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Isomers of Dechlorane Plus flame retardant in the eggs of herring gulls (*Larus argentatus*) from the Laurentian Great Lakes of North America: Temporal changes and spatial distribution

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Abstract

Dechlorane Plus (DP) is a chlorinated flame retardant (FR) comprised of two major structural isomers, *syn* and *anti*. For the Laurentian Great Lakes of North America, reports on DP have been limited to sediment and fish, not known for birds, and regardless temporal trends in Great Lakes wildlife is unknown. In the present study, *syn*- and *anti*-DP isomers were detected in egg pools spanning 1982–2006 of a Great Lakes biomonitoring species, the herring gull (*Larus argentatus*), from seven colonies in the five Laurentian Great Lakes. The sum (Σ) of *syn*- and *anti*-DP concentrations were generally $<15 \text{ ng g}^{-1}$ wet weight (ww) and variable depending on the colonial site and

year, although $\hat{\text{L}}\text{-DP}$ concentrations were generally higher post mid-1990s for all sites. *Syn*- and *anti*-DP concentrations ranged from 3.1×10^2 to 1.4×10^3 pg g^{-1} ww and 1.3×10^2 to 4.4×10^3 pg g^{-1} ww, respectively. There was a weak but significant ($r_s = -0.31$, $p < 0.001$) negative relationship between the $\hat{\text{L}}\text{-DP}$ concentration and the distance for the only DP production facility in North America at Niagara Falls, New York. However, the fraction of the *anti*-DP to the $\hat{\text{L}}\text{-DP}$ concentration (f_{anti}) was 0.69 ± 0.08 (for all seven colonies and years, $n = 101$ pools), and there was no significant ($r_s = -0.18$, $p = 0.07$) negative relationship of f_{anti} with increasing distance from the production facility at Niagara Falls, New York, which indicated that there was no temporal or spatial enrichment of either isomer relative to the commercial DP mixture. Over the past 25 years, it is clear that DP isomers have accumulated in the food web of female herring gulls with subsequent transfer during ovogenesis.



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Keywords

Dechlorane Plus; Flame retardants; Herring gulls; Egg pools; Laurentian Great Lakes; Spatial and temporal trends

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