

The Potential Effects of Environmental Contaminants on Immune Function and Health in Free-Ranging Pinnipeds in Alaska

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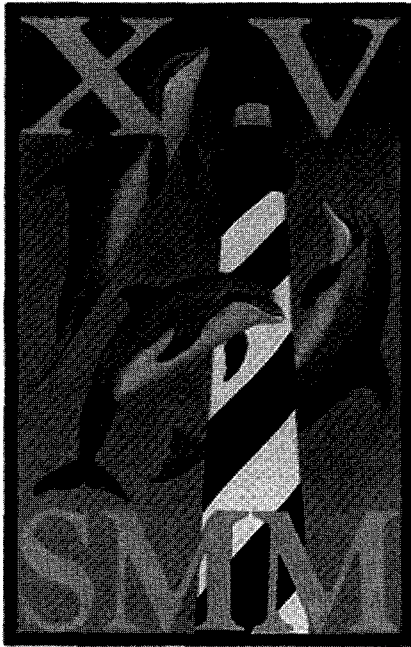
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In recent decades, certain populations of Alaskan marine mammals have decreased, including the western stock of the Steller sea lion (*Eumetopias jubatus*) and northern fur seals (*Callorhinus ursinus*). Although several areas have been investigated, including the role of exposure to chemical contaminants, the causes of these population declines are not known. Organochlorine (OC) contaminants have been measured recently in the tissues of Alaskan marine mammals at concentrations higher than expected that have been linked previously to immune suppression and reproductive dysfunction in marine mammals. During live-capture field studies conducted from 1995 to 2001, we investigated OC contaminant exposure, as well as the health and development of immune function, in juvenile northern fur seals (NFS) and Steller sea lions (SSL). We optimized and validated multiple immune functional assays for use in these species. We evaluated immune function with lymphocyte function assays (lymphoproliferative assays, immunoglobulins, and specific antigen stimulation), white blood cell differential counts and haptoglobins. By examining multiple cohorts of SSL from different stocks as well as repeat sampling of NFS from birth to weaning, we documented variation in immune responses in growing animals. We established reference ranges for leukocytes in different age group subpopulations. Additionally, we conducted expanded health surveys in SSL that included serology, parasitology, microbiology, and detailed physical examinations. These investigations detected significant correlations between OC exposure and impaired immune function including T-cell-mediated B-cell responses. Antibody production responses in NFS pups to primary and secondary tetanus toxoid vaccinations were negatively correlated to circulating blood levels of selected PCB congeners at the time of vaccination. Developmental age could not explain this effect. Responses to mitogen stimulation using lymphoproliferative assays were negatively correlated to PCB levels in both species but the effects of developmental age had an impact on these results in fur seals.

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