

## INNOVATING CROSS-DOMAIN SOLUTIONS TO DETECT EMERGING BIOLOGICAL THREATS

# Companion Animal Mortality From Oral Exposure To Palytoxin With First Confirmation Of Exposure In Clinical Samples

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Palytoxin and related compounds, herein referred to as PLTX, are an extremely potent group of marine biotoxins produced by select cnidarian zoanthids (colonial anemones) as well as *Ostreopsis* spp. dinoflagellates. PLTXs and other small molecule toxins often perplex the biothreat community as they have unique features that set them apart from the classic viral or bacterial threats. They are non-replicating, small molecule (relative to proteins or whole pathogen) threats that have grave implications on warfighter health if exposed to these targets. The toxic activity of PLTX results from binding to sodium potassium ATPase converting this critical cellular ionic pump into a non-selective pore causing a multitude of downstream negative effects ranging from the cellular to organismal level, depending on dose and route of exposure. Potential routes of exposure to PLTX include dermal, ocular, and respiratory during blooms of PLTX producing *Ostreopsis* and exposure to PLTX producing zoanthids in home and commercial aquaria. Although less common, oral exposure typically results from the consumption of PLTX contaminated seafood. We report a case of companion animal mortality from oral exposure to PLTX during the maintenance of a home aquaria containing toxic zoanthids with the first report of PLTX detection in clinical samples. Exposed animals (dogs, n=2) reportedly licked rocks containing attached zoanthids that had been previously air-dried outdoors. Animal 1 became ataxic, collapsed, and died almost immediately while animal 2 presented with ataxia and died within 12 hours of exposure. Necroscopic examination of animal 2 revealed acute, multifocal hemorrhage of the thymus, pancreas, mucosa of the urinary bladder and pericardium of the heart, and acute congestion in the small and large intestines, submandibular lymph nodes, lung, kidney, liver, and spleen with death likely due to severe internal hemorrhage. PLTX was confirmed by HPLC-UV and HRMS analysis in dried zoanthid samples removed from the rock associated with the exposures (300-600 µg PLTX/g dry weight zoanthid). Analysis of stomach content and drained blood samples from liver and kidney tissue from animal 2 using a DTRA developed magnetic bead-based sandwich immunoassay detected PLTX at an approximate concentration of 3 ng/mL in kidney samples and 0.3 ng/mL in liver samples. While this case report demonstrates a specific veterinary application of diagnostic tools developed in the JSTO enterprise, the work highlights the flexibility of the capabilities in the DoD to quickly characterize and counter the full spectrum of biological threats.