

Delivery of GonaCon™ -Equine to Feral Horses (*Equus caballus*) Using Prototype Syringe Darts

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Remote delivery of injectable fertility control products is a crucial component for both feasibility and acceptability of contraceptive management practices. While there has been much work in remote delivery of the traditional porcine zona pellucida vaccine, there has been relatively little research with respect to the GnRH based GonaCon vaccine. Due to its high viscosity, it is difficult to find a dart and pressure combination that allows this vaccine to be delivered without loss of product or dart failure. In 2013 a beta design of a slow injection (Slo-inject™) remote delivery device (RDD), equipped with 3.81 cm 14 gage Tri-Port needles and a gel collar positioned 1.27 cm forward of the ferrule, was created and donated by Pneu-Dart Inc. The design promoted a reduced rate of injection while maintaining optimum performance to insure delivery of dart contents. Closed to the public, we tested the performance of this device to deliver GonaCon™-Equine to penned and free-ranging horses at Theodore Roosevelt National Park, North Dakota.

Shots were taken from distances ranging from 10-21 meters. Darts were fired from JM-Special (DanInject) and X-caliber (Pneu-dart) projectors using pressures of 3.0-4.5 bars and 3.5-4.0 bars respectively. Darts hit their intended target at 37-47 m/s which minimized bounce yet allowed for dart discharge. A total of 88 darts were loaded and fired; 74 were recovered and weighed and determined to have delivered a full dose, 6 were lost or otherwise un-weighed but were observed to stick in the animal, there was 1 miss, 2 darts bounced out, and 5 were determined to have delivered an insufficient payload of vaccine. Overall, we observed an 84.1% success rate for delivery of payload among darts fired and 100% overall success in eventual dosing (i.e., with follow-up shots) of all study animals with remote delivery systems.

We found that the contraceptive efficacy in mares that received dart delivered GonaCon™-Equine was comparable to that observed for hand-injected mares in the same population. In the first foaling season when a contraceptive effect was expected, 45.5% of treated mares (5 of 11 individuals) had foals, whereas 84% of control mares (21 of 25 individuals) had foals in 2015.