Zebrafish embryos: a model for ecosystem health in compliance with the principle of the 3Rs.

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Thousands of chemicals substances released in the ecosystems are considered emerging because are not regulated, the exposure data are limited and risk assessment informations are scarce. These substances include pesticides, pharmaceuticals, personal care products, nanomaterials and can cause direct and indirect effects on human health and the environment. For example the number of potential neurotoxicants in the environment is raising, it has been estimated that up to 30% of all commercially used chemicals may have neurotoxic potential. These chemicals can also form mixtures with a potential synergistic toxicity. New Approach Methodologies (NAMs) are needed to understand the different effects that are caused by emerging chemicals (genotoxicity, neurotoxicity, embryotoxicity, cardiotoxicity, etc) and mixtures in the ecosystems. In the last years, in particular for fishes, are becoming popular new tests that consider only the early stages, these tests have been proven to have the same reliability of the acute test with adults and are in compliance with the 3Rs principle. The zebrafish embryo (*Danio rerio*) is a model relevant for the study, detection and assessment of effects and Mode of Actions (MoAs) of emerging chemicals and mixtures. Zebrafish embryo models have been especially successful in drug discovery research for human diseases. It has its wide acceptance and popularity as a replacement model due to many scientific attributes such as small size, ease of maintenance, low cost, rapid growth rate, high fecundity rate, external fertilization, optical transparency of the embryo. Recently zebrafish embryos, due to the scientific potential in different fields, have been also considered as a key model for One Health projects and strategies. In conclusion the use of zebrafish embryos, for his peculiar characteristics, can represent an excellent research model that should be considered in the future in order to protect our ecosystems and human health.