

Toxicity and differential oxidative stress effects on zebrafish larvae following exposure to toxins from the okadaic acid group

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JOURNAL OF TOXICOLOGY AND ENVIRONMENTAL HEALTH-PART A-CURRENT ISSUES

Volumen: 83

Número: 15-16

Páginas: 573-588

DOI: 10.1080/15287394.2020.1793046

Fecha de publicación: AUG 17 2020

Acceso anticipado: JUL 2020

Tipo de documento: Article

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Abstract

Okadaic acid-group (OA-group) is a set of lipophilic toxins produced only in seawater by species of the *Dinophysis* and *Prorocentrum* genera, and characterized globally by being associated with harmful algal blooms (HABs). The diarrhetic shellfish poisoning toxins okadaic acid (OA) and dinophysistoxin-1 (DTX-1) are the most prevalent toxic analogues making up the OA-group, which jeopardize environmental safety and human health through consumption of hydrobiological organisms contaminated with these toxins that produce diarrhetic shellfish poisoning (DSP) syndrome in humans. Consequently, a regulatory limit of 160 μg of OA-group/kg was established for marine resources (bivalves). The aim of this study was to investigate effects varying concentrations of 1-15 $\mu\text{g}/\text{ml}$ OA or DTX-1 on toxicity, development, and oxidative damage in zebrafish larvae (*Danio rerio*). After determining the lethal concentration 50 (LC50) in zebrafish larvae of 10 and 7 $\mu\text{g}/\text{ml}$ (24 h) and effective concentration 50 (EC50) of 8 and 6 $\mu\text{g}/\text{ml}$ (24 h), different concentrations (5, 6.5, or 8 $\mu\text{g}/\text{ml}$ of OA and 4, 4.5, or 6 $\mu\text{g}/\text{ml}$ of DTX-1) were used to examine the effects of these toxins on oxidative damage to larvae at different time points between 24 and 120 hpf. Macroscopic evaluation during the exposure period showed alterations in zebrafish including pericardial edema, cyclopia, shortening in the anteroposterior axis, and developmental delay. The activity levels of biochemical biomarkers superoxide dismutase (SOD) and catalase (CAT) demonstrated a concentration-dependent decrease while glutathione peroxidase (GPx) and glutathione reductase (GR) were markedly elevated. In addition, increased levels of oxidative damage (malondialdehyde and carbonyl content) were detected following toxin exposure. Data demonstrate that high concentrations of OA and DTX-1 produced pathological damage in the early stages of development <48 h post-fertilization (hpf) associated with oxidative damage.

Palabras clave

Palabras clave de autor:[Zebrafish](#); [okadaic acid](#); [Dinophysistoxin-1](#); [development](#); [oxidative stress](#)

KeyWords Plus:[DANIO-RERIO](#); [ANTIOXIDANT RESPONSES](#); [SUPEROXIDE-DISMUTASE](#); [DINOPHYSIS-ACUTA](#); [FISH](#); [BLOOMS](#); [BRAIN](#); [TIME](#); [REPRODUCTION](#); [MICROCYSTINS](#)

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Financiación

Entidad financiadora Mostrar más información	Número de concesión
Comision Nacional de Investigacion Cientifica y Tecnologica (CONICYT) CONICYT FONDECYT	1160168

[Ver texto de financiación](#)

Editorial

TAYLOR & FRANCIS INC, 530 WALNUT STREET, STE 850, PHILADELPHIA, PA 19106 USA

Información de la revista

- **Impact Factor:** [Journal Citation Reports](#)

Categorías / Clasificación

Áreas de investigación:Environmental Sciences & Ecology; Public, Environmental & Occupational Health; Toxicology

Categorías de Web of Science:Environmental Sciences; Public, Environmental & Occupational Health; Toxicology

Información del documento

Idioma:English

Número de acceso: WOS:000550073500001

ID de PubMed: 32686606

ISSN: 1528-7394

eISSN: 1087-2620