



The pregnant mares' urine industry— management and research

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Pregnant mares' urine (PMU) ranching is a cooperative effort between equine agriculture and human medicine and is an important part of the equine industry. The ranches are located in North Dakota and the 3 prairie provinces of Canada (Manitoba, Saskatchewan, and Alberta). There are currently 431 ranches that contract to provide PMU, and approximately 35,000 mares are involved in its production. Additional horses kept on these ranches include stallions, young stock, and other mares. Pregnant mares' urine ranching is an important part of the agricultural economy and community in these regions.

Mares produce multiple estrogen conjugates during pregnancy and excrete these conjugates in the urine. Multiple estrogens are extracted from PMU to manufacture a hormone replacement* for postmenopausal women. Although this presentation focus-

es only on the management and welfare of pregnant mares, it is important to understand that manufacturing this hormone replacement is of major importance to women's health care.

The Industry

On the basis of an industry demographic survey,¹ the typical PMU rancher has worked in PMU ranching for more than 10 years; works the ranch with a spouse, child, and 1 hired hand; is the second generation of his/her family to work the family ranch; cares for approximately 75 to 80 pregnant mares; breeds more Quarter Horses than any other registered breed; and also produces cereal grains, forages, and other livestock.

Pregnant mares' urine ranching follows a regular annual cycle. Mares are stabled while they produce estrogen conjugates during harsh winter weather. This means they are stabled beginning in October and return outdoors in March. Foaling takes place outdoors. During spring and summer, mares are maintained in bands on pasture. Most ranches use a natural pasture breeding management program. Stallions are

turned out with mare bands between June 1 and August 1. Foals are weaned in the fall when they are a minimum of 3 months old.

Urine is collected by use of a noninvasive lightweight collection unit suspended by elastic tubing from the ceiling behind the mare. During urine collection season (October to March) mares are housed in tie-stall barns. The collection cup is maintained near the perineum of the mare and will catch urine during normal urination. Collection of urine reduces wet bedding and, consequently, barn odor and ammonia. The suspension design allows stabled mares to move around and lie down freely within the stalls. Mares are periodically turned out to paddocks for free exercise. Turnout schedules vary among ranches.

Independent ranchers contract to supply PMU to Wyeth-Ayerst Global Pharmaceuticals. This contract includes an obligation by ranchers to apply guidelines in the *Recommended Code of Practice for the Care and Handling of Horses in PMU Operations* (The Code). These comprehensive guidelines were developed by a committee, which included independent veterinarians and government personnel. The Code is used by industry inspectors who evaluate each ranch monthly. The Code has been appended to the new Canadian-wide code for horses, which was coordinated by the Canadian Agri-Food Research Council (CARC), CARC Canada Committee on Animals, CARC Expert Committee on Farm Animal Welfare and Behavior, and the Canadian Federation of Humane Societies.

Continuous Improvement Program

The Continuous Improvement Program (CIP) encompasses various steps developed by veterinarians, quality assurance specialists, and other members of the PMU industry. These steps are designed to ensure the health and well-being of the horses involved, identify any problems within the industry, and develop ongoing strategies to improve mare and ranch management. It is, in essence, an industry-wide herd health program. The following are components of the CIP.

Monthly ranch inspections—The PMU industry employs field representative inspectors who conduct monthly comprehensive ranch reviews. An extensive review form was developed to facilitate complete and consistent inspections. Data from these forms is entered into a computerized database. To evaluate findings, information is reviewed, organized, and searched by a quality assurance specialist based on demographic data, month, or inspection results. Ranchers and field inspectors develop solutions to any problems identified, and the results are monitored by repeat assessments and data analyses. Field supervisors also review ranches and the ranch inspection process.

Veterinary review program—Ranchers are obligated to hire an independent practicing veterinarian to conduct 3 complete herd health reviews while mares are stabled (in November, January, and March). A herd health review form was developed by a committee of veterinarians to facilitate reviews and ensure they are complete and consistent. Herd health forms are also reviewed by the industry veterinarian in charge of

PMU mare health. More than 90 veterinarians participate in conducting these herd health assessments.

Independent ranch review—Several national, provincial, and state offices have the authority to inspect ranches and investigate complaints. These include the Veterinary Services Branch of Manitoba Agriculture, the Saskatchewan SPCA, the Alberta SPCA, and the North Dakota Board of Animal Health. In addition, various equine experts have conducted ranch reviews. A recent extensive outside ranch review was conducted during the 1996 to 1997 collection season by international equine veterinarians representing the American Association of Equine Practitioners (AAEP), the Canadian Veterinary Medical Association (CVMA), and the International League for the Protection of Horses (ILPH). For this review, participating veterinarians selected ranches for inspection in all 3 provinces and North Dakota. The review encompassed 25 ranches and approximately 2,400 mares from which urine was currently being collected. Findings were published in a consensus report issued by the participating veterinarians.² The veterinarians concluded, "Based on our inspections, the allegations of inhumane treatment of horses involved in PMU ranching are unfounded."

Barn improvement program—A formal assessment of all barns collecting PMU for Wyeth-Ayerst Global Pharmaceuticals was conducted as a part of the CIP. Facilities that did not meet current technical or dimensional guidelines established in The Code were prioritized for renovation or replacement, even when horse care within those facilities was considered acceptable. Facility review and evaluation of horse management are a part of this ongoing program.

Linwood Equine Ranch—A working PMU ranch was purchased and developed as a research and educational facility. A veterinarian was hired to manage the facility, conduct research studies on mare management and welfare, and oversee all issues of PMU mare health across the industry. Veterinarians, clinicians, and researchers from outside the industry collaborate on studies conducted at Linwood Equine Ranch. In addition, the facility has been reviewed for accreditation by the Canadian Council on Animal Care.

Equine Management Group and Equine Advisory Board—The Equine Management Group comprises veterinarians, managers, and others from within and outside the industry. The group is charged with oversight and publication of research conducted at Linwood Equine Ranch, and members provide expertise consulting on equine health and management. Members of the Equine Advisory Board are veterinarians and scientists who provide expertise in their area of concentration. Equine Management Group and Equine Advisory Board members have credentials in equine medicine, physiology, reproduction, nutrition, and behavior. Veterinarians in the Equine Management Group work in industry, academia, and private practice. All Advisory Board members currently practice in industry or academic settings. Participating academic institutions include Cornell University, Michigan State

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University, The Ohio State University, The University of Pennsylvania New Bolton Center, Rutgers University, and the University of Massachusetts.

Current Research Initiatives in the PMU Industry

Many animal agriculture industries have conducted controlled research studies to evaluate established management practices in the face of changing perspectives on animal welfare. The PMU industry, in conjunction with members of the Equine Management Group and Equine Advisory Board, has conducted controlled studies at Linwood Equine Ranch, evaluating methods of watering stabled mares, turnout frequency, nutrition, and other barn management issues. Some data were presented at the 1998 AAEP Annual Convention.^{3,4} Complete studies of watering methods were recently published in the *American Journal of Veterinary Research*.^{5,6} To accurately assess mare welfare, indicators of physiologic and psychologic well-being were evaluated in these studies. Summaries of key projects follow.

Watering methods—Provision of water ad libitum to stabled mares results in substantial spillage and secondary barn hygiene and management problems. Various methods for providing water intermittently have been developed to prevent these problems. These methods were critically compared to continuous watering and a new timer-float system designed to provide residual volume after watering.^{3,6} Mares were evaluated for health and hydration status clinically and biochemically. To address psychologic well-being, detailed quantitative measures and clinical assessments of behavior were conducted. In all cases, mares were healthy and normally hydrated when given intermittent access to water. Behavior of mares was normal and free of stereotypic behaviors. These studies indicated that intermittent access to water supports the physiologic and psychologic well-being of mares.

Turnout frequency—Mares are housed during the winter months in tie-stall barns and turned out at various intervals. No data is available from which to make recommendations regarding the appropriate frequency for turnout. Clinical impressions indicate that stabled pregnant mares will occasionally develop dependent edema or other forms of limb swelling. This limb swelling is not necessarily pathologic and is not always exercise-responsive. Studies were conducted at Linwood Equine Ranch to evaluate the physiologic and psychologic well-being of mares under various turnout frequencies. Although these studies are still in progress, initial findings indicate that results of physiologic health and behavioral assessments do not differ among mares on daily, weekly, or biweekly turnout schedules.^{3,4} It is clear from clinical observation and research studies that the needs of individual mares vary, and multiple factors must be considered in establishing appropriate turnout schedules.

Issues Raised by Critics

Oversight of the industry and mare well-being—Currently, the PMU industry has an extensive review

and oversight program. Inspections in the CIP provide a multilevel series of checks and balances during review of mare well-being: field inspector, field supervisor, private veterinary herd health reviews, industry veterinarian oversight, outside reviews by equine experts, and regulatory agency inspection. To ensure skill and objectivity, company inspectors are required to complete a training program with the industry veterinarian. Inspection territories are rotated every 3 years.

Veterinary care on PMU ranches compares favorably to the norm for US household-owned horses, based on the AVMA Center for Information Management 1997 report.⁷ Whereas all PMU ranches must conduct a veterinary herd health review at least 3 times per year, more than 40% of US household-owned horses did not receive a veterinary examination. Comparatively, the PMU industry is a highly regulated and closely inspected equine industry.

Provision of water—Mares' access to water is managed to maintain good stable hygiene. Although The Code requires adequate water delivery to mares, groups critical of the PMU industry have alleged that the systems used do not provide adequate water for mares, and ranchers restrict water provided to mares so that they produce a lower volume of more concentrated urine. On the basis of normal health, hydration, and behavior of mares in controlled studies conducted at Linwood Equine Ranch, intermittent watering systems employed on PMU ranches provide adequate water to mares. To further ensure that adequate water is provided, the pharmaceutical manufacturer now contracts for grams of estrogen, independent of urine volume delivered, and pays all urine transportation costs.

Exercise and confinement—During the collection season, mares are periodically turned out into paddocks for free exercise. Specific turnout schedules vary between ranches and, in many cases, are based on the needs of individual mares. Although experience-based data is of limited objective use, tie-stall management has long been practiced around the world. A lack of objective data exists that defines adequate turnout requirements for pregnant mares, and critics have expressed concern regarding tie-stall management.

Studies at Linwood Equine Ranch, as well as university studies,⁸ are being conducted to obtain objective data and develop related management recommendations regarding turnout frequencies. Available results support assessing mares as individuals. Groups critical of the industry allege that tie-stall winter housing causes musculoskeletal damage. Evaluation of muscle enzymes in the serum of mares maintained in barns from fall to early spring reveals no significant muscle damage. Regardless of the turnout schedule employed, monthly inspections and veterinary review processes are designed to identify mares that need additional turnout.

Foals—There is a misconception among groups critical of the PMU industry that foals from PMU ranches are unwanted by-products that are consumed by humans overseas. Foals can actually be an important component of the ranchers' production. Currently,

most foals are intended for show, rodeo, recreation, ranch, and replacement markets. An industry demographic survey indicated that a minority of PMU ranches sell their foals at public auction.¹ Pregnant mares' urine ranches sell 50% of their foals privately, 19% at breeder production sales, and 30% at public auction. In addition, results of a 2-year survey⁹ indicated that foal mortality on PMU ranches was relatively low, and it was not different than mortality on non-PMU extensively managed facilities (6.4 versus 7.2%, respectively). On the basis of normal foaling rates among PMU mares, it is apparent that foals from the industry comprise only a small percentage of horses that go to the North American slaughter industry.

To address the well-being of foals transported to public auction, the industry has established regulations requiring a minimum weaning age of 3 months and annual trailer inspections. Management of weanlings going to public auction may be an area where additional input by veterinarians can be useful to ranchers. Selling foals at auction or to feedlots is likely to be the least-productive route for PMU ranchers. As horse breeders, the ranchers' association (North American Equine Ranching Information Council [NAERIC]) has developed several programs to further increase the quality of foals produced and their markets.¹⁰ These programs include a Breeding Enhancement Program designed to cross PMU mares with Thoroughbred stallions for the purpose of producing quality North American horses for the sport horse industry. There are also financial incentive programs for buyers who purchase and compete with NAERIC horses as registered purebreds, ranch horses, and draft horse teams.

Urine collection system—Some members of the public mistakenly believe that PMU is routinely collected by catheterization. In reality, the suspended-collection system is noninvasive, allows freedom of movement in the stall, and is managed to avoid discomfort to mares. Based on observations at Linwood Equine Ranch, most mares turned outside in paddocks will urinate in the collection unit soon after returning to the barn. Furthermore, 5 universities in the United States use the PMU collection system in their equine nutrition research programs.

Impregnation—This is a term used by groups critical of PMU collection; however, it does not accurately reflect the use of natural pasture breeding management on PMU ranches.

Education—Ranchers' national and local associations conduct meetings and produce publications as continuing education for ranchers. Recently, a veteri-

nary continuing education conference was held for practitioners working in the PMU industry.

Conclusions

The purpose of this presentation was to provide information regarding equine management in the PMU industry and describe programs designed to address concerns about the care and well-being of mares involved in the production of PMU. The industry has been a proactive leader in responding to criticisms and addressing questions regarding mare management and well-being. Ranch inspection and veterinary review programs in place should identify and correct problems that may arise. Research studies are ongoing. Data collected to date, particularly behavioral assessments yielding normal results, indicate that PMU mares can be managed appropriately for their health and well-being. This perspective is supported by the concluding statement from the AAEP, CVMA, and ILPH equine veterinarians' Consensus Report: "The public should be assured that the care and welfare of the horses involved in the production of an estrogen replacement medication is good, and is closely monitored."

*Premarin, Wyeth-Ayerst Global Pharmaceuticals, St Davids, Pa.

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