Cornell study finds that even low levels of PCBs alter birdsong.

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Song Sparrow, Cornell Lab of Ornithology

Bird Songs Altered by PCB Contamination, Study Finds

Effects linked to particular PCBs—even at low levels

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Ithaca, N.Y.—It may not kill them outright, but low-level PCB contamination is disrupting the way some birds sing their songs. So conclude the authors of a seven-year Cornell University study published today in the science journal PLOS ONE. Before the chemicals were banned in the United States in 1979, polychlorinated biphenyls, or PCBs, were widely used in the manufacture of electrical devices because they can withstand extremely high temperatures.

Click the image above to learn more about Sara DeLeon's research.

"PCBs are changing behavior in subtle but important ways that we're only beginning to recognize," says lead author Sara DeLeon, who did the research for her doctorate. "The Black-capped Chickadees and Song Sparrows we studied ingest PCBs when they eat contaminated insects. The chemicals appear to mimic hormones and interfere with development in the part of the bird's brain that governs song and song structure."

Key among the findings is that song disruption is tied to specific types of PCBs—there are 209 variations, differentiated by the positioning and number of chlorine atoms. DeLeon tested 41 of these variations to isolate their effects.

DeLeon chose five study sites in New York State, including two along the Hudson River that were heavily polluted by PCBs dumped illegally from 1947 to 1977. The other sites were not known to have PCB contamination and tests at an Adirondack Mountains site eliminated mercury as a factor in song changes. At each site she collected and tested blood samples from males of the two bird species, recorded their songs over several field seasons, and analyzed those songs using the RavenPro sound analysis software developed at the Cornell Lab of Ornithology.

“The songs of Black-capped Chickadees and Song Sparrows are very well studied,” DeLeon says. “For example, we know that it’s normal for there to be very, very little variation in the way all Black-capped Chickadees deliver their *fee-bee* song and the interval between the two notes. We found the greatest variation among birds in areas with higher levels of certain types of PCBs—their songs just were not coming out right. Since dominant males produce the most consistent songs, this variation could have important biological consequences.”

Different types of PCB contaminants produce different effects. In analyzing the Song Sparrow’s trademark trill, DeLeon found that, at the most polluted sites, birds were singing “better” trills, with more high-quality strings of notes compared to the songs of sparrows in non-contaminated sites. However, an artificially induced improvement in performance may not accurately reflect the bird’s actual physical condition.

Black-capped Chickadee by Shirley Gallant

“Effects of PCBs are extremely complicated,” says co-author André Dhondt, director of Bird Population Studies at the Cornell Lab of Ornithology. “What this demonstrates is that most previous PCB studies may not give us the whole picture because they did not look at the specific type of PCB involved but just measured overall levels.”

It took about three years just to complete the chemical analyses. Study co-author Rayko Halitschke in Cornell’s Department of Ecology and Evolutionary Biology modified processes so that the birds would not have to be killed to detect the types of PCBs present, but could be sampled with just a small drop of blood.

The next logical step, Dhondt notes, would be to use this non-lethal method to study low-level PCB effects elsewhere to learn how the pollutants are being spread through ecosystems and the effects they could be having.

“What Sara did was not easy,” Dhondt adds. “She found effects on the song and wanted to do more than just document that there was an effect, but to isolate what was causing it.”

DeLeon received her Ph.D. from Cornell in 2012 and currently holds a Postdoctoral Researcher position at Drexel University in Philadelphia. Study co-authors include Rayko Halitschke, Ralph

S. Hames, André Kessler, Timothy DeVoogd, and André A. Dhondt, all from Cornell University.

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