



### Contact Information:

Dr. Doug Eckery,  
Research Wildlife Physiologist  
NWRC Headquarters  
4101 LaPorte Avenue  
Fort Collins, CO 80521

Phone: (970) 266-6164  
FAX: (970) 266-6157  
Email:  
douglas.c.eckery@aphis.usda.gov  
Website: www.aphis.usda.gov/  
wildlifedamage/nwrc/

### Groups Affected by These Problems:

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

### Major Cooperators:

- Australia's Invasive Animal Cooperative Research Centre
- Clemson University
- Colorado State University
- Florida Department of Agriculture and Consumer Services
- National Park Service
- Navajo Nation, AZ
- SpayFirst!
- Thomas Jefferson University
- United Kingdom's Animal and Plant Health Agency
- University of Pittsburg

### 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 socially responsible methods, tools, and techniques.

Research on the reproductive management of various bird and mammal species, which cause damage or threaten public health and safety, is a high priority for WS. The severity of human-wildlife conflicts often relates directly 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 carry a variety of diseases (e.g., plague, hantavirus) and damage rangelands and crops, resulting in the loss of millions of dollars in agricultural production. Overabundant feral horses in several western states degrade the quality of the habitat and create ecological problems. Stray dogs in many countries pose a potential public health risk, primarily due to bite injuries and the spread of rabies.

The goal of NWRC's wildlife contraceptive research is to develop injectable and oral contraceptives to manage overabundant wildlife populations and reduce the spread of zoonotic diseases. In 2009, APHIS successfully registered the first immunocontraceptive vaccine for wildlife with the U.S. Environmental Protection Agency (EPA). The single-shot, multi-year vaccine called GonaCon Immunocontraceptive Vaccine (GonaCon) was developed by NWRC scientists and initially registered for use in female white-tailed deer, especially in urban and suburban areas where traditional lethal options are limited. In 2013, GonaCon-Equine was also registered for use in feral horses and burros. GonaCon is a vaccine that targets a key reproductive hormone found in all mammals called gonadotropin-releasing hormone (GnRH). Research has shown GonaCon to be an effective reproductive inhibitor in many other mammal species including elk, bison, prairie dogs, ground squirrels, cats, and kangaroos.

Future NWRC research with GonaCon will involve studies to determine how best to use the vaccine as a wildlife management tool to reduce animal populations and prevent the transmission of disease. Efforts will also be made to expand registration to other species, such as free-roaming dogs. Greater research emphasis will also be placed on developing direct acting reagents, chemosterilants, and vaccines that can be delivered orally and are better able to induce permanent sterility in the intended species. The greatest benefits from the incorporation of wildlife contraceptives are realized when they are used in conjunction with other tools in an integrated program to manage local, overabundant wildlife species.

### Applying Science and Expertise to Wildlife Challenges

**Use of GonaCon-Equine in Wild Horses.** — Overabundant and unregulated free-ranging horses can negatively affect native plant communities and ecosystem processes, and may lead to competition with native ungulates. In response, many land management agencies have reduced free-ranging horse populations through periodic roundups and adoption or sale of excess animals. These methods are time- and resource-intensive, and can result in injuries to animals and humans. Consequently, more efficient, effective, and humane approaches are desired. One alternative is controlling the fertility of female horses through contraception.

NWRC scientists are currently involved in ongoing research at Theodore Roosevelt National Park, North Dakota, to evaluate the long-term effects of GonaCon-Equine on fertility, behavior, and safety in free-ranging female horses. Results from the first phase of this research have shown that a single injection of GonaCon-Equine poses little risk to the treated mare and her offspring and does not affect herd behavior and dynamics. Fertility in the treated mares was significantly suppressed for the first two years, but returned to control levels thereafter. While a single vaccination is often preferred from a management perspective, GonaCon-Equine may prove more effective if repeated on a periodic basis. Continuing research will attempt to define the vaccination schedule needed to maintain infertility in feral mares and whether long-term or permanent sterility is a possible outcome.

**Preventing and Treating Adrenocortical Disease in Domestic Ferrets.** — Ferrets are the third most popular domestic mammalian pet in the United States. Adrenocortical disease (ACD) is a common problem in surgically sterilized, middle-aged to old ferrets. Affected animals develop abnormal adrenal tissue, including formation of malignant tumors. Symptoms include hair loss, swollen vulva in female ferrets, muscle atrophy, limb weakness, cysts, and increased aggression. ACD is thought to be linked to continuous and increased luteinizing hormone secretion, which is stimulated by GnRH. NWRC researchers and partners investigated whether GonaCon could prevent or delay the onset of ACD and treat the symptoms in pet ferrets with existing ACD. Results showed that GonaCon provided relief from ACD, causing many symptoms to disappear. The study also found that the probability of developing ACD was significantly reduced in young ferrets (i.e., 1-3 years old) treated with GonaCon compared to untreated animals. This is an example of an incidental or "spin-off" use of a NWRC product originally developed for wildlife management.

**One Hit, Permanent Sterility.** — Successful reproduction in female mammals depends on an adequate supply of healthy eggs within the ovaries. The ovaries contain a finite supply of eggs. If those eggs are destroyed, the animal would become permanently sterile. Ongoing NWRC research is investigating compounds to deplete ovarian eggs, and thus cause permanent sterility in mammals, such as free-roaming dogs and feral swine. The ultimate goal is to develop a compound that causes permanent sterility from a single exposure.

#### **Selected Publications:**

Massei, G. and L.A. Miller. 2013. Nonsurgical fertility control for managing free-roaming dog populations: A review of products and criteria for field applications. *Theriogenology* 80(8):829-838. doi: 10.1016 / j.theriogenology.2013.07.016.

Miller, L.A., K.A. Fagerstone, and D.C. Eckery. 2013. Twenty years of immunocontraceptive research: lessons learned. *Journal of Zoo and Wildlife Medicine* 44(4S): S84-S96. doi: 10.1638 / 1042-7260-44.4S.S84.

Miller, L. A., K.A. Fagerstone, R.A. Wagner, and M. Finkler. 2013. Use of a GnRH vaccine, GonaCon–, for prevention and treatment of adrenocortical disease (ACD) in domestic ferrets. *Vaccine* 31(41):4619-4623. doi: 10.1016 / j.vaccine.2013.07.035.

Rhyan, J.C., L.A. Miller, and K.A. Fagerstone. 2013. The use of contraception as a disease management tool in wildlife. *Journal of Wildlife Medicine* 44(4S):S135-S137. doi: 10.1638 / 1042-7260-44.4S.S135.

Vargas-Pino, F., V. Gutierrez-Cedillo, E.J. Canales-Vargas, L.R. Gress-Ortega, L.A. Miller, C.E. Rupprecht, S.C. Bender, P. Garcia--Reyna, J. Ocampo-Lopez, and D. Slate. 2013. Concomitant administration of Gonacon and rabies vaccine in female dogs (*Canis familiaris*) in Mexico. *Vaccine* 31:4442-4447. doi: 10.1016 / j.vaccine.2013.06.061.

#### **Major Research Accomplishments:**

- WS research determined GonaCon, the immunocontraceptive vaccine developed by NWRC to reduce fertility in certain wildlife species, prevents or delays the onset of adrenocortical disease (ACD) in pet ferrets.
- WS collaborative research showed GonaCon successfully reduced fertility in a population of feral goats in Valley of Rocks, Lynton, UK. This led to the first practical application of fertility control for population management of a mammal in Europe.
- WS was granted an Experimental Use Permit from the EPA to conduct contraceptive research on free-roaming dogs on Tribal reservations in the United States.