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CHAPTER

The Wild Horse Fertility Control Program

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Introduction

The wild horse contraception program may well be the showpiece of the efforts and dreams of the HSUS wildlife fertility control work. The wild horse program, now in its sixteenth year, is the oldest of the organization's five major wildlife fertility control initiatives. The wild horse fertility control program has compiled the single largest body of information on contraception in the field for any technique and any wildlife species and includes information on efficacy, safety, required effort, and population effects. These data, in turn, have proved invaluable in combating the skeptics and educating the larger public about wildlife fertility control.

The driving force behind this program was the passage of the Wild Free-Roaming Horse and Burro Act of 1971 (Public Law 92-195; 16 U.S.C. §133 et seq.). This landmark federal legislation protected wild horses and burros living on Western public lands from being killed, captured for slaughter, or subjected to other forms of abuse and exploitation (Rutberg 2003). The legislation, however, underestimated the reproductive potential of horses and over-estimated the government's ability to manage this species.

[illegible] was given the authority to manage horses and burros. Although the numbers are still in dispute, there n estimated 17,000 horses inhabiting public lands when the Act was l. In less than ten years, the estimates rose to somewhere between) and 80,000 animals on these same lands. The federal Adopt-A-Horse m, while providing some relief, has been very expensive (up to) per animal removed), and it has fallen far short of reaching its goal intaining wild horse populations at desired levels (Biological ces Division 2001). Perhaps the biggest shortcoming of this pro- as been its inability to keep track of adopted horses. It is suspected any of these animals subsequently experience a low quality of life, ; from neglect as a "backyard horse" to a quick end in the slaugh- nts of Texas and Canada. In 2003 excessive numbers of horses were n marginal rangeland after five continuous years of drought—under ons that no horse, wild or domestic, should ever have to face (see, nple, Stark 2004).

arliest attempts at fertility control in wild horses began in 1971 and d around the application of steroid hormones to stallions. Although successful in a pharmacological sense, this approach was impracue volume of hormones required was too large (up to 50 cc.) and e administered too often to manage large herds (3–4 times over six The drugs also passed through the food chain, threatening scavund altering behaviors. The drugs were expensive ($100/dose or and probably were not safe to give to pregnant mares. Finally, the uld not be delivered remotely, and the stresses placed on animals apture were not publicly acceptable (Kirkpatrick, Turner, and 1982; Turner and Kirkpatrick 1983; Kirkpatrick 1995).

tory of inocontraception in Horses

se shortcomings led to the abandonment of this approach in '. At that time, a new approach, immunocontraception, came into ideration. Irwin Liu, at the University of California-Davis, had ated with captive horses that the porcine zona pellucida, or PZP, ould inhibit fertility in mares if administered three times over six iu, Bernoco, and Feldman 1989). Several advantages to this became apparent immediately. First, the volume of vaccine nec- contraception was so small (1.0 cc) that it could be delivered by inating the need to capture the animals. At $10–$20/dose, it was sonably expensive and, because the vaccine was protein-based, it pass through the food chain. PZP's mechanism of action simply ilization, and thus there was no reason to believe that it would crine function or social behaviors or that it would interfere with pregnancies in progress. These characteristics of the PZP vaccine fit well with the theoretical characteristics of an ideal wildlife contraceptive (Kirkpatrick and Turner 1991).

In what is now recognized as a landmark study, in February, March, and April 1988, twenty-six wild mares on Assateague Island National Seashore (ASIS) were treated with the PZP vaccine. Eighteen were given three inoculations and eight were given two inoculations, all by dart. A year later not a single foal was born to the treated mares, proving the efficacy of the two-inoculation regime (Kirkpatrick, Liu, and Turner 1990). Sixty percent of the mares were pregnant at the time they were treated and these produced healthy foals whose survival was no different from that of untreated mares. The social structure of the herd was unchanged, and individual mare hierarchies were not disturbed. A more recent study (Powell 1999) likewise found no behavioral effects of immunocontraception.

In February 1989 half of the treated mares were given a single booster inoculation and half were left untreated. One year later only one of the booster-treated mares produced a foal, and half of the untreated mares produced foals (a normal reproduction rate), documenting short-term reversability (Kirkpatrick et al. 1991).

By 1990 interest in this success was rapidly growing in scientific, political, and public domains. In a surprising show of interest, the Reproductive Biology Section of the National Institutes of Health (NIH) funded a three-year project to study the effects of the vaccine on ovarian endocrine function, with the aim of learning about the health of ovaries after repeated treatments. The NIH was interested because, at that time, there was some hope that this vaccine might become the basis for a human contraceptive, and the horse trials were already ahead of the research curve with regard to the many questions posed above.

The outcome of this study was that treatments given for three and four consecutive years caused no significant alteration of ovarian function. In five mares that were treated for seven consecutive years, there was no return to fertility and no ovulation (Kirkpatrick et al. 1992, 1995). These mares resumed ovulating after treatments ended but had not become pregnant as of 2004. It appears that the ovary remains healthy and functional with up to seven years of treatment.

Satisfied by the pilot studies of PZP, the NPS decided in 1994 to consider management-level application to the 166 horses on ASIS. In anticipation of this action, all 74 untreated mares on the island received a single inoculation of PZP in March 1994. The purpose of this initial treatment was not to provide sustained contraception but to ensure that every mare in the herd would require only a single additional treatment for contraception to be effective. In March 1995, after the required Environmental Assessment (EA) was completed (and six foals had been born), a management plan was implemented, and selected mares received additional PZP treatments.

The management plan established by the NPS sought to preserve the genetic integrity of the herd while maximizing the population control

The hallmark of this many-faceted plan, which is too complex to ex- in detail here, was that all mares reaching two years of age were iately treated once, then treated again at three and four years of :er that the mares were left untreated until they produced one foal, creating an "equal opportunity" foaling plan for the island's mares. as an additional benefit to this approach that didn't become appar- il many years later. By delaying pregnancies in the mares, they were ficantly better condition and health when they finally did become it, at ages six through ten, and foal mortality (as well as mare mor- lecreased. At the other end of the treatment spectrum were those vho had two or more living generations of offspring; these mares t on contraception until death. They had made their genetic con- n to the herd and they did not have to endure additional energy- ; pregnancies during later stages of life (Kirkpatrick and Turner urner and Kirkpatrick 2002).

n interesting footnote that these breakthroughs in wild horse con- on came not from the BLM, the agency which originally stimulated in this area, but rather at the invitation and sponsorship of the NPS, lls outside the authority of the Wild Free-Roaming Horse and Burro 1992, however, the first large-scale tests of PZP on BLM-managed horses were being conducted in Nevada, with results similar to those ASIS (Turner et al. 1997). In this case, the horses were not darted ; they were gathered by helicopter drives and inoculated in chutes. the long-term treatment of the ASIS horses has produced a pletho- aable data. It is known that efficacy of the two-inoculation proto- out 90 percent. It is also known that the one-inoculation protocol, istered in March at the beginning of the breeding season, is about nt effective, and that after an initial inoculation, a single annual inoculation will maintain contraception. Injection site reactions mely unusual (<1.0 percent) and, when they do occur, are not life- ing or even serious (Kirkpatrick and Frank 2002). After two years ient in March, animals can be successfully treated in August, when more easily accessible. Zero population growth can be achieved, he same time preserving the gene pool of breeding animals. Body i scores within the herd also improve significantly after ten years ient. This, in turn, has resulted in lower mortality rates and an in longevity (up to ten years) for treated mares, improving the f life for older animals living under difficult conditions. The data le it clear there is no danger of foals being born out of season nares withdrawn from treatment. This and other research also hat behaviors are not significantly altered, with the exception of ng wary of the field personnel wandering about with dart guns. It demonstrated that a herd of 170 animals could be managed in er for less than $6,000 per year (including labor) and that, as the ontinues, the effort needed to maintain zero population growth . Finally, and significantly, this approach has been accepted and embraced by the public, when adequate and honest information is provid- ed (Points and Kirkpatrick 1997).

Beginning in the 1990s, we sought an effective and reasonably inexpen- sive one-inoculation form of the vaccine that provides a full year, or perhaps two years, of contraception. In the first trials of a one-inoculation PZP vac- cine, mares inhabiting the Nevada Wild Horse Range at Nellis Air Force Base were treated with the PZP antigen encapsulated in lactide-glycolide microspheres. The results indicated that a single inoculation of the slow- releasing microspheres provided the same efficacy as the standard two- inoculation protocol (Turner et al. 2001). This approach, however, had seri- ous flaws: the microspheres, which are suspended and not dissolved, occlude the syringe needles and prevent their delivery via dart. The next obvious step was to find a way to incorporate the PZP into the lactide-gly- colide material in such a manner that it could be delivered by dart. This is being accomplished through the use of lactide-glycolide pellets that release the vaccine slowly, in pulses, and that can be administered by dart or jab-stick (Turner et al. 2002). Field trials of these pellets on wild horses in the Clan Alpine Herd Management Area of Nevada have yielded a 90 per- cent rate of efficacy after one year and an 83 percent efficacy after two years. The present line of research now aims to replicate these results and reduce the cost of these long-acting forms of the vaccine.

The success of the wild horse program has promoted the spread of fertili- ty control to other wild horse herds throughout the United States (Table 1). In 1999 the Rachel Carson Estuarine Reserve began administering PZP contraception to the wild horses of Carrot Island, North Carolina, and one year later, Cape Lookout National Seashore (known as CALO) initiated PZP treatment of the famed Shackleford Banks horses, the oldest known population of wild horses in the United States.

On Carrot Island nearly every mare is treated annually, and in 2002 not a single foal was born (P. Deal, personal communication). On CALO, similar success has been demonstrated among treated mares, although the incor- poration of an adoption program into the CALO management plan prevents a higher percentage of adult mares from being treated (69 percent of mares were treated in 2003). Efficacy of treated mares on CALO stood at 97.5 per- cent in 2003 (S. Stuska, CALO, personal communication).

One year later the privately owned wild horses of Little Cumberland Island were treated, as were the wild horses of the Return-to-Freedom Wild Horse Sanctuary in Lompoc, California. In 2002 the wild horses of the Lit- tle Bookcliff National Wild Horse Range in Colorado and the famed horses of the Pryor Mountain (Montana) National Wild Horse Range were treated with PZP. All these applications are designed to control populations, yet they all serve as useful research projects. In its sixteen-year lifespan, the wild horse PZP immunocontraception program has generated more than twenty published book chapters and scientific papers in respected peer- reviewed journals and has involved more than twenty researchers.

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ummary of Major HSUS/Research Team Wild se Immunocontraception Projects, 1988–2003

	Dates	Purpose
igue Island al Seashore, Md.	1988–present	Feasibility of field delivery, population management
e/Antelope DMAs, Nev. (BLM)	1992–1994, 1999–2002	Feasibility of field delivery, efficacy of one-shot vaccine
Wild Horse Nellis Air ase), Nev. (BLM)	1996–1998, 2003–present	Feasibility of field delivery, efficacy of long-term vaccine, population management
ek HMA, M)	1998–2001	Efficacy of one-shot vaccine, population modelling
Mountains HMA, M)	1998–2001	Efficacy of one-shot vaccine, population modelling
rden HMA, M)	1999–2002	Efficacy of one-shot vaccine
arson Estuarine N.C.	1999–present	Population management
risto HMA, M)	1999–2002	Efficacy of one-shot vaccine
lkout National , N.C. (NPS)	2000–present	Population management
ne HMA, M)	2000–2003	Efficacy of long-term vaccine, population modelling
okoliffs Wild Horse olo. (BLM/BRD)	2002–present	Intensive study of behavior, genetic, and demographic effects
untain Wild Horse ont. (BLM/BRD)	2002–present	Intensive study of behavior, genetic, and demographic effects
/Coppersmith lif. (BLM)	2003–present	Efficacy of long-term vaccine
ake River (BLM)	2003–present	Efficacy of long-term vaccine

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The Economics of Wild Horse Contraception

The economics of wild horse contraception are interesting if not exact. Often economic considerations must be viewed in the context of politics and public opinion, and contraception must be evaluated against available alternative management methods, especially with wild horse management.

In 2003 96 person-hours of work were required to dart twenty-one mares on ASIS (about 4.5 hours per horse). These particular mares are very difficult to approach and dart because of the difficulty of the terrain and their wariness toward darters. With an employee earning $25/hour to conduct this work, labor cost of the project was about $112/horse; the total cost remains below $150/horse when the cost of vaccine, supplies, and equipment are included.

Typically, only half of untreated ASIS mares produce foals each year, so the number of horses darted does not strictly equate to the number of births prevented. Using conservative historic data on reproduction, however, we estimate that the contraceptive program on ASIS has prevented a minimum of 180 births over a fifteen-year period. At an estimated cost of contraceptive treatment of approximately $5,500 per year, this totals $82,500 over the fifteen-year period, or at most $458 per birth prevented.

The BLM's costs to conduct the Adopt-a-Horse program for wild horses removed from Western public land are instructive, although not strictly comparable to those for ASIS. The BLM presently manages its horse populations primarily through gathers, or roundups. Depending on management needs, a substantial fraction of all the horses on a herd management area are gathered, usually driven into temporary corrals by helicopter. The number of horses involved ranges from a few dozen to several hundred, with the cost of the gather generally exceeding $100,000. The gathered horses are then sorted. Some, especially the more appealing younger animals, are designated for adoption; the less adoptable animals (older animals, and especially older stallions) may be sent to long-term holding facilities. The remaining horses are returned to the range to breed again. The BLM has estimated the cost of gathering, preparing, transporting, and adopting a wild horse at between $800 and $1,600 per horse; feeding a horse in a long-term holding facilities costs several hundred dollars per year, potentially for the remainder of the life of the horse. These cost estimates dwarf those of even the most generous estimates of the cost of contraception at ASIS.

Considering the expense of conducting gathers on Western public lands, significant economic efficiency would be gained by immunizing every mare captured and returned to the wild. Although this type of immunization would only provide contraception for a limited time, it would cause antigen recognition and create a "one-shot" mare for subsequent management.

Although this discussion is based on estimates, it becomes clear that even less conservative figures would demonstrate a clear economic basis for fertility control.

The Genetics of Wild Horse Contraception

The genetic integrity of free-ranging wild horses is an important consideration. This issue, however, also must be viewed in the context of alternative management approaches. As an example let us examine the Assateague horses once more. Contraceptive management of this herd has achieved zero population growth (Turner and Kirkpatrick 2002). To achieve this same level of population management without contraception, about 180 foals or young horses would have to have been removed, particularly if adoption was the goal. In the context of genetics, that means that 180 genetic contributions to the herd would have been removed forever. Using contraception to delay reproduction, rather than eliminate it, permits every mare the opportunity to make a genetic contribution, although not all mares will actually make a genetic contribution (i.e., have a foal that survives to breed during his or her life).

The ongoing removal of horses that have never bred from small herds, although probably not catastrophic, is genetically unsound. At the very least, it is a more significant alteration of the herd's genetic profile than delaying reproduction through fertility control.

The Current Status of Wild Horse Contraception

In 2003 wild horse contraception stood at a critical juncture. The NPS at the Rachel Carson National Estuarine Reserve continued to use PZP contraception to manage wild horses. The BLM, through the Biological Resources Division of the U.S. Geological Survey, had initiated limited management-level application in the Pryor Mountain and Little Bookcliff herds. At the same time, the national wild horse program was entering a period of crisis, more for the horses than the agency. The number of wild horses on BLM range lands across the west exceeded mandated—and desired—population levels in many areas, yet the BLM had very limited funding in for emergency gathers. Even if adequate funds were available for gathers, holding facilities for removed horses were full. This problem stimulated a movement within the agency and advisory groups to seek one-time congressional authorization to sell wild horses at public auction, which would lead to the very abuses the Wild Free-Roaming Horse and Burro Act was enacted to end more than thirty years ago.

At the same time, the agency has resisted applying contraception on a large scale. Some of the resistance originates with agencies that are advising the BLM, such as the USDA/APHIS, which refuses to acknowledge the published safety and efficacy data from the work described above. It is probable that other agendas are also being advanced through this particular group.

A second source of resistance comes from a limited number of wild horse advocacy groups that do not trust management-level contraception in the hands of the BLM, which they view with suspicion. This is a particularly troublesome source of opposition and though well-intentioned, it is ill-advised. Several of these groups are suspicious that the BLM's ultimate goal is to eliminate horses rather than to maintain sustainable populations. Some argue that a larger population of wild horses would be sustainable if all domestic livestock were removed from public lands, and some have even suggested that wolf and mountain lion populations should be reestablished to control the horses. Although these ideas are not without merit, they are unlikely to be implemented widely or soon, or possibly ever, and in the meantime, horses on the range continue to reproduce. The fear of eliminating wild horses with available contraceptive technology is unreasonable and ignores the Assateague experience. Although we can achieve zero-population growth with this technology, we have been unable to reduce a population through contraception in less than ten years. The increased longevity of the treated animals prevents this. Like the USDA/APHIS veterinarians advising the BLM, the opposing horse advocacy groups ignore sound data from previous studies.

Many opposing advocacy groups also misunderstand or ignore the oversight and control of the BLM contraception program by The Humane Society of the United States (HSUS), which holds an Investigational New Animal Drug exemption (INAD) from the FDA for the use of PZP in wild horses. All PZP field studies conducted to date by the NPS and the BLM have been conducted and administered under the auspices of the INAD held by The HSUS. The HSUS, which is a nationally known, moderate animal protection organization, provides oversight to each project. Before any contraceptive project can proceed, the BLM must produce a management plan that ensures responsible management of the herd, or the project will not be approved by The HSUS.

Finally, there is some opposition from other scientific groups that would like to assume the role of leadership in wild horse contraception, which in turn is probably driven by the promise of increased research funding. Collectively, these political, public, and internal forces have prevented wild horse contraception from growing in the West as rapidly as it might have.

e Future of Wild Horse Contraception

Ve have seven goals for the next five years.

First, we must strive to help the BLM to understand the need to immunize all mares who are gathered and returned to the range. ounter-intuitive that the agency should spend up to $1,600 per horse ther the animals and then release mares back onto the range without nizing them with PZP.

ond, more than 75 percent of BLM horse herds are comprised of than 150 horses, and these herds are especially suited for remote- ry contraception. It is our goal to add at least one new BLM herd gement area per year to the list of those using PZP contraception.

rd, we must find the opportunity to test Freund's Modified Adjuvant in horses. We routinely use Freund's Complete Adjuvant (FCA) in (including Przewalski's horses and zebras) without complications. A ody of data collected from hundreds of zoo animals as well as hun- of wild horses shows that injection site reactions are not a problem, unsupported claims by the opposition. There is also the concern e FCA will cause the recipient animal to test positive for tuberculo-), but no reliable test for TB exists for equids. Although opponents ffered no scientific data to support their concerns regarding injec- e reactions in horses, these concerns may be alleviated through the MA. FMA does not cause injection site reactions in horses, nor can a positive TB test even in species for which a reliable test exists. At e of this writing, PZP with FMA is being tested on captive mares in ration with the BLM.

h, we must encourage the BLM to put the long-acting contracep- lets to work on larger ranges, in concert with scheduled gathers. ly and promising results in wild horses in Nevada must be replicat- rge scale and highly controlled studies.

a great deal more effort must be put into educational endeavors to the public's understanding of this technology and how it benefits We know that well-designed educational efforts garner support for se contraception from the general public, which, in turn, often deral agency actions.

we must ensure that a constant and high-quality supply of native ported by a strong quality-control program, be available for the ly large demand prompted by the impending wild horse crisis (as ie application to animals in zoos and deer). The BLM has already record to insist that reasonable quality control procedures be o the native PZP used in BLM horses. At a minimum this would ccurate quantitative analyses for dose determination, qualitative y way of polyacrylamide gel electrophoresis, which can be stored, ening for pathogenic bacteria and selected viruses that might ses. The mechanism for this achievable goal is in place, but it sustainable source of funding.

Seventh, and as important as any initiative listed above, is the need to find the means to recruit and train field personnel to deliver the contraceptives. Time is no longer on the side of those who developed this technology and brought it to where it stands today. A new cadre of people who care passionately about wild horses must be found.

America's wild horses face an impending crisis provoked by agency budget problems, a history of mismanagement, and the worst drought in sixty-five years, compounded by indecision in the managing agency. Unless contraception, as well as other tools, is put to work very soon, we will witness deteriorating health and large die-offs of animals on our public lands. The research has been done, the safety has been documented, the efficacy is understood, and the technology is available to help these animals. The time for talking is over.