

Wildlife Services

Protecting People
Protecting Agriculture
Protecting Wildlife

National Wildlife Research Center

FY 2008

Development of Reproductive Control Methods for Overabundant Mammals and Birds



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Major Cooperators

- Pennsylvania State University
- University of Florida
- University of Pittsburg
- Colorado State University
- Innolytics, LLC
- Iowa State University
- Florida Department of Agriculture and Consumer Services
- Florida Power and Light Company
- U.S. Air Force, Avon Park Florida.
- Wildlife Services Operations personnel

Groups Affected by These Problems:

- Urban and suburban residents
- Airports, airlines, airline passengers
- Motorists, pedestrians
- Farmers
- Ranchers/Livestock producers
- Natural resource managers
- Landscapers
- Pet Owners
- Electric utility companies

National Wildlife Research Center Scientists Study Wildlife Contraception

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

Research on the reproductive management of various avian and mammalian species that cause damage or threaten public health and safety is a high priority for WS. The severity of human-wildlife conflicts often is directly related to wildlife population density: many problems are exacerbated as wildlife populations become larger. In many urban and suburban settings, for example, overabundant deer create safety hazards for motorists, consume ornamental shrubs, harbor and transmit diseases and parasites (e.g., Lyme-disease-bearing ticks), and degrade habitat quality in public parks and other locations. Rodents also carry a variety of diseases (e.g., plague, hantavirus), and they damage rangelands and crops, causing the loss of millions of dollars in agricultural production. More than four million feral hogs now occur in at least 28 states, where they cause serious ecological damage as well as serving as a reservoir for pseudorabies and brucellosis. Overabundant feral horses in several western states continue to create ecological and political problems.

The goal of NWRC's wildlife contraceptive research is to develop and field test economical and effective agents to suppress reproductive fertility in local populations of selected species that are causing conflicts. Wildlife contraceptives can be used in conjunction with other tools in an integrated program to manage local, overabundant wildlife species.

Applying Science & Expertise to Wildlife Challenges

Immunocontraceptive Vaccine—NWRC researchers have successfully tested a single-injection, GnRH (gonadotropin-releasing hormone), immunocontraceptive vaccine (called GonaCon™) on free-ranging California ground squirrels, black-tailed prairie dogs, captive Norway rats, feral cats and dogs, domestic and feral swine, wild horses, elk and white-tailed deer. Temporary infertility was achieved in all species tested. Field studies testing the GonaCon™ contraceptive in white-tailed deer have been conducted in Maryland and New Jersey to determine the safety and efficacy of the product, as required by and for registration with the U.S. Environmental Protection Agency (EPA). NWRC is working closely with the Association of Fish and Wildlife Agencies to provide information on the benefits and limitations of GonaCon™ to natural resource managers, sportsmen, and other interested groups.

Development of the single-injection form of the GonaCon™ vaccine was made possible by the creation at NWRC of a new adjuvant called AdjuVac™. An adjuvant is an immunological agent that is added to a vaccine to improve the immune response. The GonaCon™ vaccine, which incorporates the AdjuVac™ adjuvant, could prove useful as an additional method as part of an integrated management plan for overabundant wildlife species.

Oral Contraceptives—Over the past eight years, scientists from the NWRC and their partner Innolytics, LLC developed new oral contraceptive baits to help reduce overabundant populations of resident Canada geese and feral pigeons. The products, called OvoControl®-G and -P, respectively, reduce the hatchability of eggs. Final regulatory approval and registration of the baits were granted in 2005 for Canada geese (registration # 80224-5) and 2007 for pigeons (registration # 80224-1) by the EPA. OvoControl® contains the veterinary drug nicarbazine, which is traditionally given to broiler chickens to prevent coccidiosis, one of the more common and costly diseases in poultry. A side effect of nicarbazine is decreased egg production and hatching rates. Nicarbazine affects the viability of eggs by causing disruption of the yolk membrane and creating



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Animal and Plant Health Inspection Service

conditions under which the embryo cannot develop. When fed to Canada geese, ducks, and pigeons during their breeding season, OvoControl® effectively reduces the hatching success of eggs. When it is withdrawn from the diet, egg production and hatchability return to normal within a few days. OvoControl® is not harmful to geese, pigeons, other birds or people.

NWRC scientists continue to test the stability and viability of several other oral vaccines in a variety of formulations to improve their delivery to other free-ranging animals, such as feral swine.

Other Contraceptives—NWRC scientists currently are evaluating other contraceptive agents, including diazacon, in birds and mammals. Diazacon (20,25 diazacholesterol) is a cholesterol mimic that inhibits cholesterol production and blocks steroid hormone formation.

Diazacon has been tested on invasive monk parakeets. In collaboration with a south Florida utility company, NWRC biologists established bait stations at several electrical substations where monk parakeets were nesting. Nest examinations revealed that average productivity at treated sites was 0.65 nestlings per nest, compared to 3.07 nestlings per nest at untreated sites. These numbers indicate a 79% reduction. In 2008, NWRC scientists conducted a small study to test whether diazacon is effective in black-tailed prairie dogs. Though the study was delayed and treatment occurred later in the breeding season, scientists still observed positive results with the average number of young at treated sites being reduced by about 59%.

These results suggest that diazacon has potential for use as a fertility control agent in animals with a single breeding season.

Selected Publications:

Curtis, P.D., M.E. Richmond, L.A. Miller, F.W. Quimby. 2008. Pathophysiology of white-tailed deer vaccinated with gonadotropin-releasing hormone immunocontraceptive. *Human-Wildlife Conflicts* 2(1):68-79.

Fagerstone K.A., L.A. Miller, J.D. Eisemann, J.R. O'Hare, and J.P. Gionfriddo. 2008. Registration of wildlife contraceptives in the United States of America with OvoControl and GonaCon immunocontraceptive vaccines as examples. *Wildlife Research* 35:586-592.

Killian, G.J., D. THAIN, N.K. DIEHL, J.C. RHYAN, AND L.A. MILLER. 2008. Four-year contraception rates of mares treated with single-injection porcine zona pellucida and GnRH vaccines and intrauterine devices. *Wildlife Research* 35:531-539.

Massei, G., D.P. Cowan, J. Coats, F. Gladwell, J.E. Lane and L.A. Miller. 2008. Effect of the GnRH vaccine GonaCon on the fertility, physiology and behavior of wild boar. *Wildlife Research* 35:540-547.

Miller, L.A., K.A. Fagerstone, J. Gionfriddo, J. Rhyan, and G. Killian. 2008. The single-shot GnRH immunocontraceptive vaccine (GonaCon™) in white-tailed deer: comparison of several GnRH preparations. *American Journal of Reproductive Immunology* 60:214-223.

Miller, L.A. J.P. Gionfriddo, J.C. Rhyan, K.A. Fagerstone, D.C. Wagner and G.J. Killian. 2008. GnRH immunocontraception of male and female white-tailed deer fawns. *Human Wildlife Conflicts* 2(1):93-101.

Bynum, K.S., J.D. Eisemann, G.C. Weaver, C.A. Yoder, K.A. Fagerstone, and L.A. Miller. 2007. Nicarbazine OvaControl G bait reduces hatchability of eggs laid by resident Canada geese in Oregon. *Journal of Wildlife Management* 71(1):135-143.

Nash, P., C.A. Furcolow, K.S. Bynum, C.A. Yoder, L.A. Miller and J.J. Johnston. 2007. 20-25-Diazacholesterol as an oral contraceptive for black-tailed prairie dog population management. *Human-Wildlife Conflicts* 1(1):53-59.

Killian, G., K. Fagerstone, T. Kreeger, L. Miller, J. Rhyan. 2007. Management Strategies for Addressing Wildlife Disease Transmission: The Case for Fertility Control. Proceedings 12th of the Wildlife Damage Management Conference April 12, Corpus Cristi, TX.

Major Assistance Activities:

- WS and partners obtained EPA registration in 2005 and 2007 for the use of nicarbazine as an avian contraceptive for Canada geese and feral pigeons, respectively.
- WS submitted a GnRH immunocontraceptive (GonaCon™) registration package to the EPA in early 2009.
- WS is conducting studies to support the registration of DiazaCon as an avian contraceptive for invasive monk parakeets.
- WS is investigating the use of GonaCon™ in conjunction with the rabies vaccine on feral or stray dogs. The immunocontraceptive could reduce feral and stray dog populations, thus, decreasing the potential spread of the disease.