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## Enhancing the Effectiveness of Nonlethal Avian (Blackbird/Starling) Repellents and Mammalian (Skunk/Raccoon) Attractants

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### National Wildlife Research Center Scientists Assess Nonlethal Avian Repellents and Mammalian Attractants

Wildlife Services' (WS) National Wildlife Research Center (NWRC) is the only Federal research facility devoted exclusively to resolving conflicts between people and wildlife through the development of effective, selective, and acceptable methods, tools, and techniques.

Despite considerable demand for nonlethal methods of wildlife damage management, few effective chemical repellents and selective attractants exist for most applications. Fundamental physiological data concerning smell, taste, and chemically-sensitive facial nerve responses to chemical stimuli in wildlife are largely nonexistent, and the application of existing behavioral data to enhance wildlife control technologies is lacking. NWRC scientists are investigating factors that regulate learning and memory in wildlife in order to improve the effectiveness of avian repellents and to develop chemical attractants specific to skunks and raccoons.

### Applying Science and Expertise to Wildlife Challenges

**Testing Natural Products to Repel Starlings**—In a collaborative effort between State University of New York-Albany and NWRC Philadelphia Field Station, tests were conducted on a new product comprised of woodchips infused with garlic oil to repel European



starlings (*Sturnus vulgaris*) from food. Laboratory studies showed the product repelled starlings from food in one-choice tests. Additional studies with different species of birds and in field settings will be undertaken during the upcoming spring and summer.

Other research examines the suitability of new materials, particularly secondary plant compounds, for use as avian repellents. In addition, new ways of delivering these compounds are being explored. Methods that deliver the repellent directly into the gastrointestinal tract allow the repellent to function secondarily thus causing malaise in the targeted species. Secondary repellents have been shown to be more effective than primary repellents, which cause irritation.



**Major Research Accomplishments:**

- NWRC scientists at Monell found that physiological changes in hormone levels can be monitored in the European starling using fecal sampling. This method will be used to help determine the efficacy of control methods in starlings and blackbirds.

**Repellents May Become Ineffective with Overuse**—A collaborative study between the NWRC Philadelphia field station and Monell Chemical Senses Laboratory produced data showing how repellents might become ineffective as a result of overuse. The results suggest that as more habitat patches are treated with a repellent, the efficacy of the repellent disappears. This has potentially important practical implications for the use of repellents in the field. Further research will test the effect of abundance on consumption of foods treated with secondary repellents.



**Groups Affected By These Problems:**

- Agricultural producers
- Airport operators
- Aquaculture producers
- Wildlife management specialists

**Major Cooperators:**

- Monell Chemical Senses Center
- State University of New York—Albany

**Starlings Can Detect Conspecific Odors**—Earlier studies conducted by NWRC scientists revealed that the chemosensory systems (taste and smell) of birds are as sensitive as those of many mammals, such as rats and mice. More recently, research has found that starlings can detect conspecific odors (i.e., odors belonging to other individuals of the same species). The area of avian chemical communication research is new and the significance of such research results has yet to be exploited. These results highlight the importance of an untapped sensory modality in birds that might be targeted in future repellents or attractants. The next phase of the project will determine if birds detect predator odors such as cat urine, and if so, whether these odors are aversive to birds.



**Selected Publications:**

- Hile, A. G. 2004. Avoidance of plant secondary compounds by European starlings: citronellyls . *Crop Protection* 23 (10): 973-978.
- Hile, A.G. 2003. Fear and loathing: the modulatory effect of stress on memory formation and its wildlife management implications. *Proceedings of the Bird Strike Committee USA/Canada 2003 Conference.*
- Hile, A.G., Z. Shan, S. Z. Zhang, E. Block. 2004. Aversion of European starlings (*Sturnus vulgaris*) to garlic oil treated granules: garlic oil as an avian repellent. Garlic oil analysis by nuclear magnetic resonance spectroscopy. *Journal of Agricultural and Food Chemistry* 52: 2192-2196.