

Currently Available Contraceptives and Sterilization Techniques for Wild Horses and Burros

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Q: What is the Problem?

“we all love horses, why get rid of them?”

A: No one I know wants to get rid of all the horses. The problem is too many EXCESS horses.

In facilities, because the adoption demand is too low

On the range, because population growth rate is too high

Typical population growth rate is 15-20% per year w/ uncontrolled reproduction

- 3 determinants:
 - 1) foaling rate
 - 2) ingress/egress
 - 3) mortality (removals)
- typically for untreated controls
 - 60-75% of mares foal on range
 - 85-90% of mares foal in captive trials

**Ultimate goal of fertility control is
*population growth suppression***

- need fertility control with high efficacy
 - want ~ 10% of treated mares foaling
- need effective application
 - want ~ 75-90% of mares treated

Fertility Control

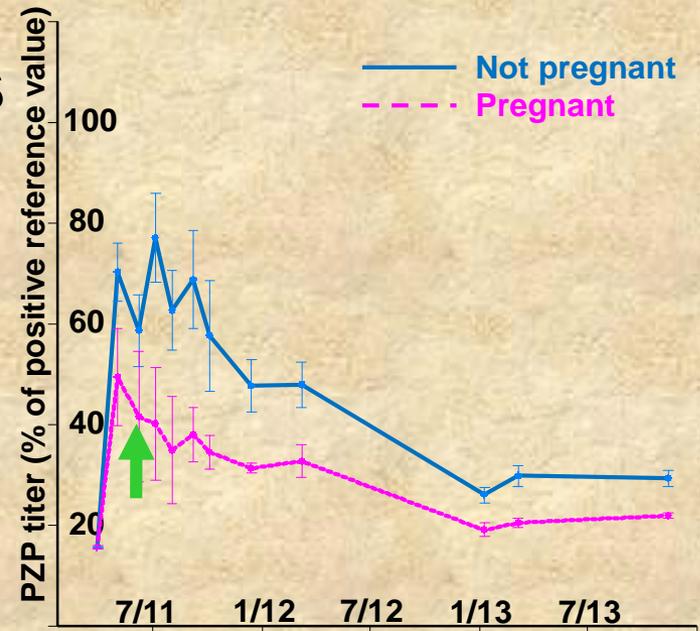
History

- first research in the late 1970s, early 1980s
 - male and female contraception
 - mostly hormone treatments = short acting, residues
- determined female contraception more promising
 - WH bands are dynamic and polygynandrous
 - harem structures change over time with **multiple males breeding multiple females**
 - 30% of foals may be sired by secondary stallions

My Opinion: if mares cycle for many months eventually the 10-20% of males that can't be captured will eventually breed all the mares

PZP = Porcine Zona Pellucida

- a glycoprotein harvested from pig ovaries
- PZP is **antigen** – target for the immune system
- mix with **adjuvant** – stimulates immune system
- mare makes PZP **antibodies**
 - block fertilization of the egg
 - also bind to proteins in ovary
 - can cause ovaries to shrink
 - can reduce estrous cycling



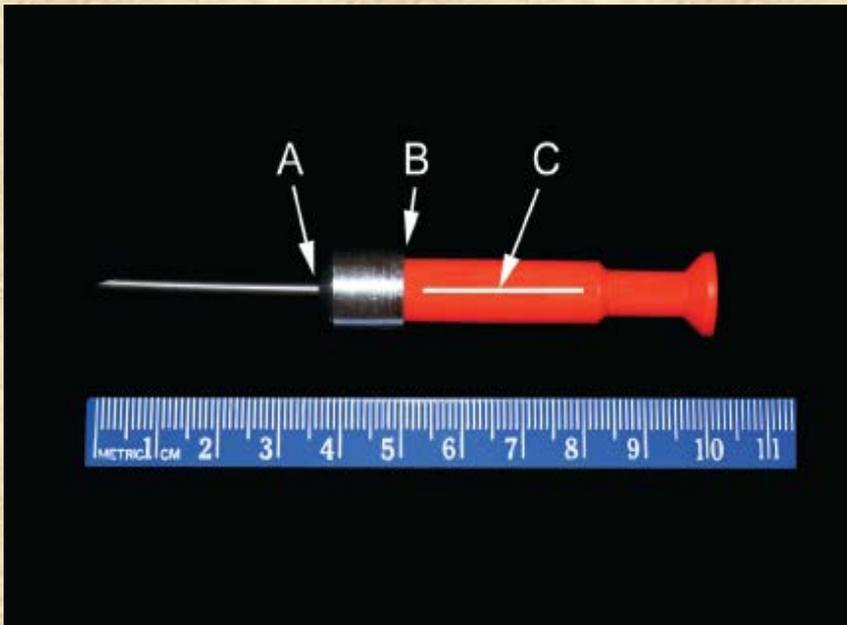
Zonastat-H[®]



- “liquid PZP”
 - registered with EPA
 - Science and Conservation Center, Zoo MT
- primary shot + 30d booster shot
- administer 1-2m prior to breeding season
- **repeat booster every year**
- cost about \$30 / shot
 - BLM application cost darting ~\$500 / mare
 - BLM catch treat release cost ~\$2500 / mare

Zonastat-H

- safe and effective at mare level
- 7–18% of Zonastat-H treated mares foal
- used by BLM on 5-6 areas that can be darted
- can greatly reduce gather frequency



Assateague ~ 1993 - 2006

- **156 horses**, AML = **120 horses** = **46% over AML**
- 2 weeks then later 4 weeks of darting each year
- 0 – 7% of treated mares were foaling each year
- average application rate ~70% (ranged 20 to 95%)
- population foaling rates dropped to 7%+/- 2% per yr

@ 2 years 166 horses

@ 8 years 175 horses

@ 5 years 171 horses

@ **13 years 143 horses**

(Kirkpatrick 2008)

@ 24 years (2017) = 89 horses



Assateague in the West ?

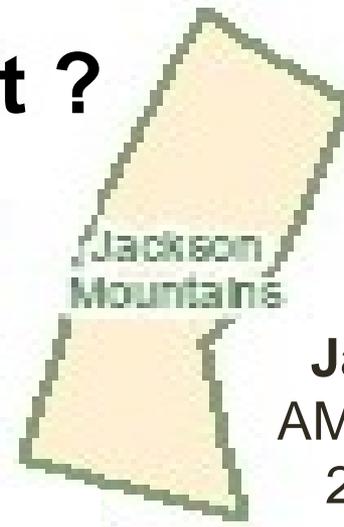


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Assateague Island

AML 120 horses

8,850 acres



Jackson Mnts

AML 170 horses

283,000 acres



... not in a typical BLM herd management area

“PZP-22” = Pelleted PZP

- one treatment, longer lasting
- liquid shot + pellet shot (1,3,12)
- pulsed release PZP over time
- cost ~ \$300/dose

Clan Alpine (Turner 2004)

(50% controls foaling)

1-2yr = 6-18% foaling

3-4yr = 30-40% foaling

**- this level of efficacy
has never been repeated**



Variable Results with PZP-22

(untreated controls = 60-75% foaling)

Sandwash/Cedar Mt = 26-48% foaling (HSUS 2011)

Carson City = 1st yr 10%, 2nd yr 68% (Turner unpublished)

- **source of poor performance uncertain**
- **we know it is safe but highly variable efficacy**
- **best available one treatment option**

PZP-22 w/ Boosters (Rutberg 2017)

Sand Wash = 18-40% foaling for 3 years

Cedar Mt = 15% foaling for 3 years

– up to 68% injection site reactions

SpayVac[®]

- developed in the 1990s
- one shot, long acting PZP product
- uses liposome technology
- block fertilization and shrink ovarian tissues
- used successfully in other species

2003 Carson City Trials (Killian 2008)

= 0% foaling 1st yr, 17% yrs 2-4

– small trial 12 treated mares, 8 controls

SpayVac

Pauls Valley Captive Trial #1 (Roelle 2017)

= 13-17% foaling 1st year, 45% yrs 2-4

- 15 mares never became pregnant

Pauls Valley Captive Trial #2 (Roelle 2017)

– raised the dose, added stronger adjuvant

= 50-70% foaling 1st year

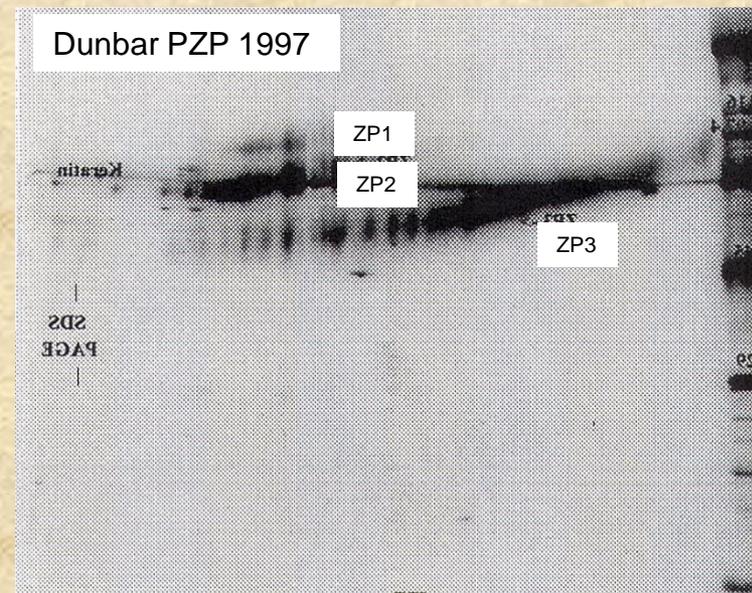
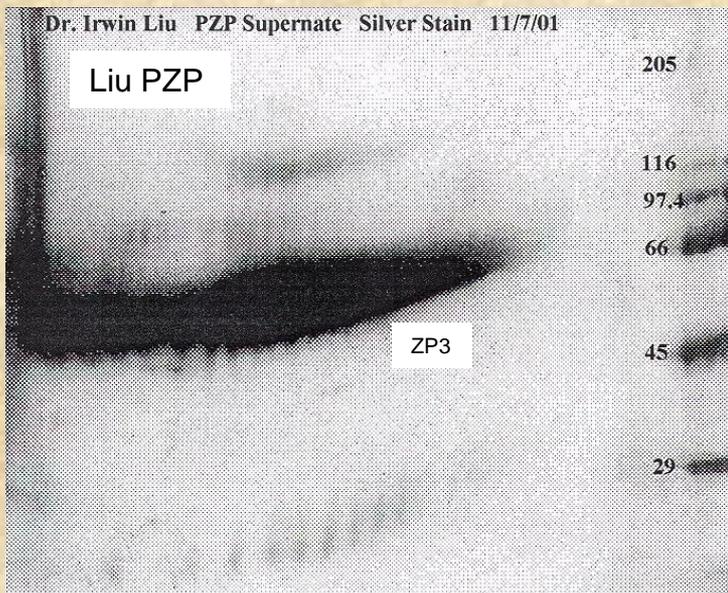
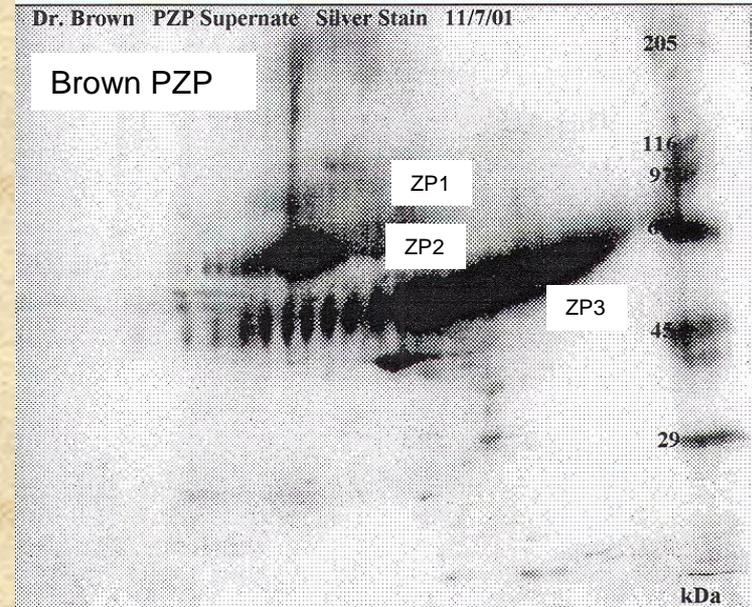
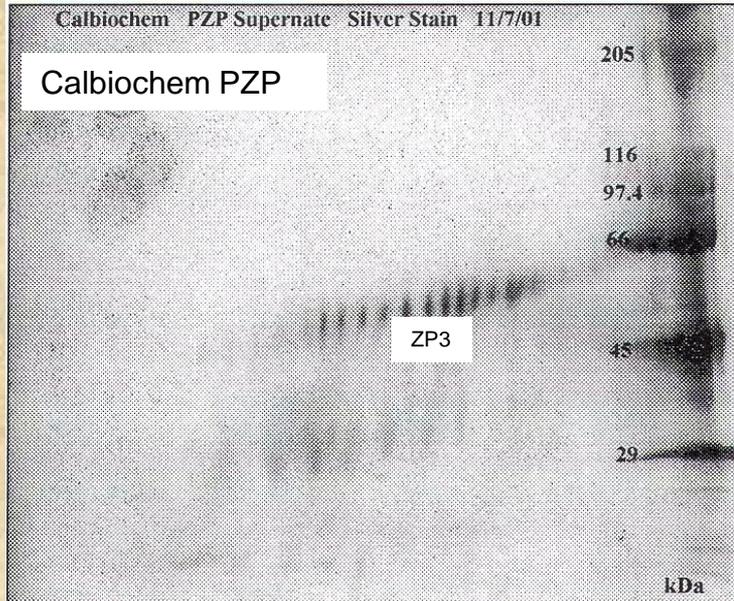
– no apparent explanation for the highly variable and worsening results so we ended the SpayVac trials

SpayVac Limitations

- formulation changes in amount of PZP antigen and type of adjuvant after first trial
- difficult to obtain, manufacturer lost interest
- not currently available ... **however, recently**
- new manufacturer, ImmunoPrecise Antibodies
- return to original formulation
- will be seeking EPA approval

My Opinion: will need new, larger efficacy studies to demonstrate reliability before have confidence for field applications

How do PZP preparations differ ? (G Killian, M Fraker)



Gonacon™ - Equine

- vaccine against the hormone GnRH
 - GnRH regulates hormones FSH and LH
- registered with the EPA
- one shot, multiyear effect
- produced by USDA APHIS Wildlife Services
- safe for treated animals and their offspring
 - rabbits, elk, deer, horses

Carson City Pen Trials

= 6% foaling 1st year

= 40% foaling years 2 and 3

Gonacon™ - Equine

Theodore Roosevelt National Park

field trial = 45-54% foaling 1st and 2nd years

(yr 3 booster) = 0% and 16% foaling 4 & 5 yrs

– ongoing work on optimal booster schedule

- one shot, pre-mixed vaccine technology
- can be darted or hand injected
- could have good efficacy after booster
- being used by BLM in one pilot study

EPA Registration

- regulation of contraceptives for *free-ranging* wild or feral animals transferred from FDA to the EPA in 2009
- restricted use pesticide
 - label has little or no information on mechanism of action, side effects or complications
- typical EPA burden is to establish environmental and non-target animal toxicity
- there is **no EPA minimum requirement for efficacy** unless there is a public health or food safety claim for the product
- **EPA registration does *not* mean efficacy**

Intrauterine Devices (IUDs)

- marbles to reduce signs of estrus in domestics
 - over period of years they fracture, cause problems
 - 100% fall out when mares are with stallions
- silastic ring (Daels1995)
 - reported >80% effective, safe, reversible
- silastic ring (Baldrighi 2017)
 - USGS and OSU attempt same design
 - overall, 60% lost IUD when in with stallions
 - effective when retained, no adverse effects to date
 - ongoing work OSU to find better design
- **use is limited to open mares**

Female Surgical Sterilization

- “spaying” mares – ovariectomy
 - done occasionally in domestic mares
 - colpotomy, 15-30 minutes/mare
 - laparoscopy, 60-90 minutes/mare
 - has been done in WH mares
 - survival varies depending on experience of surgeon
 - safety and practicality in pregnant mares unknown
 - reportedly reduced foals per harem on Sheldon Wildlife Refuge when combined with vasectomy
- tubal ligation, various techniques
 - relatively untested, not used in domestic horses
 - some techniques limited to open mares

Male Surgical Sterilization

- **surgical vasectomy** done on feral horses
- procedure itself is successful
- not well studied, not used in domestic horses
- seems to offer poor efficacy after first year
- **“chemical vasectomy”**
 - “should not be difficult to adapt” (NAS 2013)
 - **0% effective at blocking sperm (Scully 2015)**
 - at this time there is no established technique
- **castration of stallions**
 - effective if mares are replaced by geldings
 - behavioral and ecological consequences unknown

Right Now – Best Available

- Zonastat-H
 - **small, closed populations, at or near AML**
 - individual animals catalogued by appearance
 - **approachable for annual darting**
 - expect good efficacy with >90% application rate
 - stabilize but only slowly reduce population size
- Gonacon-equine
 - smaller populations at or near AML
 - can be treated at least twice
 - **expect good multiyear efficacy, duration unknown**
 - stabilize but only slowly reduce population size

Right Now – unknowns

- PZP-22
 - good one year efficacy with “one shot” primer and booster
 - better efficacy with repeated boosting
 - reliability and duration uncertain
- SpayVac
 - long term efficacy may be promising
 - ideal formulation and reliability are unknown
- spaying and other surgical techniques

QUESTIONS P



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