Innolytics, LLC
The Humane Hatch Control Company

The Efficacy of OvoControl® P (nicarbazin) in Feral Pigeons (Columba livia)

Feral pigeons (aka, rock dove, rock pigeon, domestic pigeon), descendants of homing pigeons, were introduced into the United States by Europeans in the early 1600's. Pigeons are considered invasive and their domesticated traits allow the birds to roost and nest in man-made structures that are similar to their native sea cliffs where they originated.

Although pigeons are prolific, capable of producing up to six clutches, annually, with two eggs per clutch, the birds are relatively short-lived with a life span of just 2-4 years. A typical flock of pigeons has an attrition rate estimated at 30% annually[1] – more under extreme environmental conditions. Therefore, effectively interfering with reproduction has a profound effect on the population of these birds.

Due to their ubiquitous distribution, concentration in urban areas, and zoonotic disease carrying capacity[2], pigeons are considered a *"public health pest"* by the US Environmental Protection Agency (EPA), in the same category as commensal rodents or insects such as cockroaches. As such, providing adequate data to assure efficacy is an EPA registrations requirement.

Unlike a true pesticide, OvoControl has no cidal activity. Instead, the product interferes with egg development and hatchability and, therefore, acts as a contraceptive. Measuring the efficacy of OvoControl actually requires two distinct data sets,

1. Measuring the interference with egg hatchability, and,
2. Measuring the rate of decline or attrition of the pigeon population.

Egg Hatchability Effects in Birds

Nicarbazin was developed by Merck in the mid-1950's as an anticoccidial drug for use in poultry. Mixed into the feed, the drug prevents coccidiosis, an often fatal enteric disease in young chickens. Interference with egg hatchability was an unwanted side effect that would occur when medicated feed was inadvertently fed to breeder chickens. Originally described by Ott, et al.[3] in 1956, the phenomenon has been well documented in the literature. Jones, et al.[4] described the egg hatchability effects in more detail in 1990, noting nearly complete hatchability inhibition with relatively low concentrations of the active ingredient.

Further evidence of the effects of nicarbazin on egg hatchability in avian species other than domestic chickens was provided by the USDA National Wildlife Research Center ("NWRC") in the early part of the past decade. Yoder[5], et al. published extensively on the topic in quail, geese, ducks and chickens.

V. Reinoso, at the Pennsylvania State University, conducted the first dose titration study to determine the quantitative effects of nicarbazin on egg hatchability in Pekin ducks[6]. Reinoso reported that egg

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[1] Johnston, R. F. and M. Janiga. **Feral Pigeons** (1995). Oxford University Press, New York, NY.
[2] Bonnefory, X., Kampen, H. and K. Sweeney (2008). **Public Health Significance of Urban Pests.** World Health Organization. Chapter 8, pp 239-287. ISBN 978-92-890-7188-8
[3] Ott, W.H., et. al. **Biological Studies on Nicarbazin a New Anticoccidial Agent**, Poultry Science, 1956, 35, 1355-1367
[4] Jones, J. E., J. Solis, B .L. Hughes, and D. J. Castaldo. 1990a. **Reproduction Responses of Broiler-Breeders to Anticoccidial Agents**. Poultry Science. 69:27-36
[5] Yoder, C. A., L. A. Miller, and K. S. Bynum. **Comparison of Nicarbazin Absorption in Chickens, Mallards and Canada Geese.** 2005 Poultry Science 84:1491-1494.

hatchability falls to near zero across a range of dosages without any evidence of toxicity. The data also provided unequivocal evidence for the complete reversibility of the effect. Furthermore, these experiments provided the basis for elucidating the mode of action of nicarbazin[7]. Previously described as an interference with the development of the vitelline membrane, Reinoso concluded that the mode of action was related to inhibition of the ZP3 sperm receptor sites.

Finally, Avery, et.al, documented the effects of OvoControl on feral pigeons[8] at the USDA Experiment Station in Gainesville, FL providing adequate efficacy data to warrant EPA registration of the new product.

The data is unequivocal across a range of avian species that, a) nicarbazin is extremely effective in interfering with egg hatchability when the appropriate dose is administered daily, and b) the effects are fully reversible.

OvoControl P Efficacy in Reducing Pigeon Populations

A large-scale field study to evaluate the effects of OvoControl in a large and mobile urban population of pigeons has inherent limitations. A wide range of variables prevents the same level of quantitation as a closed pen or caged study. Murton[9], et al., reported the principles of pigeon population dynamics in 1972. As flocking birds, pigeons are fundamentally sedentary and do not move far from their nesting or roosting area. Nevertheless, large scale studies evaluating the use of nicarbazin to control and reduce feral pigeon populations have been documented both in the US and Italy.

Originally registered in Italy to control pigeons, a formulation of nicarbazin called Ovistop (Acme Drugs, Spl.) has been used successfully and extensively in the market since 2002. Freedom Co., Spl[10], Ranchio di Sarsina, documented the population effects of nicarbazin in Rimini, Italy from 2005 to 2007.

A total of 10 strategically located baiting sites within the historic area of Rimini were selected based on a given set of criteria. The control program started in March and ended in mid-November, each year, in 2005 and 2006. The two-year study – actually just 14 months of treatment – reported a 48% decline in the pigeon population from the original census.

In October 2007, in collaboration with the Linda Vista Maintenance Improvement District, City of San Diego and Lloyd Pest Control, Innolytics sponsored a multi-year population dynamics study. The treatment and control sites illustrate very typical urban pigeon conditions with more than adequate food, water and harborage.

Beginning with approximately 150 birds at both the treated and control sites, the population at the treated site was reduced by 53% in the first year of OvoControl application[11]. After 28 months of treatment the population declined by a total of 88%. Unlike other short-term mitigation programs, the effects of OvoControl are sustainable and new pigeon populations do not move in to replace the ones eliminated through attrition.

Collection of data from field studies continues at a variety of locations and study data will to be reported as it becomes available.

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[6] Reinoso, V. 2008. **Contraceptive Action of Nicarbazin in White Pekin Ducks** (Master's thesis). Retrieved from http://etda.libraries.psu.edu/theses/approved/WorldWideIndex/ETD-3193/index.html

[7] Reinoso, V. P., R. Katani, and G. F. Barbato. 2007. **Nicarbazin reduces egg production and fertility in White Pekin ducks via reducing ZP3 in the perivitelline membrane**. Poultry Sci. 86 (Suppl. 1): 536.

[8] Avery, M., K. Keacher, and E. Tillman. **Nicarbazin bait reduces reproduction by pigeons (Columba livia)**. 2008. Wildlife Research 35(1) 80-85.

[9] Murton, R., Coombs, C., and Thearle, R. **Ecological studies of the feral pigeon Columba livia var. II. Flock behavior and social organization.** 1972a. Journal of Applied Ecology, 9, 875-889.

[10] Freedom Co., Ranchio di Sarsina, Italy. **Control Campaign for the Population of Urban Pigeons by the City of Rimini, Italy – 2005 to 2007.**

[11] MacDonald, A and Wolf, E. **OvoControl P 0.5% (nicarbazin) Population Dynamics in Pigeons.** Poster presented as part of the 6th International IPM Symposium, Portland, OR. March 24-26, 2009.