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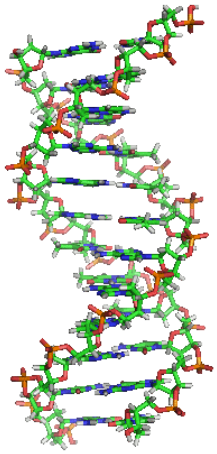
Patuxent Wildlife Research Center

Identifying the Genetic Basis of Avian Susceptibility to Mercury

- ***The Challenge:*** Mercury is a highly toxic element found throughout our environment. Mercury occurs naturally in some environments, but human industrial pollution has greatly increased the amount of mercury and the range of environments in which mercury is found. Although exposure to mercury is known to have toxic effects on birds, until recently, only limited information was available on their relative sensitivity. Recent studies have confirmed clear differences in the sensitivity of various bird species to methylmercury. Because the causes of these differences are unknown, prediction of mercury sensitivity in birds that have not or cannot be studied in the lab is difficult. Therefore, a method is needed that can predict sensitivity to mercury in poorly studied birds and can help identify susceptible populations.



- ***The Science:*** Organisms have a variety of mechanisms that protect against mercury toxicity. Variations in genes related to these processes influence susceptibility. The study of gene expression patterns has become an invaluable tool for analyzing the physiological mechanisms affected by pollutants and is an important pathway for exploring the genetic basis of sensitivity. In order to understand which adaptations allow a species to survive at higher mercury levels, we are conducting a study investigating gene expression in laughing gulls (*Larus atricilla*), which are less sensitive than many other birds to mercury. We identified a variety of differentially expressed genes in laughing gull hatchlings, which are likely to influence this bird's sensitivity to mercury and allow it to survive at higher mercury doses.

- ***The Future:*** We plan to continue this work using bird species that have shown greater sensitivity to mercury to determine whether their gene expression profiles differ from those in laughing gulls. Additionally, we will explore sequence variations in these genes, which may have important implications for the mercury detoxification capability of a species. Understanding the molecular mechanisms involved in a bird's response to mercury provides a foundation upon which variations in susceptibility to mercury may be predicted and assessments of risks to exposed population can be based.

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