Parasite Control leaflet series

ANIMAL HEALTH IRELAND

Contributing to a profitable and sustainable farming and agri-food sector through improved animal health

Lungworm - the facts

Lungworms in the trachea (windpipe) of an animal that died of hoose.

Parasite Control Leaflet Series, Vol. 7, Ver 2.1, July 2018

PARASITE CONTROL PROGRAMME

Parasite Control
Animal Health Ireland.ie

Animal Health Ireland, 4-5 The Archways, Carrick-on-Shannon, Co. Leitrim, N41 WN27

AHI gratefully acknowledges the financial and other contributions of our stakeholders.

PARASITE CONTROL PROGRAMME

Parasite Control
Animal Health Ireland.ie

Animal Health Ireland, 4-5 The Archways, Carrick-on-Shannon, Co. Leitrim, N41 WN27

Introduction

Lungworm infection is one of the most important respiratory diseases of cattle in northern Europe.

It is caused by the lungworm, *Dictyocaulus viviparus*, which is a roundworm (nematode) parasite similar to gutworms. However, it completes its life cycle in the lungs rather than in the gastrointestinal tract. The clinical signs of infection include coughing and difficulty in breathing (especially when animals are being moved). The disease is described as a 'parasitic bronchitis' and is commonly known as hoose or husk and and can result in death where serious infections occurs. As deaths from hoose can occur with very little warning and at various times of the year, it is essential that farmers consult their own veterinary practitioner when drawing up their parasite control programmes.

Lungworm Life Cycle

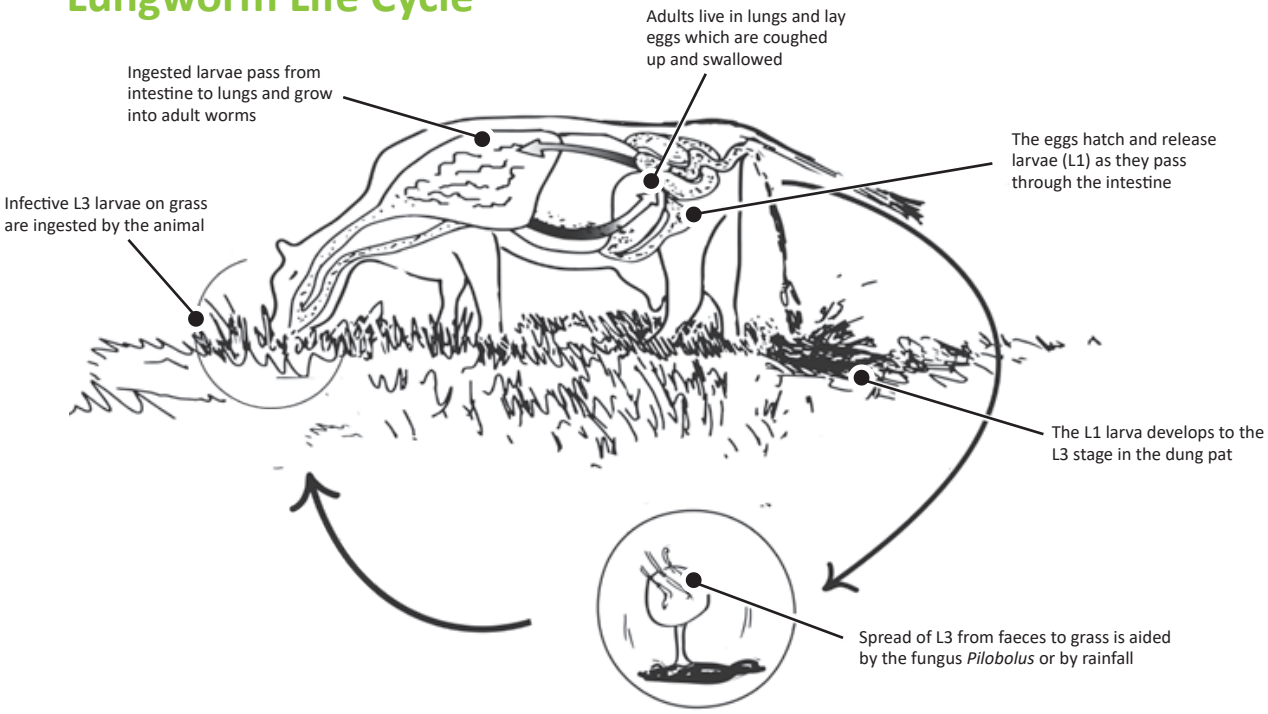


Figure 1. Lungworm Life Cycle

Figure 1 shows the Life Cycle of lungworm. When L3 stage larvae on pasture are ingested, they pierce the intestinal wall and move through the lymphatic system and blood stream to the lungs. In the lungs they leave the blood and penetrate lung tissue, where they grow rapidly and mature into adult worms.

Within 24-28 days of ingestion, eggs are laid by adult female worms in the large airways and are then coughed up and swallowed by the host animal. During the passage through the intestine, the eggs hatch and the immature larvae (L1) are excreted in the dung.

The rate of development of the free-living stages depends on the prevailing environmental conditions. If the weather is warm (approx. 20^{0}C) and humid, infective larvae may be available on pasture within seven days or less of being passed in the faeces.

Larvae may be dispersed from the dung pat by a fungus *(Pilobolus)* or by the splashing effects of rain. This means that pastures can become contaminated with infective larvae very quickly.

Older animals (yearlings and adults) may serve as carriers over winter as some adult worms will survive in the lungs (either as fully mature or hibernating immature adults). Infective larvae are relatively short lived (a few weeks in hot, dry conditions) but may survive in pasture regrowth after silage is made and also over the winter on pasture in enough numbers to cause disease in susceptible animals turned out to pasture in early spring.

The numbers of larvae present, their survival and their rate of development on pasture are very variable and unpredictable.

Risk factors for disease outbreaks

The main predisposing risk factor for disease is failure of calves and adult cattle to develop and maintain immunity from exposure to a low or moderate level of infection. Young animals (especially first grazing season calves) if exposed to a very high challenge early in life will succumb to disease. Older animals may also show signs of disease.

Table 1. Risk factors for Hoose

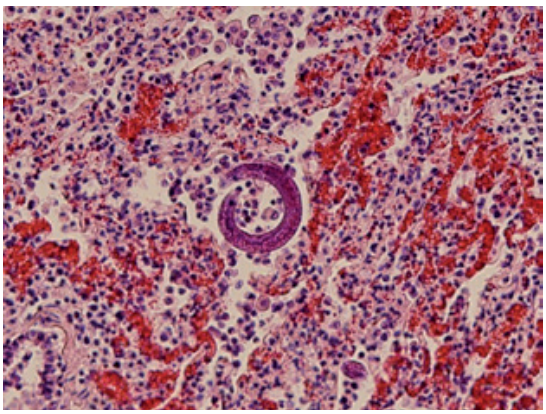
Risk factor	First grazing season calves*	Older cattle and cows
Grazing pasture contaminated by calves the previous year	✗ ✗ ✗	✗ ✗
Young animals grazing pasture previously grazed by older animals	✗ ✗	-
Mixed grazing groups of old and young cattle	✗ ✗	✗
Introduction of any animals reared off-farm or bought-in from farms of unknown lungworm status	-	✗ ✗

**Dairy calves and autumn born suckler calves may both be considered as first grazing season calves*

✗ - *indicate relative level of risk*

What are the signs that hoose may be in your herd?

- Mildly affected animals will have an intermittent cough especially after exercise.
- Moderately affected animals will cough frequently at rest and have an increased respiratory rate.
- Severely affected animals will have difficulty breathing and may adopt a mouth-breathing stance with the head and neck out-stretched, mouth open and the tongue protruding.
- Lung damage can be severe and some of the pathology is irreversible, so deterioration of clinical cases and mortality can occur despite successful removal of the worms with an anthelmintic.
- Adult cows may also have a severe drop in milk yield. This can be observed before coughing is seen.
- Affected cattle have an increased susceptibility to other respiratory pathogens such as viruses and bacteria.



Lungworm in lung tissue, as seen under a microscope

Clinical disease usually results when dairy or beef cattle with poor immunity, typically first grazing season (FGS) calves, ingest larvae from pasture. Animals can acquire a dangerous level of infection even after only one day of grazing a contaminated pasture.

It is more common to see disease in the second half of the grazing season, commonly following high rainfall, when pastures have large numbers of larvae (those that have survived from previous grazing combined with those deposited by infected cattle). However, it is important to be always on the lookout for clinical signs of hoose, as disease may sometimes occur as early as May.

Weaned autumn born suckler calves are more vulnerable to hoose than spring born suckler calves when grazing contaminated pasture because they eat more grass and should be observed very closely for any clinical signs.

Hoose in adult cattle

Hoose can occur in adult cattle in two distinct ways, resulting in animals with broadly similar clinical signs.

Lungworms in the trachea (windpipe) of an animal that died of hoose.

Animals with little or no immunity - the disease will be similar to that in calves, where adult hoose worms occur in the airways and larvae can be found in faeces. This is known as Patent Infection. Lack of, or low levels of immunity can result from inadequate exposure to infection on pasture over the previous six months or more. There are several potential reasons for this, including housing of animals, grazing on newly sown pastures and intensive anthelmintic treatments.

Animals with some immunity to lungworm - if these are exposed to heavy larval challenge from pasture they may develop severe coughing and a drop in milk production, resulting from the destruction of migrating worms in the lungs by the immune response (Reinfection Syndrome). Hoose larvae are not detectable in the faeces of the majority of these animals.

Diagnosis

Close monitoring for early clinical signs of respiratory disease, particularly coughing, is the best approach for detection of lungworm infection. Hoose is frequently suspected on clinical grounds alone but other respiratory diseases must be ruled out. It may be confirmed by submitting dung samples for identification of lungworm larvae, but deaths from acute hoose can occur even before larvae begin to appear in dung samples. Discuss sampling regimes and results with your own veterinary practitioner. Post mortem examination of any animal dying of respiratory disease can play a vital part in confirming the diagnosis. In acute infections, animals may be found dead or recumbent without coughing having been noticed, hence the importance of routine post mortem examination of all cases of sudden death.

Veterinary technical box

Diagnosis can be confirmed by finding lungworm larvae in the dung of affected animals (using the Baermann Technique) or by post-mortem examination of any animal that dies. Collection of dung must be from the rectum rather than the ground. It is critical that all dung samples get to the laboratory promptly after sampling, but it is particularly important for lungworm testing that the laboratory receives the samples within 48 hours after collection. All samples should be stored in a fridge unless tested immediately.

The Baermann Technique is only suitable for diagnosing patent infection i.e. adult lungworm infection. The absence of larvae in the dung does not rule out hoose.

The use of bronchoalveolar lavage is warranted in cases where prepatent infection is suspected. This procedure involves flushing the lower airways with small volumes of saline and examining the recovered sediment for the presence of eggs, larvae and inflammatory cells (eosinophils). Further information on diagnosing lungworm infections can be found in the Animal Health Ireland Practical Roundworm and Fluke Diagnosis information leaflet. Please **click here**.

Blood and milk samples can be taken in order to measure antibodies against *D. viviparus*. The presence of antibodies only indicates that animals have been infected sometime within the previous six months. Please note that antibodies will remain elevated despite successful treatment for hoose. The number of eosinophils in blood samples may be increased in animals suffering from hoose. However, these increases in eosinophil numbers can also be observed in other parasitic infections and in cases of hypersensitivity.

Prevention and Control

An assessment of the pastures on a farm can be carried out to estimate the level of larval contamination and the potential for future disease outbreaks (Table 2). However, given the unpredictable nature of the disease, the rapid development of larvae in faeces and their efficient dispersal to the sward makes lungworm control through various grassland management practices challenging. Even with the adoption of the grazing practices as outlined below, farmers need to remain vigilant for any clinical signs.

Recommended grazing strategies include:

1. The ideal option is to turn first grazing season calves out onto pasture on which there were no cattle the previous year.
2. Calves should be kept housed until they can be turned out onto pasture as one group. If calf turnout is staggered, then the later calves should be turned out as one group onto another low risk pasture.

Current grazing patterns on Irish farms may not allow optimum grazing practices for the implementation of lungworm control but where possible every effort should be made to follow these practices. As a minimum, it is recommended that calves are turned out onto different pasture each year. In conjunction with recommended grazing practices, calves must be monitored closely and treated as necessary. If calves have not been exposed to lungworm in the first year, they may be still at risk of lungworm infection in subsequent years even on 'low risk' pastures. Constant monitoring for coughing animals is important on all farms even with good grazing management.

TIME	RISK ASSESSMENT OF PASTURES		
	High risk pastures	Medium risk pastures	Low risk pastures
Spring	Grazed by first grazing season calves in the previous year Grazed by lungworm-infected cattle in the previous year	Grazed only by cows or yearling cattle with no history of hoose in the previous year	New pasture Grazed by sheep or used for hay or silage only in the previous year
Mid summer	Grazed by first grazing season calves in the spring	Grazed by cows and yearling cattle with no history of hoose	Grazed by sheep or after grass (used only for silage or hay in the first half of the season) i.e never grazed in current grazing season

Table 2. Risk assessment of pastures

Treatment

Anthelmintics are used in two situations.

1. Therapeutically in the face of an outbreak.
2. Strategically in conjunction with a pasture management programme.

Discuss with your veterinary practitioner which treatment and grazing management strategy is most suited to your farm and animals.

The three major groups of anthelmintics are all effective against lungworm. The choice of treatment is based on criteria such as previous experience, ease of administration, speed of action and persistence. The last is important if the animals remain on pasture as

Anthelmintic treatment for lungworm

they will be vulnerable to re-infection. Table 3 lists the main groups of anthelmintics that can be used for hoose and some of their important characteristics.

Dosing can be minimised with a concentrated effort on both grazing management and careful stockmanship. This can enable the development of immunity to lungworm.

Anthelmintic	Formulation	Speed of Action	Persistent Activity
Benzimidazole	Oral	Slow (36 hours)	None
Levamisole	Oral/injection/topical	Fast (3 hours injection)	None
Macrocyclic Lactones e.g. Ivermectin	Injection/topical	Medium*	4-17 weeks

Table 3. Anthelmintic groups active against lungworm

** Not defined, probably within approximately 24 hours*

Vaccination

A live lungworm vaccine is available in Ireland and can provide good protection against hoose. It is necessary to complete the vaccination schedule prior to turnout. As a result it may be unsuitable for spring born calves unless turnout is delayed. It can be suitable for housed autumn born calves, not turned out until the following spring. Vaccination of second season grazing animals or adult cows before turnout may be indicated if hoose has previously affected older animals on the farm. Vaccination strategies should be discussed with your own veterinary practitioner.

Dairy cows

Once the diagnosis of lungworm has been confirmed, discuss with your own veterinary practitioner the appropriate treatment of the dairy herd with an anthelmintic (remembering to pay close attention to the minimum milk withdrawal period). Treated cattle should then be moved to a clean or a less contaminated pasture. Purchased in-calf heifers should receive a full course of vaccine, as a routine, before introduction into those dairy herds that have experienced lungworm infection previously.

Finally....

Regardless of which control options are followed, it is essential that all ages of cattle are closely monitored over the grazing season and in the early housing period. In particular, it is essential to be especially vigilant over the second half of the grazing season and shortly after moving animals to new pastures. Treatment of the whole group should be undertaken as soon as possible after the appearance of clinical signs in order to limit the impact of the infection. If treatment is delayed, lung damage may become advanced and irreversible. Even though all hoose worms are removed by anthelmintic treatment, these animals may still die due to the severity of the lung damage (post-patent hoose). Other additional treatments may be necessary for complications and you should consult your own veterinary practitioner.

Animals may pick up new infections in the autumn and may be housed whilst infected. They should be closely monitored after housing and treatment may be required during this period. See the Parasite Control at Housing leaflet for further information **[click here]**.

Bulk milk test results

Bulk milk ELISA testing can be used as a monitoring tool for lungworm infection in dairy herds but it has limitations as a diagnostic tool in outbreaks of hoose as the antibodies persist for several months after exposure to *D. viviparus*.

NOTES

TECHNICAL WORKING GROUP

James O'Shaughnessy (Chairman) - DAFM, Veterinary Laboratory Services, **Charles Chavasse** - Zoetis, **Bosco Cowley**- MSD Animal Health, **Martin Danaher** - Teagasc Food Research Centre Ashtown, **Theo de Waal** - UCD School of Veterinary Medicine, **John Gilmore** - Veterinary Practitioner, **Barbara Good** - Teagasc, Athenry, **Fintan Graham** - Veterinary Practitioner, **Ian Hogan** - DAFM, Veterinary Laboratory Services, **Orla Keane** - Teagasc, Grange, **Mark McGee** - Teagasc, Grange, **Grace Mulcahy** - UCD School of Veterinary Medicine, **Maresa Sheehan** - DAFM, Veterinary Laboratory Services, **Donal Toolan**- DAFM Regional Veterinary Laboratory, Kilkenny (retired).

ILLUSTRATOR

Stephen Cahalan MVB MRCVS, Dept Pathology and Infectious Diseases, The Royal Veterinary College, Hatfield UK.

PEER REVIEW BY

Dr. Jason Barley, Veterinary Sciences Division, AgriFood and Biosciences Institute Stormont, **Professor Bob Hanna**, Veterinary Sciences Division, Agri-Food and Biosciences Institute, Stormont.

Parasite Control Leaflet Series, Vol. 7, Ver 2.1, July 2018

AHI Animal Health Ireland.ie

4-5 The Archways, Carrick-on-Shannon, Co Leitrim N41 WN27.

Phone 071 9671928

Email nmorgan@animalhealthireland.ie

Web www.animalhealthireland.ie