

專題演講 新穎技術與環境鑑識

魚類急毒性替代測試的國際現況及展望

Alternative models for fish acute toxicity testing: Current understanding and future perspectives

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摘要

The use of fish in effluent toxicity assessments has become essential, however, large amount of fish is needed to perform the acute tests in the short term. It has been estimated that more than 5 million fish are used in effluent per year worldwide. During the past decades, there has been a global shift away from whole vertebrate animal in vivo testing toward in vitro alternatives to better align with the 3Rs to replace, reduce, and refine the use of animals in research. Alternative assays utilizing zebrafish embryo (FET) and rainbow trout gill cell line (RTgill-W1) (FCT) have been proposed as animal alternatives to fish acute toxicity testing (AFT) for regulatory use of effluent testing and chemical registration. However, the ecological relevance of alternative methods must be established before they can be adopted into regulatory frameworks. In our current study, we developed a promising integrated testing strategy (ITS) on acute fish toxicity by using in silico and in vitro data. We found that in silico, FCT and FET all had high correlation with AFT. For example, in silico model was suitable for toxicant identification due to the highest sensitivity and the minimum animal usage. Next, considering regulatory purposes and flexibility, we determined predictive LC50 of toxic chemicals by preference-dependent strategy which possessed highest flexibility. All strategies demonstrated high predictive power and correlation with AFT for certain toxic chemicals. Taken together, we developed multiple powerful and flexible ITS on acute fish toxicity by integrating non-animal methodologies.

關鍵字：魚類急毒性測試(Fish acute toxicity testing, AFT), 替代測試模式 (Alternative models), 魚類胚胎試驗(Fish embryo test, FET), 魚鰓細胞試驗(Fish gill cell test, FCT), 整合型測試策略(Integrated testing strategy, ITS)