

Evaluation of mitogen-induced responses in marine mammal and human lymphocytes by in-vitro exposure of butyltins and non-ortho coplanar PCBs

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“Capsule”: *Butyltins may affect the immune response in marine mammals.*

Abstract

The effects of exposure to butyltin compounds (BTs: tributyltin; TBT, dibutyltin; DBT and monobutyltin; MBT) and non-ortho coplanar PCBs (IUPAC 77, 126 and 169) on marine mammals and human lymphocyte were evaluated. Peripheral blood mononuclear cells (PBMCs) isolated from Dall's porpoises (*Phocoenoides dalli*), bottlenose dolphins (*Tursiops truncatus*), a California sealion (*Zalophus californianus*), a large seal (*Phoca largha*) and humans (*Homo sapiens*) were exposed at varying concentrations of BTs and coplanar PCBs. Concanavalin A (Con A)-stimulated mitogenesis found significantly suppressed ($P < 0.01$) when the cells were exposed at 300 nM (89 ng/ml) of TBT and 330 nM of DBT (77 ng/ml), while MBT showed little cytotoxicity at treatment levels of up to 3600 nM (620 ng/ml). BTs concentrations in the liver of Dall's porpoises from Japanese coastal waters ranged between 81–450 ng/g for TBT and 200–1100 ng/g (wet wt.) for DBTs, which is greater than the cytotoxic levels registered in this study. In contrast, non-ortho coplanar PCBs did not suppress cell proliferation at concentrations of up to 30 nM (10 ng/ml). The residue levels of coplanar PCBs in the blubber of Dall's porpoises were 0.12–1.3 ng/g, which were one order of lower than those levels that do cell proliferation. When cells were exposed to a mixture of TBT/DBT and coplanar PCBs, the proliferation was significantly reduced to 33 nM DBT plus 34 nM CB-77 and 33 nM DBT plus 28 nM CB-169 mixtures, respectively. The investigations relating the contaminant-induced immunosuppression in marine mammals have been focused on persistent organochlorines such as PCBs, pesticides and dioxin compounds. However, this study suggested the possibility of BTs could also pose a serious threat to the immune functions in free-ranging marine mammals and humans. © 2002 Elsevier Science Ltd. All rights reserved.

Keywords: Immunosuppression; Peripheral blood mononuclear cells (PBMCs); Mitogen-induced response; Marine mammal; Butyltins; Non-ortho coplanar PCBs

1. Introduction

During the last two decades, approximately seven serious mass mortalities of marine mammals have been

reported (Simmonds, 1992). Nearly, 20,000 harbour seals and several hundred grey seals were found dead in the North Sea in 1988 (Dietz et al., 1989). Similarly, mass mortalities of 2500 bottlenose dolphins and 8000 Baikal seals were found in the US east coast waters (Kuehl et al., 1991) and in the Lake Baikal (Grachev et al., 1989), respectively. When we consider such mortalities, three common features were observed to all these incidents. First, the animals were severely infected

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