

The Wildlife-Contraception Journey of PZP-22

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PZP-based wildlife contraception began in 1985 when the research team of Jay Kirkpatrick and John Turner joined with Irwin Liu's laboratory at UC Davis. Several years later Allen Rutberg entered the group. The early studies of PZP vaccine contraception in equids utilized both captive and free-roaming wild horses (the latter on Assateague Island National Seashore). Field treatments of mares employed two separate dart-delivered injections of a PZP/Freund's Adjuvant emulsion given one month apart between January and March and yielded 5-10% fertility (vs. 50-65% in untreated mares). An annual booster maintained low fertility (5-12%), and fertility returned to normal the next year. As PZP studies moved to larger and less accessible Western wild horse populations in the early 1990's, it became clear that a single-injection, multi-year vaccine would be needed for population management. For this purpose we explored controlled-release polymers, leading to lab and field studies of polymer-matrixed PZP/adjuvant preparations deliverable alongside the standard primer emulsion by dart or hand/jabstick injection. Delivery of the solid controlled-release component was a key challenge. After experimenting with several forms, we settled on small pellets (0.5mm x 1.6 mm) which fit inside the barrel of the 14-gauge delivery needle to delay booster release to 1 and 3 months. This one-injection vaccine yielded one year of infertility (10-20%) in tests in several herds during the 1990's. Further controlled-release efforts yielded a pellet with 10-12 month release delay. Laboratory and field testing of a single-injection 3-pellet controlled-release PZP vaccine from 1998-2005 yielded contraceptive-level antibody titers across 22 months in ten captive mares and field fertility rates of 10.1% across 2 years in 100 treated mares. The vaccine was subsequently labelled "PZP-22." A population-level field project with PZP-22 and laboratory studies to extend PZP-22 to a 3-year vaccine were initiated in 2008, and a captive-mare study of a presumptive 3-year PZP vaccine was begun in 2011. These field and captive studies and PZP-22 field studies conducted by USGS raised both positive and negative issues for PZP-22 which in balance were sufficiently encouraging to continue forward. Most importantly these studies led to additional exploration of both controlled-release technology and novel adjuvants. The population-level project also provided strong databases demonstrating the importance of PZP re-treatment as a critical component of long-term wild horse management. Continued success with PZP-22 as a 2-year contraceptive in deer provides an additional perspective.