:00 pm. Dr. Robert Tanguay, Oregon State University, OR**
Title: Nutrition and toxicology
- **3:00 – 3:15 Break**
- **3:15 – 3:35 pm. Dr. Louis D’Abramo, Past-President World Aquaculture Society, University of Alabama at Birmingham**
Title: Diet and life stage: what we need to know.

3:35 - 4:45 pm. Development of recommendations, discussion, and summary

5:00pm: Final comments and adjourn

¹: The government and/or government contractors are not involved in facilitating the provision of free food and/or light refreshments. Therefore, meals and light refreshments are at the expense of attendees.

