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Editorial

Behavioural Toxicology and Teleost Fish

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DESCRIPTION

Late proof shows that fish, an incredibly significant asset, are rapidly turning out to be scant. One outcome of this shortage is the expanding worry for fish endurance and a developing interest in recognizing the degrees of different compound toxins which are "protected" for fish and other aquatic life. Although the lethal concentrations and effects of many chemical pollutants, e.g, cyanide and pesticides have been well documented, the long term indirect effects of sub lethal concentrations upon the fish's ability to adapt to naturally occurring changes in its environment are unclear. However, evidence is accumulating that indicates that chemical agents may be behaviourally toxic even though symptoms of structural or biochemical toxicity are not detectable. Behavioural toxicity is said to have occurred when the introduction of a chemical agent into the fish's environment produces a change in its behaviour without a corresponding anatomical or physiological change. To be behaviourally toxic the chemical must induce a behaviour change that exceeds: The normal range of variability, i.e., inappropriate given the existing environmental conditions. Although any change in behaviour would indicate behavioural toxicity, toxicologists and ecologists are particularly interested in those chemically induced changes that decrease the animal's ability to adapt to its environment. For example, the introduction of a chemical substance may (1) increase the time required to learn to escape or avoid noxious stimuli, (2) decrease the animal's sensitivity to subtle changes in its environment, or (3) interfere with the animal's ability to retain previously learned behaviour.

As Thompson and Schuster note, the study of toxic effects on the behavioural level offers ecologists and environmentalists two major advantages. First, those chemical agents that produce only behavioural changes that have serious and possibly irreversible deleterious effects on the animal's ability to adapt may be identified and controlled. Second, the identification of the behaviourally toxic effects of chemical agents may provide an early warning system which may allow the detection of toxicity before irreversible structural and biochemical damage has occurred. However, behavioural toxicology requires reliable measures and a precise control over animal behaviour under specified experimental conditions. The fine grained analysis and control over the behaviour of rats, pigeons, and primates developed by researchers in respondent and operant conditioning laboratories has contributed greatly to the recent progress in both behavioural toxicology and pharmacology. As a result, much less precise control over the behaviour of individual fish is currently available to behavioural toxicologists.

The purpose of this work is to demonstrate the feasibility of using teleost fish as subjects in behavioural toxicology experiments. To accomplish this, we will first review the existing literature on both operant and respondent conditioning in fish. Then, after familiarizing the reader with the techniques and procedures currently available for controlling fish behaviour, a review of the literature examining the effect of various chemical substances on conditioned fish behaviour will be presented. Finally, the implications of the findings of these studies for future work in behavioural toxicology with fish will be discussed. No attempt was made to limit the review of behaviourally toxic substances to only those chemicals commonly classified as environmental pollutants. Instead, any chemical agent that has been shown to influence conditioned behaviour has been included. Although these chemicals are not environmental pollutants, their effects upon behaviour clearly fall within the broad definition of behavioural toxicity of Thompson and Schuster. In addition, the procedures developed in these studies may prove useful in determining whether environmental pollutants will produce similar effects under similar conditions.

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