

Influence of selenium and mercury chemistries on the progression of cardiomyopathy: impacts on oxidative stress and selenoprotein profiles in pygmy sperm whales

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Pygmy sperm whales (*Kogia breviceps*) are the second most frequently stranded toothed whale along the U.S. Atlantic and Gulf coasts. More than half of documented cases exhibit signs of cardiomyopathy (CMP). Many factors may contribute to the development of idiopathic CMP in *K. breviceps*, including genetics, infectious agents, contaminants, biotoxins, and dietary intake (vitamins, selenium, mercury, and pro-oxidants). This study assesses trace elements in *K. breviceps* at various stages of CMP progression using fresh frozen liver and heart samples collected from stranded individuals. The *K. breviceps* diet, consisting mainly of squid, imparts a high dose of mercury (Hg), which requires detoxification, and polyunsaturated fatty acids (PUFAs) that require effective antioxidant biochemistry to regulate free radical formation. Standard addition calibration and collision cell ICP-MS were employed for total Se analysis and pyrolysis atomic absorption (AA) was utilized for total Hg analysis to examine if the Se/Hg detoxification pathway inhibits the bioavailability of Se. Double spike speciated isotope dilution GC/ICP-MS was utilized to measure MeHg and iHg. Due to the important role Se can play in antioxidant biochemistry and protein formation, selenoprotein and small molecule Se species profiles were examined by multi-dimension LC/UV/ICP-MS detection, and selenoprotein identification was performed by LC-ESI-MS/MS. Immunoblot detection and colorimetric assays were used to assess overall protein oxidation status. Data collected on trace elements, selenoproteins, and oxidative status were evaluated in the context of animal life history, disease state markers, and other complementary histological information to gain insight into the biochemical pathways contributing to the development of CMP in *K. breviceps*.

Funding for this study is provided by the National Institute of Standards and Technology and through interagency agreements established with the National Oceanographic and Atmospheric Administration (NOAA) National Marine Fisheries Service. This research is being performed in the context of a larger study on Kogia species in partnership with NOAA's Center for Coastal Environmental Health and Biomolecular Research and HBOI Division of Marine Mammal Research and Conservation.