Freshwater Fish Sublethal Tests:

A review of the sublethal tests 60 years

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Pressure on animal testing has traditionally been the purview of mammalian toxicological science, but in the past few years, more attention is given also to environmental safety. As with higher vertebrate animal alternatives, balance between reduce animal use without impairing or increasing uncertainty in risk assessment is needed. Testing demands for long-term (chronic) fish toxicity represents the third largest pool of needs following 2-generation mammalian developmental toxicity test (OECD TG 416) for REACh. In 1984, in a review of sublethal tests, Woltering suggested that that the growth endpoint could be deleted from the sublethal fish tests, without affecting the predictive nature of the tests. As this endpoint has not been excluded and other endpoints have been added (e.g., biomass), we evaluated toxicity data from years of fish life cycle chronic, partial chronic and early life stage tests to assess the utility of the standard fish chronic toxicity endpoints, in particular the sublethal response. Within this evaluation using several databases and the literature, we found the most sublethal tests have been performed with the fathead minnow, rainbow trout, zebrafish, Medaka, and bluegill, and not surprisingly, the fathead minnow has the greatest frequency of use over a wide variety of research applications. With the additional development of shorter tests, i.e., the 7-d growth and survival test and 21-day reproduction tests, a review of the tests and their endpoints is due. The choice of species and method is often based on what makes it a strong model for addressing new challenges in aquatic toxicology, including the identification of sensitive life-stages/endpoints or chemicals with differing modes/mechanisms of action, predicting population-level effects based on data collected from lower levels of biological organization, and exploring/understanding the emerging role of genomics in research and regulation. Much of the ability to application to chronic toxicity hinges on an understanding of chemical mode of action. A summary of the most common methods, species, and duration and will be presented, and endpoints for the tests will be discussed.

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