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## Annual ryegrass toxicity

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### Importance

Annual ryegrass toxicity (ARGT) is a disease that occurs in livestock when they eat annual (Wimmera) ryegrass that has been infected jointly by a nematode (eelworm) and a bacterium. The interaction of the bacterium with the plant results in the bacterium producing a powerful toxin (poison) that causes ARGT in grazing animals.

Many farmers in Victoria are concerned about the disease because they have heard of its devastating effect on livestock in South and Western Australia. The disease has spread rapidly in both these states in recent years, and as annual ryegrass is one of our most common pasture grasses, ARGT is a potential threat to livestock industries in Victoria.

### Symptoms of infected pasture

Around hay-cutting time, a yellow bacterial slime may appear on the seed-head, although sometimes the slime is confined within the nematode gall. With time, the slime hardens and turns orange and then brown. The slime does not always appear and may also be washed off by rain. Therefore absence of visible slime does not necessarily mean that the pasture is safe.

Inspection of the seed should show whether it is infected by the nematode. The seeds at the base of the spikelet are the most likely to be infected. A healthy ryegrass seed is rounded at the top and is green, purple or buff, depending on the stage of maturity. Nematode-infected seeds are pointed, shorter than normal, and are black or yellow. A yellow colouration indicates that bacteria are present in the gall.

The presence of infected heads indicates that the pastures might be highly toxic. However, failure to find infected heads does not mean that the pasture will not be toxic, as infected plants can be easily missed during inspection.

Once formed, the toxin is very stable. Infected material remains toxic for a long time, and pastures that have become toxic will remain so until the infected plant material has been weathered away and is replaced by new growth. Hay that has been made late enough to contain infected seed-heads will remain toxic during storage and can poison stock when it is fed out. Hay cut from infected pasture has been known to remain toxic for many years.

### Biology

#### Survival

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The larvae of the nematode (*Anguina* sp.) remain dormant over the summer and autumn, sheltered in galls which have been lying in the soil since they dropped off mature ryegrass plants in the previous season. After the autumn break, when the ryegrass has germinated and the seedlings have reached the two or three-leaf stage, the microscopic larvae emerge from the galls and invade the seedlings. Provided there is adequate soil moisture, the larvae may emerge from the galls over a period of three months, so that even late-developing shoots and seedlings may be affected.

The larvae move up the outside of the ryegrass plant by raindrop splash, or by moving through films of water on the surface of the plant. Eventually they move between the leaf sheaths to the growing points of the plant. The larvae then moult to become adults, which remain passive at the growing point and are carried upwards as the shoot develops and lengthens. When flowers begin to form the nematodes invade the developing florets, producing a gall in place of the seed.

The adults mate and eggs are laid within the gall. These hatch to produce larvae which remain dormant within the gall. So far the galls are not poisonous, but at this stage a bacterium (*Corynebacterium* sp.) may come into the picture. These bacteria, which live in the soil, will have been carried into the plant by the nematode larvae.

Once the bacteria are inside the nematode gall they multiply rapidly and may produce a yellow slime which spills out over the seed-head. It is at this stage (seed-setting, hay cutting) that the galls become extremely poisonous. At the end of the season the galls fall to the ground, where they remain to repeat the cycle in the following year.

## Dispersal

Anything capable of spreading ryegrass can spread ARGV from infected areas. The most common ways are through uncleaned or poorly cleaned annual ryegrass seed, on the wind, and in hay. The disease can also be spread on uncleaned machinery, vehicles, animals, and in run-off water. It generally takes 10-15 years from when the nematode first occurs in the pasture until stock are affected.

## Prevention

If a paddock is infected, management practices, including reducing the amount of annual ryegrass on a property, can help prevent the poisoning of stock. It should be remembered however, that annual ryegrass is a valuable pasture species and that it may be necessary to compromise between risking the loss of stock by poisoning and having no annual ryegrass for them to eat.

Preventive practices include:

- Using pre-emergent herbicides to reduce annual ryegrass in wheat, barley and lupins.
- Using post-emergent herbicides on pastures and crops.
- Heavy grazing, especially in the late winter and early spring, to reduce the amount of ryegrass reaching maturity and also to utilise the pasture fully before it can become toxic.
- Cutting hay before the seed-heads reach the danger stage.
- Topping, or "spray topping" with a herbicide such as paraquat, or "Roundup" before flowering.
- Burning the dried off pasture in summer to reduce the number of seeds and to destroy toxic herbage and nematode galls. If you intend to burn off when fire restrictions are in force don't forget to get a permit to burn.
- Don't introduce hay from areas where ARGV is known to occur.
- Don't use annual ryegrass seed from known infected areas when sowing pastures. Sow seed that has been examined for the disease during the routine tests for germination and purity. For extra protection ask the seller of the seed for a copy of the seed testing analysis statement covering the line you are buying.

If a paddock is known, or suspected, to be infected it is important to keep it under frequent and regular observation from the time the seed-heads begin to emerge. Toxicity is likely to develop at about the seed-setting stage. Close observation will enable you to tell when this stage is approaching so that stock can be removed from the pasture before the danger period.

The approach of this stage is indicated by the:

- complete emergence of the seed-heads from the enveloping leaves.
- appearance of the small yellow pollen sacs on the head.

One should also examine the seed-heads to see if seed is forming and, finally, keep watching for the yellow bacterial slime on the heads. Alternatively pasture and or seed samples can be tested for the presence of the ARGV causal organisms. This service is available through commercial outlets in Victoria. Two sampling tests are offered.

The first is a "Pre-flowering Ryegrass Test" for stock-owners in high risk areas. This test detects the bacterium but not the nematode. The test identifies in the early spring the paddocks in which ARGV is most likely to occur. The second test is a "Mature Ryegrass Test". This test is recommended for stock-owners concerned about ARGV. The test can detect both the nematode and the bacterium, and can estimate the risk of stock poisoning before the paddock is grazed.

The "Mature Ryegrass Test" identifies paddocks that may require attention to prevent ARGV becoming a problem within the next few years and assist in the diagnosing of the disease when stock have been poisoned. For further information on the ARGV testing services, contact your local DEPI office, or the commercial outlets for the service.

## Symptoms of ARGV in livestock

All grazing animals, of any species, age or sex are susceptible to the toxin, which affects their nervous system. Symptoms progress from a high-stepping gait with the head arched back, to a loss of coordination and, later, nervous convulsions followed by death. In some cases the first sign of trouble may be sudden deaths. Deaths may occur within a few hours, or up to eight days after the onset of symptoms, and may continue after stock are removed from the affected pasture.

## Diagnosis

As several other diseases cause similar nervous symptoms in livestock, it is important to contact a veterinarian so that the problem may be accurately diagnosed. Some of the other diseases that cause nervous symptoms are ryegrass staggers, phalaris staggers, enterotoxaemia (pulpy kidney) and polioencephalomalacia (star-gazing).

## Treatment

Stock suspected of being affected by annual ryegrass toxicity should be moved as quietly, and as soon as possible, to a clean paddock. Veterinary advice should be sought immediately.

## Prevention

Once the problem has been confirmed, care must be taken not to graze animals on affected pastures during the danger period which extends from the seed-setting stage until the time when the affected herbage has weathered away or been burnt or ploughed under. Alternatively where it is not known whether pastures are safe to graze or not, samples could be tested for the presence of the nematode and/or bacteria.

## The situation in Victoria

As yet, no stock deaths in Victoria have been attributed to ARGV, but the nematode galls have now been detected at 43 locations in seed from paddocks, roadsides and seed submitted for certification. Most of the infected locations are in the Wimmera, north and west of Horsham and at Logan, Kerang and Pine Lodge in the north-central region. A single unconfirmed report of bacterial galls together with nematode galls came from a roadside location near the South Australian border.

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It is inevitable that annual ryegrass toxicity will cause stock deaths in Victoria. The spread of ARGV can be delayed considerably by the simple precautions of not introducing hay or ryegrass seed from infected areas. Agriculture Victoria is constantly monitoring the situation by inspecting pastures during the spring and summer for symptoms of the disease. Officers of the Department would appreciate the co-operation of farmers in looking for signs of ARGV. If any are found they should be reported immediately to the nearest office of the Department of Environment and Primary Industries.

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