As of: 12/08/2019

Statement of the carry-over working group on ergot alkaloids and ergot in animal feed and their impact on animal health of August 2019[1]

(Source: Dänicke)

The term ergot (sclerotium) refers to the hardened mycelium of fungi of the genus *Claviceps spp*. It may develop instead of a healthy corn in ears of cereal, if these have been infected. In general, sclerotia are of a brown-black colour, in some cases with nuances of violet, and contain – besides amines, amino acids, enzymes, oils, sterols and other substances – up to 40 different ergot alkaloids. From a chemical point of view, these are amides or peptides of lysergic acid, which can cause undesirable effects in humans and animals if they are absorbed with food or feed. As a rule, ergot can develop on all grasses and cereals; in Germany, rye and triticale are most often affected. During harvest, sclerotia may end up in the harvested crops together with the grains.

In the European Union, a maximum level of 1000 mg ergot/kg feed, referring to a feedingstuff with a moisture content of 12%, has been set for feed materials and compound feedingstuffs containing unground cereals (Directive 2002/32/EC[2]).

[1] Further explanations and background information can be found in the publication "German survey 2012 – 2014: Ergot of Claviceps purpurea in feedingstuffs, ergot alkaloids thereof and their toxicological relevance for animal feeding" and in the annex to the vote(the Annex is not translated here).

[2] Directive 2002/32/EC of the European Parliament and of the Council of 7 May 2002 on undesirable substances in animal feed, Official Journal of the European Union L 140 of 30/05/2002, p. 10

Since sclerotia contain different levels of ergot alkaloids, the physical determination of the contamination of cereals caused by ergot is often not conclusive.

A national survey on ergot alkaloids was carried out in Germany from 2012 based on the recommendation of the European Commission (2012/154/EU) in order to be able to examine a possible relationship between the occurrence of ergot alkaloids and the amount of sclerotia. Samples were to be taken on spec from unground rye and triticale with visible ergot infestation and analysed. The samples were to be analysed both for their sclerotia content and the analytically determinable ergot alkaloids (total ergot alkaloids equals sum of ergocristine, ergotamine, ergocryptine, ergometrine, ergosine and ergocornine) and their epimeres. Following standardised sample treatment, an HPLC procedure with cleaning was to be applied to an alkaline aluminium oxide solid phase.

From 2012 to 2014, the feed monitoring authorities of the *Laender* analysed a total of 600 feed samples – primarily whole grain cereals with visible ergot infestation (451 samples), but also whole grain cereals without visible ergot infestation (149 samples), including rye (321 samples), triticale (197 samples), wheat (52 samples), and cereal grain mixtures and compound feedingstuffs (30 samples) – for their ergot content (sclerotia) and six ergot alkaloids as well as their epimeres.

The feed samples rye, triticale, barley, wheat, mixtures of cereal grains and compound feedingstuffs did not differ significantly, neither with regard to their content of individual ergot alkaloids or their sum nor regarding their ergot content.

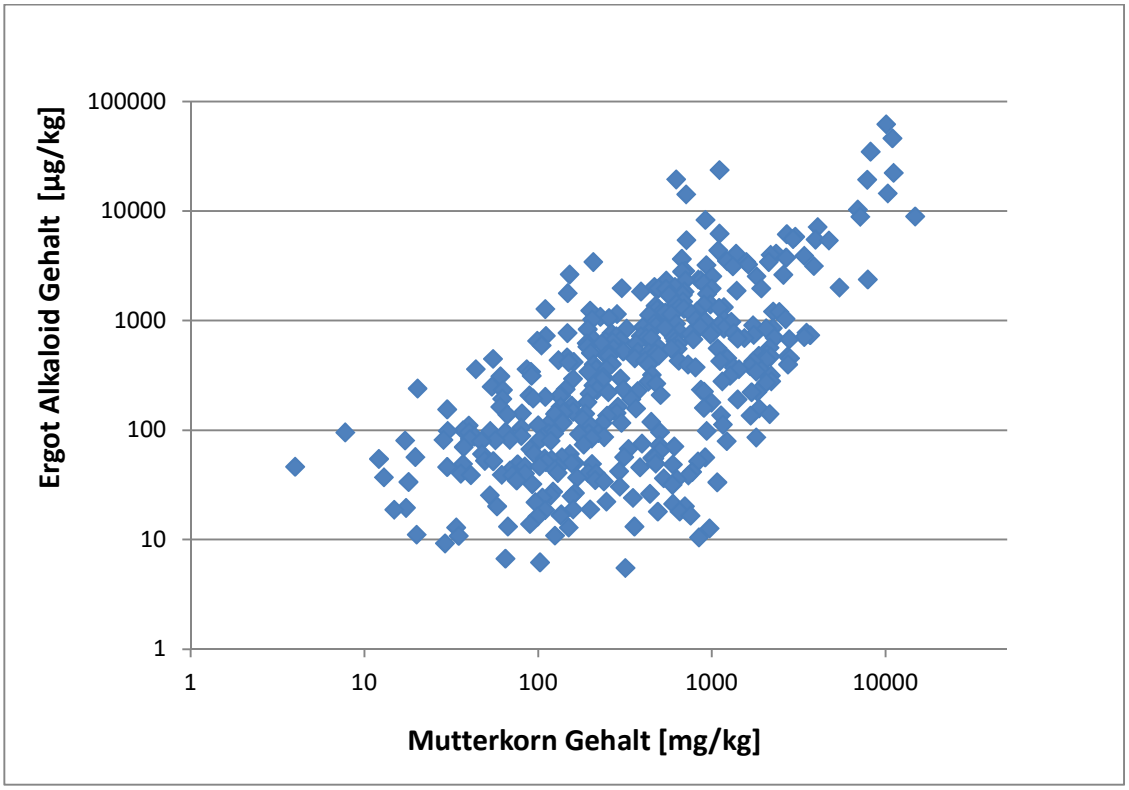

Figure 1: Logarithmic presentation of the relationship between ergot content (mg/kg) and the corresponding total ergot alkaloid content (µg/kg) in the analysed feed samples (without “zero” values). A correlation coefficient of r = 0.680 was estimated.

In about 13% of the samples tested, neither ergot nor ergot alkaloids were detected. The share of samples exceeding the current maximum level of 1000 mg of ergot per kg of feedingstuffs containing unground cereals (88%, dry matter) was almost 16%. It should be noted that the levels of ergot and ergot alkaloids were equally high in some samples, while in other samples the level of ergot alkaloids was high and the level of ergot comparably low. Overall, 70 samples (11.7%) contained ergot alkaloids but no ergot. The variation in the ergot alkaloid content in feeds that have the same level of ergot means that the ergot alkaloid content of the ergot itself is also subject to considerable fluctuation.

Risk assessment of feed for livestock based on the ergot alkaloid content

The toxic effects of ergot are mainly due to the ergot alkaloids it contains, although other components of ergot, such as ricinoleic acid, can also contribute to the overall effect on animals. Feeding studies show that the effects on animals – e.g. on performance features of growing pigs – can better be described based on the total ergot alkaloid content in the feed than based on the ergot content Reference to the total ergot alkaloid content, however, is only an initial approximation on the way to an improved risk management, because even with the same total ergot alkaloid content of the feed different effects can be observed in animals. These are presumably based on the combined effect of individual alkaloids, which occur in different proportions in the ergot and consequently in feed.

Recent studies on livestock based on dose-response trials regarding the total ergot alkaloid content show significant different sensitivities to ergot for various animal species. The considerable variation in the total ergot alkaloid content in ergot has shown that individual animal species or animal categories (e.g. Pekin ducks and primiparous sows) are not protected by the current upper limit which is solely based on the ergot content in unground cereal grains.

Preliminary guidance values[1] for critical total ergot alkaloid concentration levels (sum of all analysed individual alkaloids) in the daily feed ration of livestock (mg/kg feedingstuff, 88% dry matter) were derived based on the present state of knowledge.

Animal species/category	Guidance value(mg/kg)
Pigs	
Rearing piglets, fattening pigs	0.6
Sows	0.03
Cattle and sheep (all categories)	0.1
Poultry	
Broiler chickens	1.9
Laying hens	3.7
Fattening Pekin ducks	0.06

[1]The values only reflect an average alkaloid pattern which can typically be expected for ergot on rye in Germany. Variations in alkaloid patterns and the remaining chemical (toxic) components could not be considered for the derivation due to a lack of experimental data. Initially, these were therefore only taken into account via the uncertainty factors.

Complying with the preliminary guidance values specified in the table health and productivity of the animals are presumably ensured with regard to ergot alkaloids. The derivation of the preliminary guidance values is discussed extensively by Schwake-Anduschus et al. (2019).

Conclusions

1) In the tested feed samples a substantial variation in the total ergot alkaloid content was found. This variation – which is also significant in cases for the same ergot content – means that the number of ergot grains does not allow any conclusions to be drawn regarding the total ergot alkaloid content.

2) Feeding studies show that risk assessments for evaluating livestock health that are based on the total ergot alkaloid content of ergot in feedingstuffs should have higher priority than risk assessments based on the ergot content.

3) The current upper limit relating to the ergot content in unground cereal grains is not deemed sufficient to protect animal health.

4) Based on the present state of knowledge, it is possible to derive preliminary guidance values for critical total ergot alkaloid concentration levels in the daily ration species-specifically.

5) Since different effects were observed in animals even when the total ergot alkaloid content of the feed was the same, further experiments should be performed to verify and/or adjust the preliminary guidance values resting on a more comprehensive database and to improve the risk assessment taking into account the significant variation of animal species-specific sensitivity.