



Contaminant Exposure and Biomarker Response in Embryos of Black-crowned Night-herons (Nycticorax nycticorax) Nesting Near Lake Calumet, Illinois

Lake Calumet in Illinois was a former glacial lake draining into Lake Michigan. After extensive industrialization and modifications to the area, it now drains to the Des Plaines River, which runs to the Mississippi River. Industrialization and eventual abandonment of several sites near Lake Calumet and associated wetlands have left the area with extensive environmental pollution and possible species extinction.

At the time of this study (2003–2007), little was known about contaminant levels in animals living in the Lake Calumet and wetlands area. Researchers from the Prairie Research Institute, including ISTC’s senior chemist, John Scott, partnered with scientists from the U.S. Geological Survey, University of Illinois, Duke University, and Purdue University to conduct an extensive study on black-crowned night-heron (Nycticorax nycticorax) embryos. The team collected only one egg from nests found in the marshes near Lake Calumet to ensure species survival.

Each embryo was tested for biomarkers related to oxidative stress (low oxygen in the egg) and genetic damage from contaminants. The embryos were also tested for metals (cadmium, cobalt, copper, chromium, lead, manganese, mercury, and zinc) and metalloids (arsenic and selenium). In addition, the team tested for organochlorines such as polychlorinated biphenyls (PCBs) and chlorinated insecticides like dichlorodiphenyldichloroethylene (DDE).

Even though the total PCB concentrations were high in the heron embryos, the levels were not high enough to affect normal nesting and reproductive activities. Additionally, the chlorinated insecticide levels in the eggs were not high enough to cause egg shell thinning, which reduces successful hatching rates. All metals and metalloids were not at concentrations that had an effect on embryos and egg hatching, except for selenium. The selenium levels were higher than established lethal rates in the embryos, but no embryos died from selenium contamination, although sub-lethal effects were observed. Oxidative stress biomarkers were normal. No genetic abnormalities were seen, even though known mutagenic compounds such as PCBs and DDE were detected. The researchers believe that because of the black-crowned night-herons’ resiliency, the species would make an excellent bio-indicator for contaminated wetland sites.

Eventually, on March 2, 2010, the Lake Calumet and wetlands area was added to the U.S. Environmental Protection Agency’s list of **superfund sites**, and cleanup efforts were underway, although progress was slow.

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