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**Validation of a Novel Microfluidic Platform by Imaging Diet Uptake in Zebrafish (*Danio rerio*) Larvae.**

A functional microfluidic imaging platform allows the study of several conditions such as the effect of diets on metabolism/digestion, drug interactions, and effects of gene mutations on metabolic processes. Extended durations of *in vivo* larval zebrafish microscopy are lacking, especially in regard to metabolism. We aim to extend the duration of *in vivo* larval zebrafish microscopy by using a novel microfluidic imaging platform capable of exchanging fluid (entry and exit flow), supplying oxygen, and supplying diets/drugs. Zebrafish (*Danio rerio*) serve as good research models for microscopy and disease related research. Zebrafish are optically transparent in larval stages and share 70% of genes with humans and 84% of which shared genes are known to be disease related. We first describe the optimal feed time to compare free feeding larval dietary consumption to larvae fed in the microfluidic platform, we imaged seven days post-fertilization (DPF) larvae fed at 1-, 3-, 5-, 7-, and 9-hour durations (10 larvae/timepoint, 3 replicates) with a Zeiss Discovery V8 microscope. We used a diet of 5% egg yolk spiked with Fluosphere polystyrene beads (580/605)™ to track the amount of diet consumed. We found the 5-hour timepoint was the best one to measure because fluorescent mean gray value quantified by NIH ImageJ had minor variation, and all larvae had fed. Future experiments will determine if seven DPF larvae will consume food equally in the microfluidic imaging platform environment. If seven DPF larvae feed equally in the microfluidic imaging platform it suggests an improved environment for imaging zebrafish larvae.