

Effects of butyltins on the symbiotic sea anemone *Aiptasia pallida* (Verrill)

Annie Mercier^{a,c,*}, Émilien Pelletier^b, Jean-François Hamel^c

^aDépartement d'océanographie, Université du Québec à Rimouski, 310 allée des Ursulines, Rimouski (Québec) Canada, G5L 3A1

^bINRS-Océanologie, 310 allée des Ursulines, Rimouski (Québec) Canada, G5L 3A1

^cSociété d'exploration et de valorisation de l'environnement (SEVE), 90 Notre-Dame Est, Rimouski (Québec) Canada, G5L 1Z6

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Abstract

Tributyltin (TBT) is a widespread biocide often used in antifouling paints. Leaching of TBT and of its butyltin derivatives into the marine habitat is known to have severe consequences on aquatic life. The present study was designed to determine the impact of butyltin exposure on sea anemones *Aiptasia pallida* (Verrill) and their symbiotic zooxanthellae. Sea anemones exposed to a nominal TBT concentration of $50 \text{ ng} \cdot \text{l}^{-1}$ in a flow-through system of sea water for 28 days showed a decreasing concentration of zooxanthellae within their tentacles, along with an increased number of bacterial aggregates in the ectoderm. Also observed were stimulated mucus secretion, thickening of the pedal disc ectoderm and a decreased number of undischarged nematocysts. Another group of sea anemones, fed 5 mg of contaminated mussel tissue ($5 \text{ ng TBT} \cdot \text{mg}^{-1}$) daily for 28 days, showed a similar decrease in zooxanthellae abundance, increased occurrence of bacterial aggregates, and lowered amount of undischarged nematocysts, but none of the other symptoms. Replenishment of the lost zooxanthellae was apparently prevented, either through control over the mitotic activity of the vegetal cells by the contaminated sea anemones or as a result of the toxic effects of butyltins. Expulsion of zooxanthellae, which appeared to favour butyltin depuration, is a common response of symbiotic cnidarians toward stressful conditions. In this case, it occurred after exposure to very low concentrations of butyltins, stressing the high toxicity of these contaminants. The concurrent increase in the number of bacterial aggregates in the ectoderm showed that they proliferate when zooxanthellae depart. This bacterial growth can be interpreted as the first observation of a microbial infection promoted by low-level exposure to chemical contamination from sea water and food. However, the exact nature of the bacteria-anemone relation and whether it could be a form of auxiliary symbiosis instead of an infection is

*Corresponding author. Present address: Dépt. océanographie, Université du Québec à Rimouski, Rimouski (Québec), Canada, G5L 1Z6. Tel.: (418) 724 1770; fax: (418) 723 7234; e-mail: Annie_Mercier@UQAR.UQuebec.ca