ERGOT CONTAMINATION IN ANIMAL FEED

Sean Thompson
Feeds Innovation Institute, University of Saskatchewan

July 2016

What is ergot?

Ergot is a term that describes the black sclerotia (or ergot bodies) produced by fungi in the *Claviceps* genera, particularly *C. purpurea*. Several cereal grain species are vulnerable to ergot infection, which occurs in the late spring to early summer months, producing ergot bodies that range from a few millimeters to greater than 4 cm in length.

Ergot toxicity symptoms in livestock

Ergot contamination in feed can lead to significant economic losses for livestock producers. The manifestations of ergot toxicity generally occur as either the convulsive or gangrenous form. Symptoms include:

Convulsive
- Seizures
- Staggering
- Confusion
- Hallucinations

Gangrenous
- Elevated respiration rate
- Weight loss
- Reduced milk production
- Decline in reproductive fitness (i.e. abortion, dystocia)
- Loss of tissues on extremities (i.e. ear tips, hooves, tail)

Figure 1. Consumption of ergot can lead to the loss of ear tips and other extremities in livestock. Source: NDSU (1).

In Canada, maximum ergot alkaloid concentrations are recommended for livestock. Dairy and beef cattle, calves and horses have maximum concentrations of 2 to 3 ppm, while swine and poultry have maximum values of 4 to 6 ppm and 6 to 9 ppm, respectively. However, there is a common belief that the current standards may exceed the actual no effect concentrations for livestock. Dietary ergot alkaloid concentrations as low as 0.1 to 0.2 ppm have been shown to adversely affect animal growth performance (2).

Sampling and screening methodologies

In general, mycotoxins are difficult to sample and screen in a reliable fashion. Inherent variability can translate into uneven distribution of mycotoxins within a single bin of grain harvested from the same field. As well, the density of ergot sclerotia is different compared to that of healthy seed kernels which may result in "layering" when transporting grain. Presently, as no on-site test for ergot alkaloid level is available, visual screening of ergot bodies is the most common screening method used in industry.

Pre-delivery samples are common in the feed industry. Confirmation of the supplier's sampling procedures should be done to ensure that pre-delivery samples are an appropriate representation of the ingredient lot. It is also essential that each facility carries out individual load sampling upon arrival of ingredients. The number of subsamples will vary depending on the size of the truck, but in general, a minimum of six subsamples (i.e. one sample from each corner and two from mid-trailer) probing the entire depth should be taken for every load (i.e. super B trailer). Ideally, ingredient shipments containing any visible ergot bodies should be rejected. However, other mitigation strategies should be applied if this is not possible.

Several feed ingredients pose a risk for ergot contamination. Raw cereal grains from ergot-susceptible crops should be inspected before entering a feed mill. Grain screenings are a common feed ingredient but also present the highest risk for ergot contamination. Caution should be exercised when utilizing screenings at high inclusion levels. Finally, byproducts of different milling and biofuel industries can also present a risk of containing high ergot alkaloid levels. Unlike raw grain or screenings, visual identification of ergot sclerotia in these byproduct ingredients is difficult if not impossible. A list of feed ingredients susceptible to ergot contamination can be found in Table 1.

Table 1. Common feed ingredients susceptible to ergot contamination.

Cereal grains	
Rye	Barley
Triticale	Oats
Wheat	
Grain terminal wastes	
Cereal grain screenings	
Milling byproducts	
Wheat flour	Wheat bran
Wheat or barley mill run	Wheat shorts
Distillers'/biofuel byproducts	
Wheat or barley dried distillers' grains	

Strategies to reduce the risk of ergot toxicity

It is important that feed mills discuss the issue of ergot contamination with their ingredient suppliers as pre-screening ingredients prior to receiving is the first stage in prevention. Adapting more thorough sampling and receiving procedures, and ensuring suppliers and plant employees are properly trained to conduct them adds another layer of prevention. In addition to visual inspection of unground ingredients, ingredient quality assurance programs could be expanded to address the ergot. One preventative strategy may include requiring suppliers to submit ingredient samples for ergot alkaloid analysis and meet maximum allowable concentrations in order to be accepted by the mill.

If feed ingredients are found to contain ergot after being received, they should either be used in a manner that will reduce the risk of ergot toxicity to poultry and livestock or be discarded. Several commercial products are currently marketed for mycotoxin control, some of which may prove effective in managing ergot contamination. Finally, implementing maximum dietary inclusion levels for higher risk ingredients such as grain screenings can also reduce the risk of ergot toxicity.

For more information on ergot in feed, refer to ANAC's white paper "Reducing the Impact of Ergot in Livestock Feed" (2016).

References:

(1) McMullen, M. and Stoltenow, C. 2002. Ergot, PP-551 (revised). North Dakota State University Agriculture website. Available from: http://www.ag.ndsu.edu/pubs/plantsci/crops/pp551w.htm.
(2) Cowan, V. E. and Blakley, B. R. 2014. Ergot contamination in livestock feeds. Anim. Health. Prospect. 10(2):1-2.