

# Equine Infectious Anemia



## What is Equine Infectious Anemia?

Equine infectious anemia (EIA), also known as swamp fever, is a viral disease of horses, donkeys and mules around the world. It is closely related to other lentiviruses such as the human immunodeficiency virus (HIV), feline immunodeficiency virus (FIV) and bovine immunodeficiency virus (BIV). EIA affects horses' immune systems; however, it has never been reported to pose a threat to human health. Like other lentiviruses, this virus integrates itself into the host's genome and consequently, there is no vaccine or cure—horses remain infected for life. While most infected horses don't show any symptoms, this lifetime carrier status means they will continue to be a threat to the health of other horses.

The EIA virus reproduces in white blood cells throughout the body of the horse. White blood cells, or leukocytes, are cells of the immune system involved in defending the body against infectious disease. Virus particles attach to red blood cells which are then attacked and destroyed by the immune system, leading to anemia. Inflammation associated with the viral infection may damage vital organs, such as bone marrow, liver, heart and kidney. Secondary infections (e.g. pneumonia) may occur due to subsequent immune suppression. Horses infected with EIA virus may die from the direct effects of the virus or from secondary infections.



Horses on pasture  
Saskatchewan Ministry of Agriculture

## EIA in Canada

The first case of EIA was recorded in North America in the 1880s in the state of Wisconsin and subsequently spread across the continent. Over the last century cases have been detected in most parts of Canada, including the Yukon Territory.

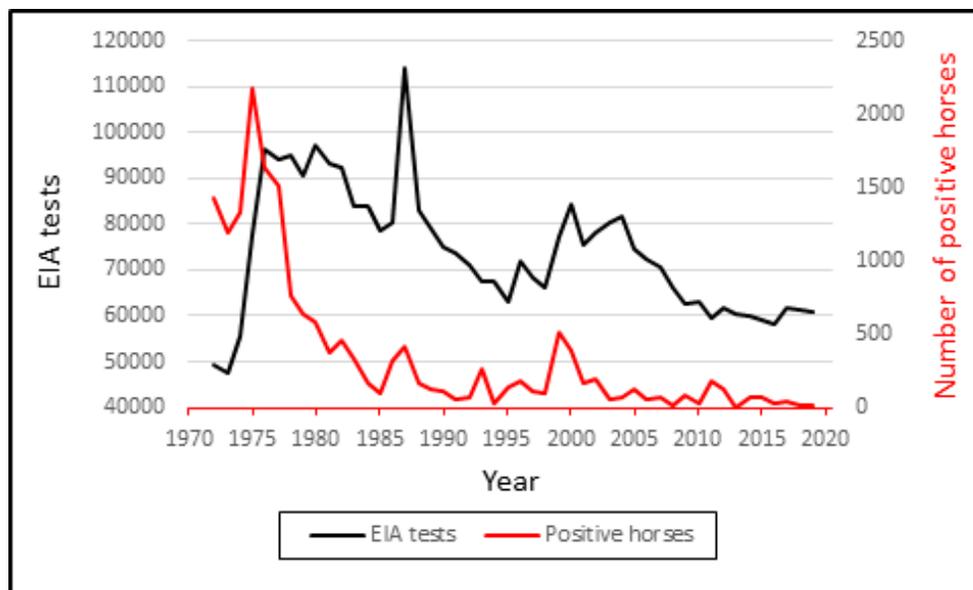


Figure 1: EIA tests and positive reactors in Canada, 1972-2019.

Until 1970, EIA was diagnosed primarily by clinical signs due to a lack of diagnostic tests. The development of the first accurate laboratory procedure for diagnosing the disease in 1970 led to the widespread application of EIA control programs across North America. In 1971, EIA was named a reportable disease in Canada and a national control program was implemented.

During the first year of the control program, over 1,400 cases of EIA were detected in Canada (2.9 per cent of all horses tested; (Figure 1), (Table 1). The number of positive cases detected peaked in 1975 with almost 2,200 confirmed cases of EIA. From 1976 onwards, the success of the control program became evident as fewer cases were detected each year. In 2010, only 23 infected horses were detected across all of Canada (0.04 per cent of all horses tested); however, an outbreak in 2011 resulted in the detection of 179 cases in Western Canada. Numbers have slowly decreased over the following years and have now returned to near pre-2011 levels.

Despite the best efforts of the horse industry and governments, EIA continues to be detected in Western Canada, particularly in the northern parts of British Columbia, Alberta and Saskatchewan, as well as in the Yukon territory. Periodic increases in occurrence point to pockets of infection that harbour the virus in the equine population.

Table 1: EIA tests and positive reactors in Canada, 1972-2019.

| Year | EIA tests | Positive horses | Year | EIA tests | Positive horses |
|------|-----------|-----------------|------|-----------|-----------------|
| 1972 | 49,114    | 1424            | 1996 | 71,810    | 179             |
| 1973 | 47,599    | 1190            | 1997 | 68,347    | 111             |
| 1974 | 55,592    | 1334            | 1998 | 66,177    | 96              |
| 1975 | 77,581    | 2172            | 1999 | 77,222    | 510             |
| 1976 | 96,389    | 1639            | 2000 | 84,217    | 384             |
| 1977 | 94,339    | 1509            | 2001 | 75,305    | 161             |
| 1978 | 94,815    | 759             | 2002 | 78,183    | 193             |
| 1979 | 90,739    | 635             | 2003 | 80,506    | 58              |
| 1980 | 97,168    | 583             | 2004 | 81,925    | 69              |
| 1981 | 93,202    | 373             | 2005 | 74,765    | 121             |
| 1982 | 92,524    | 463             | 2006 | 72,402    | 54              |
| 1983 | 83,913    | 336             | 2007 | 70,590    | 64              |
| 1984 | 83,793    | 168             | 2008 | 65,978    | 18              |
| 1985 | 78,617    | 94              | 2009 | 62,604    | 78              |
| 1986 | 80,464    | 322             | 2010 | 63,205    | 23              |
| 1987 | 113,979   | 410             | 2011 | 59,628    | 179             |
| 1988 | 83,178    | 166             | 2012 | 61,806    | 130             |
| 1989 | 79,116    | 127             | 2013 | 60,524    | 113             |
| 1990 | 75,248    | 105             | 2014 | 60,029    | 68              |
| 1991 | 73,741    | 52              | 2015 | 59,236    | 74              |
| 1992 | 70,984    | 71              | 2016 | 58,275    | 27              |
| 1993 | 67,551    | 264             | 2017 | 61,837    | 37              |
| 1994 | 67,356    | 29              | 2018 | 61,338    | 14              |
| 1995 | 62,972    | 135             | 2019 | 60,810    | 20              |

## EIA in Saskatchewan

Province-level statistics on EIA cases are available from 1993 onwards. With the exception of four cases in 2009, EIA was not detected in Saskatchewan between 2004 and 2011 (Table 2). This situation changed in 2011, when 102 EIA-infected horses were found on 15 different premises, the beginning of a disease outbreak that would continue for several years (Figure 2). After a number of years of little or no activity, this spike in EIA incidences shows that the virus continues to circulate in some horse populations. These infected horses serve as a source of infection, threatening the rest of the provincial horse population.

Voluntary testing rates are low, which reduces the potential for detecting carrier animals. For example, in 2015, horse owners voluntarily tested fewer than 2,800 of Saskatchewan's estimated 125,000 horses (Equine Canada, 2010)—less than three per cent of the total population.

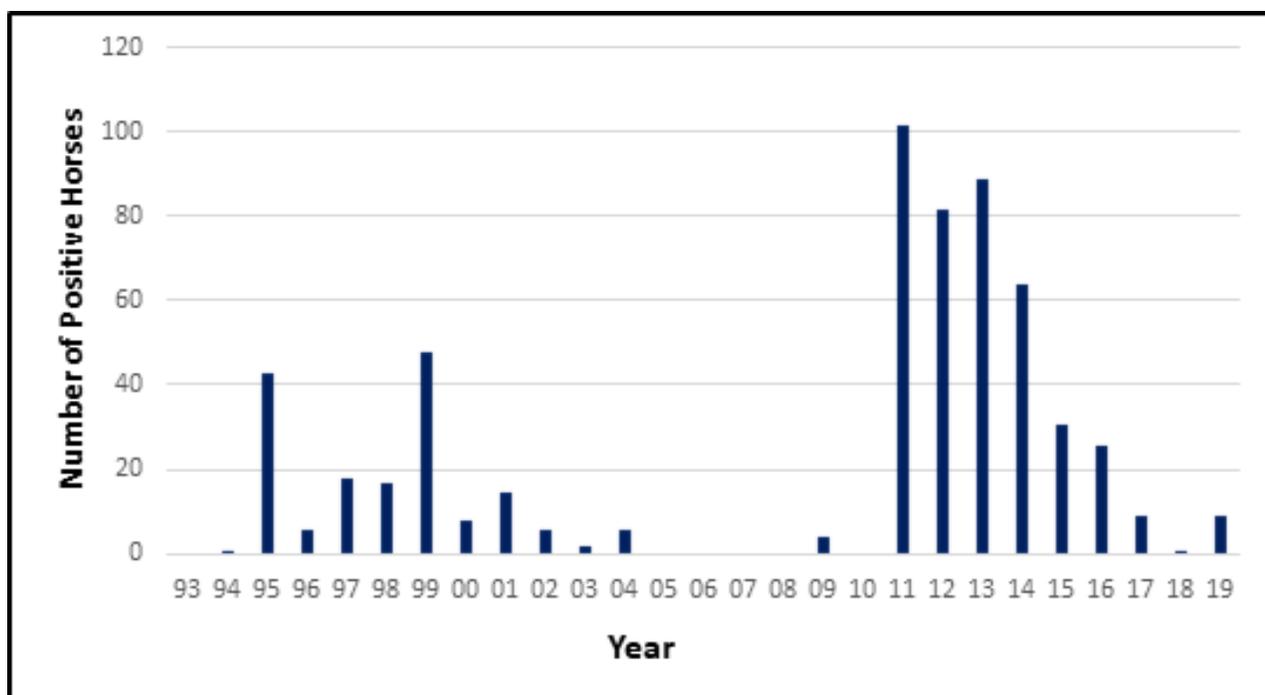


Figure 2: Number of EIA cases detected in Saskatchewan, 1993-2019.

Table 2: EIA tests and positive reactors in Saskatchewan, 1993-2019.

| Year | EIA tests | Positive horses | Year | EIA tests | Positive horses |
|------|-----------|-----------------|------|-----------|-----------------|
| 1993 | 2036      | 0               | 2007 | 2808      | 0               |
| 1994 | 3562      | 1               | 2008 | 2640      | 0               |
| 1995 | 4119      | 43              | 2009 | 2455      | 4               |
| 1996 | 8201      | 6               | 2010 | 2215      | 0               |
| 1997 | 5302      | 18              | 2011 | 1565      | 102             |
| 1998 | 3460      | 17              | 2012 | 3750      | 82              |
| 1999 | 8933      | 48              | 2013 | 2522      | 89              |
| 2000 | 7662      | 8               | 2014 | *2101     | 64              |
| 2001 | 5524      | 15              | 2015 | *2742     | 31              |
| 2002 | 5312      | 6               | 2016 | *5491     | 26              |
| 2003 | 5912      | 2               | 2017 | *3736     | 9               |
| 2004 | 5024      | 6               | 2018 | *3671     | 1               |
| 2005 | 3032      | 0               | 2019 | *3877     | 9               |
| 2006 | 2977      | 0               |      |           |                 |

\*Represents voluntary tests only; data from previous years includes voluntary and non-voluntary testing.\



Horse fly  
Photo courtesy of Dennis Ray

### How is EIA Transmitted?

The EIA virus is most commonly transmitted by blood. Biting insects, such as deer and horse flies, are important vectors for the virus. As well, people who reuse needles or use medical equipment without proper disinfection are responsible for transmission from infected horses to non-infected horses. The amount of virus present in the blood varies depending on the stage of disease. For example, more virus is present during acute episodes as compared to the chronic stage. Therefore, the risk of transmission from one horse to another is highest during an acute episode. Risk of transmission also increases with the amount of blood transferred. For example, re-

using the same needle on multiple horses will transfer more blood than a single small insect bite. The virus will also survive much longer on reused needles than it will on insects' mouthparts.

The virus does not multiply in the insect but is passed from one horse to another mechanically on the insect's mouthparts as it feeds. The bites of these flies are painful, and the animal's reaction interrupts feeding. The fly attempts to resume feeding immediately, either on the same animal or on another nearby horse, resulting in the transfer of infectious blood. These flies usually do not travel more than 200 metres from their food source, therefore the virus is less likely to be spread to more distant horses.

Because these insects reproduce in wet areas, outbreaks of EIA have often been associated with pasturing in swampy areas, hence the name, swamp fever. However, the disease is not limited by geography and can be found in drier climates as well.



Deer fly  
Photo courtesy of Bruce Marlin

Another means of blood transmission is the practice of reusing needles and syringes. In the past, this was probably the primary method by which EIA spread from horse to horse. Reusing needles should no longer be common practice and the assumption is that EIA transmission now occurs mainly as a result of biting insects. Other blood-contaminated equipment such as dental floats, tattooing equipment and rectal sleeves can also spread the virus. The virus can pass from mare to foal during pregnancy or during nursing. Venereal transmission may be possible as well, since the virus can be found in semen. For this reason, stud horses are usually required to be tested and shown to be free of EIA. The virus is not found in urine or saliva.

### What is the Incubation Period?

The virus' normal incubation period is one to three weeks, but clinical disease may take as long as three months to develop. Although some horses do not develop clinical disease, most infected horses will develop antibodies which can be detected seven to 14 days after infection and last for life. Occasionally, some horses take up to 45 days to develop detectable EIA antibodies. If a horse is infected but tested before antibodies develop, the test will be negative.

### What Are the Clinical Signs?

The clinical signs of EIA can vary considerably depending on disease stage:

**Acute:** The acute form is the first onset of the disease. Clinical signs include high fever, anemia, weakness, swelling of the lower abdomen and legs, weak pulse, heart arrhythmias, thirst, perspiration, debility and depression. Death is possible. In this stage, fever attacks are severe, often reaching 40.5 C. Signs of anemia are not usually present at the onset and pallor of the mucous membranes occurs later in the course of the disease. Animals that do not die during this phase of the disease recover or progress into the subacute or chronic phases. Blood may ooze from fly bites, needle punctures or other wounds for some time after the injury has been inflicted. The anemia associated with the virus usually coincides with the first day of fever and may return to normal upon the return to normal body temperature.

**Subacute:** The subacute form occurs after "recovery" from the acute condition. It is a slower and less severe progression of the infection. Clinical signs include recurrent fever, weight loss, an enlarged spleen and anemia. There may also be swelling of the lower chest, abdominal area, perianal area and legs. Horses may have repeated bouts of fever with periods of normal temperature. This phase may last weeks or even months.

**Chronic:** With the chronic form, horses tire easily and are unable to work. They may have a recurrent fever and anemia and may relapse to the subacute or acute form even several years after the original infection. A horse in the chronic phase of the disease has milder temperature rises occurring at intervals of one to three months or more over a period of months to years. Horses in this phase of the disease may be apparently healthy, even though they still harbour the virus (the so-called "carrier" animal), or the disease may progress in the affected horse, resulting in a chronic illness with weight loss, swelling of the lower chest, abdominal area, perianal area and leg, debility and progressive anemia. In the latter phase the signs are less noticeable but the anemia continues to worsen and the animal is eventually debilitated. The horses with chronic EIA that show few or no clinical signs pose the most threat to other animals, since they continue to travel, attend equine events and potentially expose other horses to the virus.

Horses remain carriers of the virus for life. Unlike most viral infections, the presence of serum antibodies, or a positive EIA test, indicates an ongoing infection rather than simply past exposure to the virus.

### How is EIA Diagnosed?

When a horse is infected with the EIA virus, or other contagious diseases, the immune system produces antibodies. These antibodies are proteins used by the immune system to identify and neutralize foreign objects such as bacteria and viruses.



*Drawing blood from a horse for testing  
Photo courtesy of Vriesela*

To accurately determine whether a horse is infected with the EIA virus, a blood sample from the horse is tested for the presence of EIA antibodies. There are two laboratory tests available to detect antibodies to EIA. The first line of testing is a c-ELISA (competitive enzyme-linked immunoadsorbent assay), used for screening horses for EIA. However, “false-positives” can occur with this test. For this reason, the Canadian Food Inspection Agency (CFIA) laboratories conduct a second c-ELISA to verify every positive test. If a horse tests positive on this second c-ELISA, CFIA will conduct a third test using the agar gel immunodiffusion (AGAR) test. This test, which was developed by veterinary researcher Dr. Leroy Coggins in 1970, is considered the “gold standard” and is commonly known as the Coggins test. A negative Coggins test means there are no detectable antibodies at the time of testing. A positive test indicates the horse

is infected and a carrier of the virus. Foals can test positive due to maternal antibodies and must be re-tested after weaning.

Because the Coggins test was the most widely used test for decades, the certificate of EIA status has become known as the “Coggins Certificate” and is commonly referred to by this name regardless of which test was used. This sometimes causes confusion since “Coggins” does not appear anywhere on the EIA Serum Test Report and Certificate.

Blood samples must be taken from horses by veterinary practitioners who are accredited by the CFIA for EIA testing. Many veterinary clinics have accredited veterinarians on staff. If you are interested in having your horse tested, contact your local veterinarian for more information.

### **What Are Risk Factors for EIA Transmission?**

Certain management and geographic factors put horses at greater risk for contracting EIA. Risk factors include:

- Pasturing horses in damp, swampy areas.
- Pasturing horses in areas where EIA testing is not routinely done.
- Animals that are in frequent contact with outside horses or that live or travel in geographic regions known for EIA outbreaks.
- Environments that have a constant influx of new horses, especially if negative EIA certificates are not required.
- Exposure to other horses at events such as shows, clinics and sales, especially if rigorous health care regulations are not enforced and a current negative EIA certificate is not required.
- Exposure to feral horses, as EIA may be present in these populations.



*Pasturing horses in damp, swampy areas increases risk of EIA transmission.*

### **How Can I Protect My Horse From EIA?**

The only protection is prevention. There is no effective treatment for EIA, there is no vaccine to prevent it and there is no cure. However, good management can reduce the potential for infection. The following biosecurity measures can help minimize the risk of EIA transmission:

- Test all of your horses at least once a year, preferably in the spring before the vector fly season begins. One infected animal puts all your horses at risk. High-risk horses should be tested more frequently.
- Test horses at the time of purchase.

- Farm and stable operators should require a current negative EIA certificate before allowing new horses onto the premises
- Horse shows, racetracks, rodeos and other events should require a current negative EIA certificate for all horses entering the event.



*Seemingly healthy carriers of the EIA virus jeopardize the health of other horses*

*Saskatchewan Ministry of Agriculture*

Although euthanasia is an emotionally difficult choice, it's considered the most realistic option, since it may be virtually impossible to properly quarantine the horse and still maintain a good quality of life for the animal.

Because they are life-long carriers of the virus, EIA-positive horses will always pose a risk to other horses even if they do not show signs of illness. Even in the best management situations, biting and blood-sucking insects cannot be totally controlled or eliminated. To eradicate the disease it is necessary to eliminate the carriers. An owner may choose not to euthanize an EIA-positive horse that has no clinical signs, electing to permanently quarantine the animal instead. However, transportation and housing for these EIA-positive horses are severely restricted. Contact the CFIA for specific requirements.

Some horse owners choose not to test their horses to avoid the possibility of having to make a difficult choice. While this attitude is understandable, it is the wrong decision. EIA carriers cannot be identified without testing, and this puts many other horses at risk.

Several situations have occurred in Saskatchewan that illustrate the danger of not testing for EIA. In 2011, 39 out of 69 horses on one farm were positive for EIA. The affected horses were euthanized or sent for slaughter. In 2013, all 15 horses on another farm were positive and were all euthanized. In 2015, EIA-positive horses were detected on a premises that housed animals owned by multiple people. Ultimately, 31 EIA-positive horses were euthanized or died of the disease. In all of these cases, regular testing and early detection would have limited the spread of the virus in this herd and saved the lives of many valuable animals.

- Keep new horses in isolation for 45 days and observe them for any signs of illness before introducing them into the herd. Daily rectal temperatures will help detect sick horses.
- Take measures to control biting flies. Provide adequate drainage to discourage breeding sites for pests.
- Use disposable needles and syringes, one per horse, for vaccinations and medication.
- Sterilize dental tools and other instruments before using them on other horses.

### **Difficult Choices**

When horses are confirmed to have EIA, the options are very limited. The Canadian Food Inspection Agency (CFIA) requires that positive horses be either