BOTSTIBER INSTITUTE
FOR WILDLIFE FERTILITY CONTROL

FACT SHEET

PZP-22

Regulatory Status:
Not yet registered with EPA

Producers:
University of Toledo, Toledo, Ohio
The Science and Conservation Center, Billings, Montana

General Description

Like ZonaStat-H, the native PZP (Porcine Zona Pellucida) vaccine, PZP-22 works by causing the target female to produce antibodies that attach to the envelope surrounding the ovulated egg, block sperm attachment, and prevent fertilization. PZP-22 adds to the ZonaStat-H vaccine three small timed-release pellets containing PZP and a federally-approved adjuvant that stimulates the immune system. The pellets are designed to release PZP and adjuvant at 1, 3, and 12 months, mimicking a series of PZP booster shots.[i,ii] PZP-22 can be delivered by hand-injection or jabstick, or remotely by a specially designed dart.[i,iii] For hand-injection, the pellets can be pre-inserted into needles for easier handling and delivery in the field.

History

Native PZP was shown in the 1990's to be an effective contraceptive and a useful management tool on island populations of wild horses and white-tailed deer.[iv,v,vi] However, researchers and managers alike recognized that a single-shot, multi-year version of PZP would expand its usefulness for managing populations of free-ranging wildlife.

Pursuit of timed-release preparations to simulate PZP boosters began in 1992.[vii] After some false starts, researchers settled on packaging PZP and adjuvant into polymer pellets that produced both the desired timed-release effects and offered easier handling and delivery. The PZP-emulsion/pellets combination was named PZP-22 by the Bureau of Land Management (BLM) because research on captive mares showed that antibody titers remained at contraceptive levels for approximately 22 months after treatment.[ii] Field trials of PZP-22 on wild horses at Clan Alpine Herd Management Area (HMA), Nevada, and on white-tailed deer at Fripp Island, South Carolina, proved highly encouraging.[vii,ix]

Efficacy

The initial field trial of PZP-22 in wild horses at Clan Alpine HMA showed fertility reductions of 90% in Year One and 75% in Year Two, and a full return to fertility in Year Four.[viii] PZP-22 efficacy, very similar to that seen in wild horses at Clan Alpine, has been reported in two field trials in white-tailed deer, at Fripp Island and at Hastings-on-Hudson, New York.[ix,x]

Follow-up field trials at Cedar Mountain, Utah, and elsewhere yielded more variable fertility reduction, highlighting the importance of appropriate timing of delivery and of vaccine release from the polymer pellets.[iii,xi] New batches of pellets that restore the originally-designed release patterns await testing. In both wild horses and deer, administering a single PZP booster 2-3 years after initial treatment reduces fertility by 66-90% for three or more additional years.[iii,x] Boosters of native PZP and PZP-22 yield similar results, so that a PZP-22 primer followed by a native PZP booster 2-3 years later offers at least 5-6 years of effective contraception over a 7-year period.

Prospects for Management Use

Because it is reversible, PZP-22 protects the demographic and genetic health of treated populations. As with any fertility control agent, PZP-22 will work best as a management tool when a high proportion of females is treated. Generally, a multi-year effort will be needed to reach and maintain the levels of contraception needed.

In the second round of gathers among the Cedar Mountain wild horses, 70% of mares in the herd were treated with initial PZP-22 treatments or

boosters of native PZP or PZP-22. The next year, population foaling rates declined to 34% of control levels, and annual population growth dropped by 74%.[xii] Weaker population effects have been observed at Cedar Mountain and elsewhere when a smaller proportion of mares was treated. On Fripp Island, a 40% reduction of white-tailed deer densities was observed over a five-year period following hand-injection of about 90% of females present with PZP-22 and other single treatment PZP preparations.[xiii] Population data emerging from Hastings-on-Hudson suggest that reduction of white-tailed deer populations using PZP-22 will not be limited to island environments. [x]

References

[i] Turner, J. W., Jr., I. K. M. Liu, D. R. Flanagan, K. S. Bynum, and A. T. Rutberg. 2002. PZP immunocontraception of wild horses in Nevada: a 10- year study. *Reproduction* Suppl. 60:177-186.

[ii] Turner, J.W. Jr., A.T. Rutberg, R.E. Naugle, M.A. Kaur, D.R. Flanagan, H.J. Bertschinger, and I.K.M. Liu. 2008. Controlled-release components of PZP contraceptive vaccine extend duration of infertility. *Wildlife Research* 35:555-562.

[iii] Rutberg et al. 2017 Rutberg, A., K. Grams, J.W. Turner, Jr., and H. Hopkins. 2017. Contraceptive efficacy of priming and booster doses of controlled-release PZP in wild horses. *Wildlife Research* 44:174-181. https://doi.org/10.1071/WR16123

[iv] Kirkpatrick, J.F., Liu, I.K.M., and Turner, J.W., Jr. (1990). Remotely-delivered immunocontraception in feral horses. *Wildlife Society Bulletin* **18**, 326-330.

[v]Turner, A., and J. F. Kirkpatrick 2002. Effects of immunocontraception on population, longevity and body condition in wild mares (*Equus caballus*). *Reproduction* Supplment 60:187-195

[vi] Naugle, R. E., A. T. Rutberg, H. B. Underwood, J. W. Turner, Jr., and I. K. M. Liu. 2002. Field testing of immunocontraception on white-tailed deer (*Odocoileus virginianus*) at Fire Island National Seashore, New York, USA. *Reproduction* Suppl. 60:143-153.

[vii] Turner, J. W., Jr., I. K. M. Liu, D. R. Flanagan, A. T. Rutberg, and J. F. Kirkpatrick. 2001. Immunocontraception in feral horses: one inoculation provides one year of infertility. J*ournal of Wildlife Management* 65:235-241.

[viii] Turner, J.W., Jr., I.K.M. Liu, D.R. Flanagan, A.T. Rutberg, and J.F. Kirkpatrick. 2007. Immunocontraception in wild horses: one inoculation provides two years of infertility. *Journal of Wildlife Management* 71:662-667.

[ix] Rutberg, A. T., R. Naugle, J.W. Turner, Jr., M. Fraker, D. Flanagan, and I.K.M. Liu. 2013. Tests of one-treatment immunocontraceptive vaccines on white-tailed deer (*Odocoileus virginianus)* on Fripp Island, SC. *Wildlife Research 40:281 -288.*

[x] Rutberg, A. T., and K. Pereira. 2019. White -tailed deer contraception and impact study, Village of Hastings-on-Hudson, New York. 2019 Report to the New York State Department of Environmental Conservation.

[xi] Carey, K., A. Ortiz, K. Grams, D. Elkins, J.W. Turner, Jr., and A. Rutberg. 2019. Efficacy of dart-delivered PZP-22 in wild horses (*Equus caballus*) in baited traps in New Mexico. *Wildlife Research* 46:713-718.

[xii] Grams, K. A., A. T. Rutberg, and J.W. Turner, Jr. *In review*. Dynamics of western wild horse populations under Immunocontraceptive treatments.

[xiii] Rutberg, A.T., R.E. Naugle, and F. Verret. 2013. Single-treatment PZP immunocontraception associated with reduction of a white-tailed deer (*Odocoileus virginianus*) population. *Journal of Zoo and Wildlife Medicine* 44(4S):S75-S83.