

Chronically starved horses: Predicting survival, economic, and ethical considerations

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Abstract — Nine of 45 horses subjected to prolonged malnutrition died subsequent to being placed with a responsible caregiver and being provided an appropriate diet. Initial extreme poor body condition score tended to be associated with death, although individual response to refeeding varied. The financial costs of stabilizing the group of horses significantly exceeded their free market price. Responsible management of chronically starved commercial animals should include options for immediate euthanasia.

Résumé — **Chevaux chroniquement sous-alimentés : prévision de survie, considérations économiques et éthiques.** Neuf des 45 chevaux soumis à une malnutrition prolongée sont morts après avoir été placés chez un soigneur responsable et nourris de façon adéquate. L'extrême mauvaise condition physique initiale semblait être associée à la mortalité quoique la réponse individuelle à la réalimentation ait été variable. Les frais encourus pour stabiliser le troupeau de chevaux excédaient de loin leur valeur marchande. Une gestion responsable d'animaux à valeur commerciale chroniquement sous alimentés devrait comprendre une option d'euthanasie immédiate.

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Case description

In Manitoba, the enforcement of on-farm animal welfare legislation is delivered by provincially appointed inspectors. In late April 2004, an animal welfare complaint was received by the Veterinary Services Branch (VSB) related to outdoor housed horses. The location and the animals in question were known to the enforcement officer (TW), who had inspected this group of horses 5 times in the previous calendar year. On each of previous inspections, moderate lapses of good farming practices had been identified and discussed with the caregiver. On each inspection, the caregiver had responded with corrective action to specific items that had been identified and had reported his intent to sell all the horses when market conditions improved. No previous citation or animal seizure had occurred in relation to this group of animals. The farm had been in continuous operation for over 20 y.

At the time of the April 2004 inspection, 7 horse carcasses were identified. The carcasses had been and

remained partially frozen and no scavenging was evident. The appearance of the carcasses was consistent with extreme thinness prior to death. Evidence of prolonged antemortem lateral recumbency was present for 1 carcass. The other carcasses had been moved after death. In addition, 1 yearling filly was emaciated and unable to rise.

The group of about 50 horses was confined to a 20-Ha field, without free access to buildings, although the horses were congregated near the farm buildings. Access to water was provided by a dugout. An area of 5000 m² was bedded up to 0.75 m deep with clean wheat straw, and there was initial evidence of a limited volume of hay available. The available hay was completely consumed in the 2.5-hour time period of the inspection. There was no evidence of stored feed on the premises and the caregiver confirmed that no additional hay or grain was immediately available.

The horses were in winter hair coat, consistent with outdoor management over the winter. The group appeared to have an individual body condition ranging from 2 to 5 out of a standard range of 9 body condition scores, 1 being emaciated and 9 being obese.

In the judgment of the animal care officer (TW), the live horses were suffering from lack of food, and starvation probably contributed to the death of the animals identified. Although water was available by access to the dugout, very weak animals may have not freely accessed the water because of difficulty walking through the mud at the waters edge. No wound, lameness, or overgrown

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hooves were identified on any animal inspected. The caregiver was requested to immediately euthanize the downer filly and to immediately provide additional better quality feed for the remaining animals. The caregiver made assurances that he was to receive a delivery of plastic wrapped ensiled hay bales within 72 h.

Upon reinspection 4 d later, the carcasses had been disposed of, as had the downer filly previously identified. No hay, grain, or other source of nutrients was available to the horses and no evidence was available of intent on the caregivers' part to do more than hold on until pasture was available.

Over the 96-hour period, another individual horse had died, and 3 had difficulty rising to a standing position. The difficulty in rising was characterized by reluctance to attempt to stand, and once the attempt to stand had been initiated, the individual would stay in a "dog-sitting" position for in excess of a minute before initiating forward torso momentum to rise to a full standing position. Two of the 3 affected horses made several attempts prior to rising, and 1 horse required assistance to achieve a standing position. Once standing, the 3 individuals displayed no symptoms of lameness.

Cool spring weather had delayed the growing season and it was estimated at least 40 d would be required for sufficient pasture growth to feed this group of animals where they were currently housed. The VSB took possession of the animals on April 28, under the Animal Care Act (1). The Manitoba Animal Care Act and Regulations are legislation directed at controlling certain proscribed human behavior and to relieve suffering of animals when identified.

Forty-five horses of mixed age, breed, and sex were relocated to a commercial feeding facility, which required the horses to ride in a single deck gooseneck trailer for slightly over 1 h. At the feeding facility, the animals were back tagged, photographed, and body condition scored from 1–9, as previously described (2), by the provincial horse specialist (RS) as they were processed through a chute. Unloading, individual animal identification, and condition scoring was completed in about 2.5 h.

The group was very thin with a mean BCS of 1.9 ($s = 0.67$), (10 animals initially scoring 1, 31 scoring 2, 2 scoring 3, and 2 scoring 4). There were 3 studs; 2 geldings; plus 40 mares, 16 open and 24 in foal, as estimated by udder development and abdomen size. The age of animals was not systematically evaluated.

The animals were held as a group in a single paddock, 100 m by 150 m and provided with 4 widely dispersed round bale feeders and access to 2 ice free water bowls at midpoint on opposite sides of the paddock. There was no covered protection from the elements available at this location and no other facility with better protection was available. It was decided that the group of animals was unfit for public auction and that a reliable evaluation was not possible for sale by private treaty. A decision was made to hold and feed the group at public expense for 30 d and reevaluate for disposition at that time. It was deemed that in a stable social group such as this, segregation by sex or body condition would provide little in the way of enhancing individual access to feed. The horses appeared very docile in spite of the presence of intact males. Due to heavy rains and a significant snow-

Table 1. Association between initial body condition score (BCS) and survival in 45 malnourished horses

BCS	Survival		Total
	No	Yes	
BCS 1	4	6	10
BCS > 1	5	30	35
Total	9	36	45

fall (25 cm, May 11), the feeding period was extended to 50 d. The very poor body condition was not considered compatible with immediate vaccination or antiparasite treatment, which was delayed until day 40.

As far as could be determined from the interview of the original caregiver, the horses had survived the winter, primarily consuming clean wheat straw of the most recent harvest. Previous vaccination and antiparasite treatment could not be determined with any degree of confidence. The generally thin condition and full abdomen of individuals in the group were consistent with lack of capacity for individuals to consume enough straw to meet daily minimum energy requirements. Initial feeding commenced with a free-choice forage diet, starting with medium quality long-stem hay with the intent to proceed with better quality feeds as the horses adapted.

Horses were located proximal to the residence to allow for twice daily or more frequent observation. Ten days after introduction of free choice hay, limited feeding of locally available barley-corn silage was introduced. The feedlot manager reported the initial acceptance of silage was associated with horses in better body condition at the time of relocation. No colic, diarrhea, or other digestive upset was identified in any individuals during the 50-day refeeding period. An outbreak of upper respiratory disease, associated with nasal discharge and increased respiratory rate, affected about 1/3 of the individual horses between day 5 and day 10 of the refeeding period.

Nine horses in this group died 7.9 ± 6.3 d subsequent to the initiation of refeeding (range 1 to 19 d). The 3 horses identified as having difficulty rising on April 28 did not become recumbent during transport but died within 48 h. One mare (BCS-2) died during parturition, 11 d subsequent to movement. One clinically affected stud (BCS-2) died during the outbreak of upper respiratory disease. Death in the other 4 horses was characterized only by progressive weakness and difficulty in rising, while maintaining a moderate interest in eating. Weak horses unable to rise after 24 h were euthanized. All the animals that died retained back tags to the point of death and were identified. Postmortem examinations were not done.

After 50 d of feeding, the 36 surviving animals were reprocessed, as previously described, and each was body condition scored by the same individual. No discussion of the value of the previous BCS occurred during the 2nd scoring exercise. At this evaluation, the mean BCS of this survivor group ($n = 36$) had increased from 2.0 ($s = 0.68$) to 2.6 ($s = 1.02$), with 14 individuals not changing score, 15 improving by 1 BCS, 3 improving by 2 BCS, and 1 improving by 3 BCS. Three animals

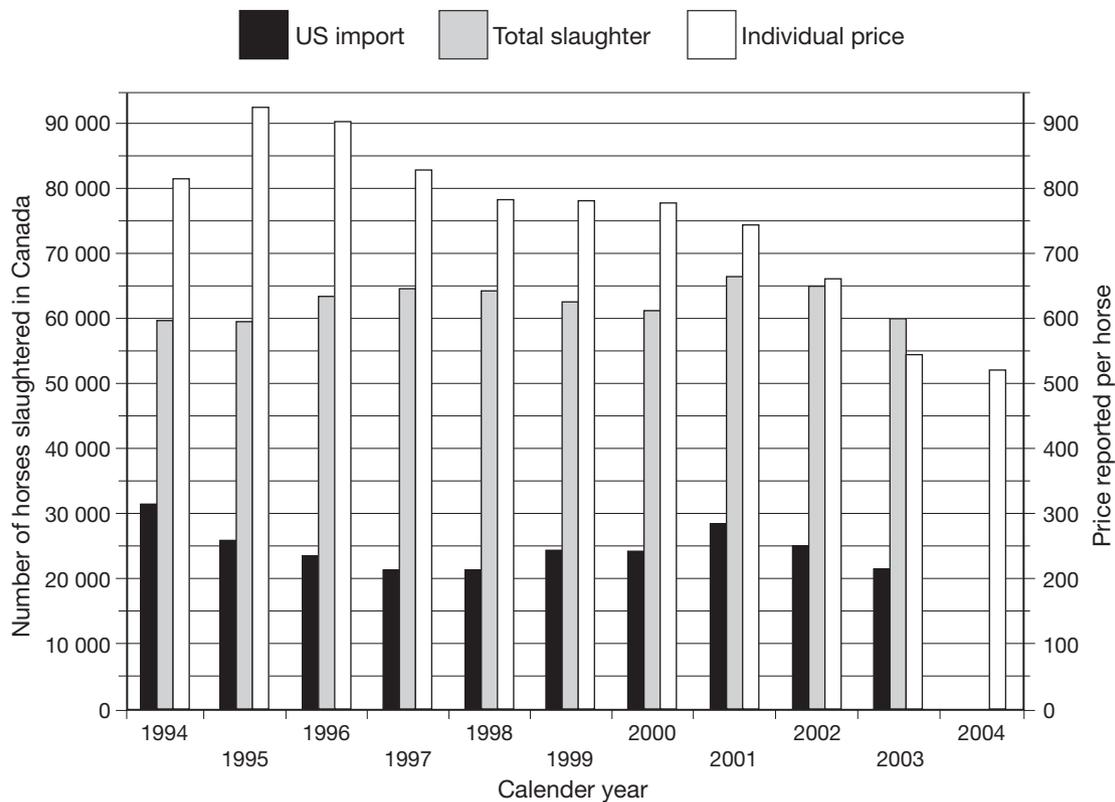


Figure 1. Horses slaughtered in Canada per year. Black bar is number of horses imported for immediate slaughter from the United States, left-Y-axis (9). Grey bar is the total number of horses slaughtered in Canada, left-Y-axis (10). Open bar is average per horse price of US origin slaughter horses per year (9) adjusted to 2004 Canadian dollars using the Bank of Canada inflation calculator available at http://www.bankofcanada.ca/en/inflation_calc.htm. Stable annual import volume from the USA over this time period would suggest there is an equivalent over time drop in slaughter horse price in the northern US, as has occurred in Canada. The 2004 price data is from January to May only.

initially scored as BCS-2, scored BCS-1. Six of the 24 mares in foal had foaled by June 8, and 3 of the foals survived more than 72 h.

Detailed financial accounts of the cost of this enforcement action were kept, the cash cost per horse seized and held for 50 d, including transport, carcass disposal, use of a dedicated paddock, feeding, medication, and anti-parasite treatment, was \$226.76. No cost estimate was made for officers involved in the management of the case. Only about a quarter of the cash cost was recovered from the sale of the horses at the end of 50 d maintenance (\$54.72 per survivor).

Data evaluation

Statistical analysis was done in a computer spreadsheet program (Excel; Microsoft Corporation, Redmond, Washington, USA), odds ratio and confidence intervals were calculated as previously described (3). In considering the mares as a separate group, pregnancy status was not associated with subsequent mortality (OR 0.14, 95% CI 0.23 to 5.62).

A trend was identified for individuals having an initial BCS of 1 to be more likely to die during the refeeding period than individuals with a BCS of 2 or better ($\chi^2 = 3.21$, $P < 0.10$, $df = 1$, OR 4.0, 95% CI 0.82 to 19.4) (Table 1).

Small sample size makes this data set very susceptible to classification error in the BCS. Classification error may also be more common at the very extreme ends of the BCS scale. Assuming there was an error classifying in a single horse that went on to die as BCS-2 instead of BCS-1, a recalculated $\chi^2 = 5.90$, ($P < 0.025$, OR 6.26, 95% CI 1.29 to 30.3) would indicate that BCS-1 was statistically associated with a failure to survive. Alternatively, if the 2 horses with BCS-2 that died with concurrent risk factors, parturition and respiratory disease, are removed from the data set, leaving 43 animals, a BCS-1 is associated with a risk for death, ($\chi^2 = 5.38$, $P < 0.025$, OR 6.67, 95% CI 1.18 to 37.8).

Discussion

This case review is opportunistic in nature and not based on a randomized or representative sample of horses, but reflects an enforcement action.

Chronically starved horses frequently respond poorly to refeeding, even with diets designed to restrict immediate carbohydrate availability (4–6). About 20% of severely malnourished horses can be expected to die in spite of attempts at refeeding (4). In this case, the unremarkable response to a significant time period of refeeding is consistent with previous information

indicating that recovery of severely malnourished horses to an average body condition may require between 6 and 10 mo (6).

Body condition scoring of individual horses is widely used in Manitoba and requires palpation of specific bony prominences of the horse (2). This case demonstrates that the BCS, when used appropriately, may provide some information related to probable survivability in severely emaciated horses given conservative treatment. The use of BCS was not sufficiently predictive in this case to have allowed for the selection of individual animals that were most likely not to survive for more aggressive treatment.

Attempting to estimate BCS in horses by visual inspection without bony prominence palpation was a source of inspector error in the investigation of this welfare case. Assigning a range of BCS to a group by visual inspection overestimated the true average value in this group of very thin horses.

In human starvation, a "refeeding syndrome" has been described where emaciated patients given concentrated caloric supplement may become clinically ill with serious metabolic disturbance, including liver failure, neurological signs, and die within 3 to 5 d (7). Some metabolic characteristics of this syndrome in refeed starved horses have been described previously (8). In this case, the hallmark neurological symptoms were not identified and the mean time to death was 7.9 d (range 1 to 19 d), which is much longer than is typical of the refeeding syndrome in humans.

Economic considerations may have contributed to the development of starvation in this group of horses. The price of feeder horses in Manitoba had depreciated significantly in the 2 y prior to this event. Feeder horses in western Canada, depending on body condition and type, generally sell for \$250.00 to \$350.00 less than slaughter value. Feeder horses are sold at public auction and weekly trends in selling price are known. The price of Canadian slaughter horses is not readily available, as they are generally sold by private treaty or other longterm contractual agreement. The market price of horses for immediate slaughter from the USA is public information; and the 2003 to 2004 average price was depreciated 35% to 40% over the 1998 to 2001 average price (9) (Figure 1).

The total number of horses slaughtered in Canada per year has not changed significantly during the period 1999 to 2004, remaining around 62 000 animals, with about 40% of them originating in the United States (10).

In the years 1998 to 2001, 400 kg youthful, good meat type, feeder horses with a BCS of 4 to 5 would sell at Manitoba auction for \$650.00. During the spring of 2004, this type of horse was being sold at auction for between \$150.00 and \$180.00, thin horses and cull breeding stock sold for less.

This case raises some significant ethical problems for animal welfare enforcement agencies in the handling of large numbers of low value malnourished commercial animals. Animal seizure is not a punitive measure against the caregiver. In considering enforcement options, animal suffering must be present or imminent prior to property based intervention (animal rescue). In addition to the presence of suffering, in order to justify seizure, the

officer must believe the caregiver to be either unwilling or unable to take the appropriate corrective action.

The legal obligation of caregivers under the Act is relief of pain and distress, and the provision of veterinary care. In this case, treatment options were constrained by the number of horses involved, availability of suitable housing, uncertainty as to the benefits of more aggressive treatment, uncertainty as to which individuals were most critical, and financial constraints on the department. In addition, the best veterinary medical care for the malnourished horse is not well documented (4–6).

At the time of the seizure, the horses were identified as grade animals of low monetary value and a financial deficit in managing the case had been anticipated. The loss of public monies could have been minimized by immediate euthanasia of a portion of, or all of, the animals. Low or negative market value can occur as a result of drought or similar natural disaster (11) or where there is a disruption in market channels due to trade embargos (12). In this case, low market price, combined with the caregivers refusal to accept that price and sell stock, was a significant risk factor for the development of poor animal welfare.

The enforcement officers' reluctance to recommend mass euthanasia of otherwise healthy horses was based primarily on personal aversion. Aversion to the killing of healthy companion animals is common within the veterinary profession and is an issue of active ethical debate (13). In food animal practice, the purpose of healthy animals is to be killed and used to provide wholesome food for human consumption. The killing of healthy food production animals where no use is made of them, such as in foreign animal disease eradication has resulted in public criticism of livestock production systems in Europe (12).

In commercial livestock production, maintaining quality of life for the individual animal is clearly an ethical responsibility of producers. For food producing animals, the length of animal life is not an ethical question, as long as humane killing is assured. Although horses are killed for human consumption for the export trade (10), horses are not generally considered a food animal in Canada. The attitude of society to horses, reflected in the management of this case, combines both affective attributes usually associated with companion animals and utilitarian attributes usually associated with commercial animals (14). The Animal Care Act recognizes this distinction between companion and commercial animals in the administration of the regulations and defines horses as a commercial animal.

Where commercial or cull livestock are concerned, future policy direction may require a balance between fiscally responsible management of welfare cases and what is considered acceptable to the public at large. Euthanasia may be the fiscally prudent option for seized or abandoned livestock in instances where the market value of the animals is low.

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