APHIS Info Sheet

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Trends in Biosecurity Practices on U.S. Equine Operations, 1998—2015

Biosecurity practices are vital to the health of domestic animals and to preventing infectious disease spread. Biosecurity practices include measures that reduce the risk of introducing disease agents to an operation. These measures include insect control, limiting domestic animals' contact with wildlife, isolating animals when they arrive or return to an operation, vaccination, and proper sanitation practices.

One priority of the U.S. Department of Agriculture's National Animal Health Monitoring System's (NAHMS) Equine 2015 study was to compare changes in biosecurity practices used on equine operations from 1998 to 2015. To do so, data from two previous NAHMS equine studies conducted in 1998 and 2005 were compared with data from the Equine 2015 study.

All three studies represented at least 70 percent of U.S. equids and at least 70 percent of U.S. farms with equids during their respective study years.[1]

General practices

General management practices that affect biosecurity on equine operations include contact with other animals, potential contamination of feed or water sources, and insect control.

Contact with other animals

Several diseases, such as *Salmonella* and rabies, can be transmitted to equids via other animals. Implementing biosecurity measures when or before contact between equids and other animals occurs can help prevent disease transmission and ensure a more timely response to a disease outbreak.

Across all study years, the highest percentages of operations reported that dogs or cats had physical contact with resident equids[2] or their feed across all study years.

The percentage of operations on which poultry had direct contact with resident equids or their feed increased from 13.4 percent in 1998 to 19.2 percent in 2015 (table 1). The percentage of operations on which cattle had direct contact with resident equids or their feed increased from 34.1 percent in 1998 to 42.9 percent in 2015. These increases in equid contact with poultry and cattle might be due to the increase in study participation by operations with a primary function of farm or ranch in 2005 and 2015 (40.3 and 39.5 percent of participating operations, respectively) than in 1998 (30.1 percent). Farm or ranch operations likely have cattle and/or poultry.

Table 1. Percentage of operations on which the following animals had physical contact with resident equids or their feed, by study

	Percent Operations		
Animal	**Equine '98**	**Equine 2005**	**Equine 2015**
Dogs	77.9	76.9	75.2
Cats	67.7	66.4	62.5
Cattle	34.1	43.2	42.9
Poultry	13.4	18.6	19.2
Sheep/goats	11.4	13.9	15.0
Pigs*	3.7	4.7	6.0
Llamas/alpacas	1.5	2.4	2.6
Emus/ostriches	1.0	1.2	0.8

*In 2015, this category was called "domestic pigs."

[1]For more details on study design for 1998, 2005, and 2015, see the descriptive reports available on the NAHMS Web site: (www.aphis.usda.gov/nahms).

[2]In all three studies, a resident equid was defined as an equid that spent or was expected to spend more time at the operation than at any other operation. The operation was its home base.

Feed and water management

Contaminated feed or water are potential routes of infection for equids. Possible methods of contamination include rodents accessing feed storage areas and shedding disease agents or manure runoff into a water source.

For operations that fed grain/concentrate, the percentage of operations that stored grain/concentrate in a manner to prevent fecal contamination by mice or rats increased from 77.6 percent in 1998[3] to 88.9 percent in 2015.

The main sources of drinking water for equids were similar in 1998, 2005, and 2015; well water was the predominant source of water for equids on more than half the operations in all three studies (table 2).

Table 2. Percentage of operations by predominant source of drinking water for resident equids during the previous 12 months, by study

	Percent Operations		
Drinking water source	**Equine '98**	**Equine 2005**	**Equine 2015**
Well	58.9	57.5	55.5
Public/municipal water supply	17.2	18.9	23.2
Surface water (pond, stream, river, or cistern)	18.2	18.1	16.0
Spring	5.2	5.4	5.0
Other	0.5	0.1	0.3
Total	100.0	100.0	100.0

Surface water (e.g., rivers, streams, lakes) presents the greatest concern of exposing equids and livestock to disease because it is difficult to control the quality of water in these sources; about 18 percent of operations in 1998 and 2005 used surface water as the primary water source for equids, and 16.0 percent used surface water as a primary water source in 2015.

Insect control

Insect control is vital to the health of equids because insects can transmit disease agents through biological means (the agent needs the insect to mature and/or reproduce and then is transmitted to an equid by the insect) and mechanical means (the agent is carried on the body of the insect and transmitted to an equid). Eastern/Western equine encephalitis and West Nile virus are diseases that insects can transmit biologically to equids. Equine infectious anemia (EIA) and *Salmonella* are diseases for which insects serve as mechanical vectors. Large infestations of insects can weaken an equid's immune system. In all three studies, approximately 9 of 10 operations practiced some form of insect control. The listed methods of insect control in table 3 were not mutually exclusive, as operations could have used various combinations of control.

Insect repellent applied to equids was the method of insect control used by the highest percentage of operations in all three studies, although its use decreased from 86.5 percent of operations in 1998 to 73.1 percent in 2005 and remained similar in 2015 at 76.0 percent (table 3). The percentages of operations that used insecticides applied in or near equine housing areas or applied insecticides on pastures increased from 1998 to 2005 and was similar in 2005 and 2015. Participants in the 1998 study listed several methods of insect control not included in the study questionnaire: bug zapper, fly sheet on equids, mosquito treatment in drinking water, water container emptied at least weekly, frequent removal of manure and weeds from premises, and screened-in stalls. These methods were added to the 2005 and 2015 questionnaires, and two of them (water container emptied and refilled with fresh water at least weekly and frequent removal of manure and weeds) were used by the second and third highest percentages of operations The insect control methods added to 2005 and 2015 questionnaires likely account for the decrease from 1998 to 2015 in the percentage of operations that listed "other" as a method of insect control.

[3]In 1998, the questionnaire asked if feed was stored in rodent-proof containers, and the change from more specific to less specific wording might account for some of the increase.

Table 3. Percentage of operations on which the following insect-control methods were used during summer, by study

	Percent Operations		
Method	**Equine '98**	**Equine 2005**	**Equine 2015**
Repellents applied to equids	86.5	73.1	76.0
Water container emptied and refilled with fresh water at least weekly	NA	58.5	58.7
Frequent removal of weeds and manure from premises	NA	51.3	51.8
Insecticides applied in or near equine housing area	26.1	36.0	36.8
Face mask on equid	32.3	27.2	32.6
Sticky tape	26.7	20.9	31.8
Fly sheets on equid	NA	7.3	14.6
Parasitic wasps specifically brought onto operation[1]	2.4	3.1	10.1
Bug zapper	NA	8.4	8.6
Mosquito treatment in drinking water (mosquito dunks)	NA	6.3	8.3
Insecticides applied to pasture areas	1.2	5.5	7.4
Insect control product in feed, such as using Equitrol®[2]	2.8	5.6	7.0
Fly tags attached to equine halters	3.5	4.1	4.5
Regional control program, such as aerial spraying	2.5	4.1	4.0
Screened-in stalls	NA	2.4	3.5
Other	13.1	5.9	2.0
Any	91.3	88.9	88.7

[1]In 2015, choice was insect predators specifically brought onto operation.
[2]In 2015, choice was insect control product in feed or as feed through.

Practices related to the introduction of new equids

Introducing equids to an operation can pose a risk of disease introduction, depending on the new equids' health status and the precautions taken to reduce risk of disease spread. Data were collected on operations that introduced either a nonresident equid[4] and/or a new resident equid[5] to their operation in the previous 12 months. The percentage of operations that introduced a nonresident and/or new resident equid to the operation decreased from 50.4 percent in 1998 to 27.4 percent in 2015.

For operations that introduced equids in 1998, an average of 0.8 nonresident and/or new resident equid was introduced for each resident equid on the operation. In 2005, approximately one (0.95) nonresident and/or new resident equid was introduced to the operation for each resident equid. In 2015, an average of only 0.63 nonresident and/or new resident equid was introduced for each resident equid. The decrease in 2005 could be due to decreased movement of equids onto operations and/or equids living longer on an operation, resulting in a lower number of needed replacements.

Nonresident equids

The percentage of operations with 0, 1 to 9, and 10 or more nonresident equids that stayed fewer than 30 consecutive days was similar in 1998, 2005, and 2015 (table 4). Approximately 8 of 10 operations from 1998 to 2015 had no nonresident equid visitors during the previous 12 months. For operations that had nonresident equid visitors, the majority had fewer than 10 nonresident equids visit during the previous 12 months.

Table 4. Percentage of operations by number of nonresident equids that stayed for fewer than 30 consecutive days during the previous 12 months

	Percent Operations		
Number nonresident equids	**Equine '98**	**Equine 2005**	**Equine 2015**
0	79.1	81.0	82.3
1 to 9	15.4	14.7	12.7
10 or more	5.5	4.3	5.0
Total	100.0	100.0	100.0

Methods that reduce the risk of nonresident equids introducing disease agents to an operation include evaluating the health status of nonresidents (e.g., physical exams, preventive treatments, testing requirements), vaccination and deworming, and quarantine or isolation prior to contact with resident equids.

[4]A nonresident equid was defined as an equid that visited the operation for fewer than 30 consecutive days during the previous 12 months.

[5]A new resident equid was defined as a purchased animal, a new boarder, or other acquired equid considered from that point on to be a resident of the operation.

For operations that had nonresident equids that stayed fewer than 30 consecutive days, the percentages of operations that implemented the health requirements listed in table 5 for nonresident equids were similar in 1998, 2005, and 2015. Across studies, the health requirements for nonresident equids implemented by the highest percentages of operations at least some of the time were a Coggins or other test for EIA, vaccination within the past year, and deworming within the past year. In 2005 and 2015, three choices were added to the questionnaire's health-requirement category: screening test for strangles or history of no occurrence in the past 6 months, other past medical history from the owner, and quarantine prior to contact with resident equids. These additions could explain the decrease in the percentage of "other" health requirements from 1998 to 2015.

Table 5. For operations with nonresident equids that stayed for less than 30 consecutive days during the previous 12 months, percentage of operations on which the following health requirements were always or sometimes implemented for the majority of nonresident equids, by study

	Percent Operations		
Health requirement	**Equine '98**	**Equine 2005**	**Equine 2015**
Coggins test (EIA test)	50.2	45.3	49.0
Vaccination within past year	43.5	36.3	38.9
Deworming within past year	43.2	33.6	37.0
Official health certificate, i.e., certificate of veterinary inspection (CVI)	31.9	24.8	32.3
Other past medical history from owner	NA	21.8	22.9
Quarantine prior to contact with resident equids	NA	17.2	22.4
Veterinary examination other than CVI	30.7	18.4	20.8
Screening test for strangles or history of no occurrence in past 6 months	NA	9.7	14.4
Other	10.6	3.8	2.5

New resident equids

The percentage of operations that added new resident equids decreased across the three studies (table 6), and the percentage of resident equids added decreased from 1998 to 2005, but was similar in 2005 and 2015.

Table 6. Percentage of operations that added new resident equids during the previous 12 months and percentage of equids added, including foals not born to a resident mare (excluding births)

Measure	**Equine '98**	**Equine 2005**	**Equine 2015**
Percent operations	40.5	21.5	15.4
Percent resident equids*	11.3	6.3	5.8

*(Total number of equids added to resident equine population)/(total resident equine inventory) x 100.

For all three studies, about two-thirds of the operations that added new resident equids during the previous 12 months required a Coggins or other test for EIA for new additions some or all of the time (table 7).

Table 7. For operations that added new resident equids during the previous 12 months, percentage of operations that always or sometimes implemented the following health requirements for new additions, by study

	Percent Operations		
Health requirement	**Equine '98**	**Equine 2005**	**Equine 2015**
Coggins test (EIA test)	67.2	61.8	65.9
Deworming within past year	65.8	48.9	58.9
Vaccination within past year	57.0	49.2	58.7
Official health certificate (CVI)	53.1	34.6	46.8
Quarantine prior to contact with resident equids	NA	32.0	44.0
Other past medical history from owner	NA	36.3	43.1
Veterinary examination other than CVI	45.1	29.2	38.3
Screening test for strangles or history of no occurrence in past 6 months	NA	14.2	20.0
Other	13.0	5.0	1.8

A higher percentage of operations in 2015 than in 2005 implemented most of the health requirements listed in table 7. Vaccination and deworming remained common requirements. The percentage of operations that required a Certificate of Veterinary Inspection (CVI) or other veterinary examination increased from 2005 to 2015. As noted previously, three additional choices for health requirements were added in 2005 and 2015: screening test for strangles or history of no occurrence in past 6 months, other past medical history from owner, and quarantine prior to contact with resident equids. The health requirement choices were not mutually exclusive, so it is unlikely that responses to the first five categories were influenced by the new choices. The percentage of "other" requirements decreased from 13.0 percent in 1998 to 5.0 percent in 2005, likely because of the above-mentioned choices added to the 2005 questionnaire.

Health requirements for nonresidents compared with those for new resident additions

As mentioned before, nonresident equids and new additions can introduce disease to resident equids. A comparison of health requirements used for nonresident equids with health requirements used for new additions shows that a higher percentage of operations that added new resident equids than operations that had nonresident visitors implemented each health requirement listed in table 7.

It should be noted that across all three studies about one-fifth of operations that introduced any equids to the operation introduced both a nonresident equid and a new resident equid, which was considered in the calculations for each group. Discrepancies in biosecurity methods used for nonresident equids and new resident equids could be due to the general differences in requirements between operations that had only nonresident equids (19.6, 36.0, and 43.4 in 1998, 2005, and 2015, respectively) and operations that introduced only new resident equids (58.5, 43.3, and 35.4, in 1998, 2005, and 2015, respectively) out of all operations that introduced an equid to the operation. Additionally, an operation may have had more control in how new resident equids were managed than in how visiting equids were managed, as the operation was likely the owner of new equids. Differences in perceived disease risks posed by visiting equids versus those that became residents might also be an explanation; however, there is not necessarily a difference in the risk of disease introduction between these two populations. Thus, operations should aim to implement equal biosecurity measures for nonresident visiting equids and newly introduced resident equids.

Practices related to contact with equids off the operation

Equids that leave the home operation and have contact with outside equids may be exposed to disease agents and introduce these agents to the home operation upon return. Isolating returning equids is one way to prevent this type of disease introduction.

The percentage of operations on which resident equids left the home operation and returned after having direct contact with outside equids decreased from 87.3 percent in 1998, to 75.1 percent in 2005, and to 63.0 percent in 2015.

For operations with resident equids that left the home operation and returned after direct contact with outside equids, the percentage of operations that routinely isolated returning equids was similar in all three studies (table 8). The percentage of operations that isolated returning equids due only to disease or exposure to disease increased across studies: 15.8 percent in 1998, 26.0 percent in 2005, and 44.4 percent in 2015. The percentage of operations that never isolated returning equids decreased from 72.3 percent in 1998 to 60.6 percent in 2005 and to 39.7 percent in 2015. The large increase in the percentage of operations that isolated returning equids for a cause such as disease or exposure to disease could be explained by greater owner knowledge of infectious disease signs, biosecurity practices, and the disease occurrences or outbreaks that could affect their equids.

Table 8. For operations that had resident equids that left the home operation and returned after direct contact with outside equids, percentage of operations by infection control method(s) used for returning equids, by study

	Percent Operations		
Practice	**Equine '98**	**Equine 2005**	**Equine 2015**
Only isolate returning equids for a cause such as disease or exposure to disease	15.8	26.0	44.4
Never isolate returning equids	72.3	60.6	39.7
Routinely isolate returning equids	11.9	10.6	11.5
Quarantine before arrival at home operation	NA	2.8	4.4
Total	100.0	100.0	100.0

Summary

Biosecurity practices are necessary to protect equids from disease exposure and to prevent disease spread on an operation or from one operation to another. Limiting the introduction of disease agents by decreasing equids contact with other animals, contaminated feed or water, insects, and outside equids is essential to keeping infectious disease off an operation. In the event that an infectious agent is introduced to an operation, routine vaccination and deworming and isolation of affected equids can prevent further disease spread. The application of biosecurity practices leads to fewer health issues for equids and helps avoid movement and show restrictions on animals.

For more information on trends in the U.S. equine industry see the NAHMS descriptive report “Changes in the U.S. Equine Industry, 1998–2015” at the NAHMS Web site: (www.aphis.usda.gov/nahms).

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