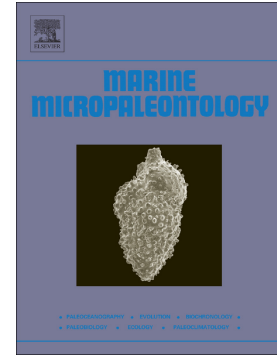


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Benthic foraminiferal ultrastructural alteration induced by heavy metals

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Abstract

Heavy metals are known to cause deleterious effects on biota because of their toxicity, persistence and bioaccumulation. Here, we briefly document the ultrastructural changes observed in the miliolid foraminifer *Pseudotriloculina rotunda* (d'Orbigny in Schlumberger, 1893) and in the perforate calcareous species *Ammonia parkinsoniana* (d'Orbigny, 1839) induced by exposure to one of three heavy metals (zinc, lead, or mercury). The exposure of these two benthic foraminiferal species to the selected heavy metals appear to promote cytological alterations and organelle degeneration. These alterations include a thickening of the inner organic lining, an increase in number and size of lipid droplets, mitochondrial degeneration, and degradation vacuoles and residual body proliferation. Some of these alterations, including the thickening of the inner organic lining and the proliferation of lipids, might represent defense mechanisms against heavy metal-induced stress.

Key words: protist, pollution, miliolid, ultrastructure, cytoplasm, *Ammonia*, *Pseudotriloculina*

1. Introduction

Benthic foraminifera are single-celled eukaryotes that are highly abundant in marine environments. Traditionally, benthic foraminifera have been applied to paleoecological, paleoenvironmental and paleoclimatological reconstructions and hydrocarbon exploration.

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