Response of temperate sea anemones to butyltin contamination

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Abstract: Two common species from the North Atlantic, *Metridium senile* and *Bunodactis stella*, were used to assess the response of temperate sea anemones toward tributyltin (TBT) contamination. Sea anemones *M. senile* exposed to a nominal TBT concentration of 50 ng·L seawater^{-1} in a continuous-flow system for 5 days accumulated 0.33 ± 0.02 ng TBT·mg dry mass^{-1} and 0.49 ± 0.02 ng dibutyltin (DBT)·mg dry mass^{-1}, a TBT derivative that dominates in seawater. The daily ingestion of 10 mg of mussel homogenate, contaminated with 10 ng TBT·mg wet mass^{-1}, for 5 days led to comparable accumulations in *M. senile* and *B. stella* of 0.52 ± 0.09 ng TBT·mg dry mass^{-1} (0.61 ± 0.01 ng DBT·mg dry mass^{-1}) and 0.47 ± 0.10 ng TBT·mg dry mass^{-1} (0.62 ± 0.12 ng DBT·mg dry mass^{-1}), respectively. Total burdens to the tissues after 5 days, combining TBT and DBT as Sn, represented 35 ± 6 and 42 ± 15% of ingested TBT in *M. senile* and *B. stella*, respectively. Adsorption and degradation processes are apparently involved in butyltin regulation. The two cold-water species metabolized TBT almost as efficiently as a previously studied tropical symbiotic species, but they accumulated lower levels of butyltins and therefore seem less vulnerable to TBT contamination.

Résumé : Cette étude examine la réponse d'anémones de mer tempérées soumises à une contamination de l'eau ou de la nourriture par le tributylétain (TBT). Deux espèces communes de l'Atlantique Nord, *Metridium senile* et *Bunodactis stella*, furent utilisées. L'anémone *M. senile* exposée à une concentration nominale de 50 ng TBT·L d'eau de mer^{-1} dans un système continu pendant 5 jours a accumulé 0,33 ± 0,02 ng TBT·mg masse sèche^{-1}. La concentration de dibutylétain (DBT), un dérivé du TBT dominant dans l'eau de mer, atteignait 0,49 ± 0,02 ng·mg masse sèche^{-1} après le même délai. L'ingestion quotidienne par *M. senile* et *B. stella* de 10 mg d'homogénat de moules contenant 10 ng TBT·mg masse humide^{-1} pendant 5 jours a entraîné une accumulation dans les tissus de 0,52 ± 0,09 et 0,47 ± 0,10 ng·mg masse sèche^{-1} chez les deux espèces, respectivement. L'accumulation de DBT fut semblable, soit 0,61 ± 0,01 ng·mg masse sèche^{-1} chez *M. senile* et 0,62 ± 0,12 ng·mg masse sèche^{-1} chez *B. stella*. La quantité totale de butylétains retrouvée dans les tissus, combinant le TBT et le DBT sous forme de Sn, représentait 35 ± 6 et 42 ± 15 % du TBT ingéré par *M. senile* et *B. stella*, respectivement. Des processus d'absorption et de dégradation sont apparemment impliqués dans la régulation des butylétains. Les deux espèces des eaux froides métabolisent le TBT de façon comparable aux espèces symbiotiques tropicales précédemment étudiées, mais elles accumulent des niveaux inférieurs de butylétains et semblent donc moins vulnérables à la présence de TBT dans leur milieu.

Introduction

The goal of this study was to gather realistic data on the response of widespread marine organisms toward tributyltin (TBT) contamination, providing additional and novel information regarding the impact of this persistent contaminant on coastal marine ecosystems.

Marine cnidarians, which comprise sea anemones, corals, jellyfish, and hydroids, are widely distributed in coastal zones around the world. Their abundance and position in the trophic chain (i.e., they are mostly opportunistic predators and plankton feeders) are in favour of their potential use as test organisms in aquatic toxicology (Mercier et al. 1996). However, to our knowledge, the possible damage caused to these marine invertebrates by toxic chemicals has not yet received much attention. Cnidarians were mostly used in the general monitoring of coral reef health (Grigg and Dollar 1991; Fiege et al. 1994; Morton 1994; Zann 1994); only a few assessments were made of the impact of sewage (Banner 1974; Smith 1977), oil (Loya and Rinkevich 1980; Peters et al. 1981), and organochlorines (Firman and Gassman 1995) on corals. Regulation of trace metals by symbiotic cnidarians has been examined (Brown and Howard 1985; Howard et al. 1986; Harland and Brown 1989; Harland and Nganro 1990; Harland et al. 1990), although most studies dealt with biologically relevant metals rather than toxic ones.

Of the many threats faced by shallow coastal ecosystems where cnidarians prosper, TBT is certainly among the most insidious. This active agent of antifouling paints leaches from boat hulls into the marine habitat, especially in areas of important shipping activity. The use of TBT-based paints on small crafts (less than 25 m in length) was banned in most industrialized countries during the 1980s after its adverse

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