

Ergot

How a medieval mycotoxin is challenging the modern grain chain



Joe Brennan – UK Flour Millers

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UK FLOUR
MILLERS

- UK Flour Millers represents 99% of the UK flour milling sector by volume.
- 32 members. 50 flour mills.
- Our members use 5 million tonnes of wheat each year to produce 4 million tonnes of flour.
- Wheat flour is an ingredient in 33% of food products sold in supermarkets and accounts for 20% of the nation's food energy intake.
- We chair the UK Ergot Working Group.

UK and Irish flour mills



Ergot - introduction

Ergot	The fungal disease affecting cereals.
Ergot sclerotia	Produced by plants infected with ergot. A mass of dormant fungi containing ergot alkaloids.
Ergot alkaloids	The mycotoxins within ergot sclerotia and ergot infected grain.
Ergotism	The condition that arises from long-term ergot poisoning. Previously known as 'St Anthony's fire'.

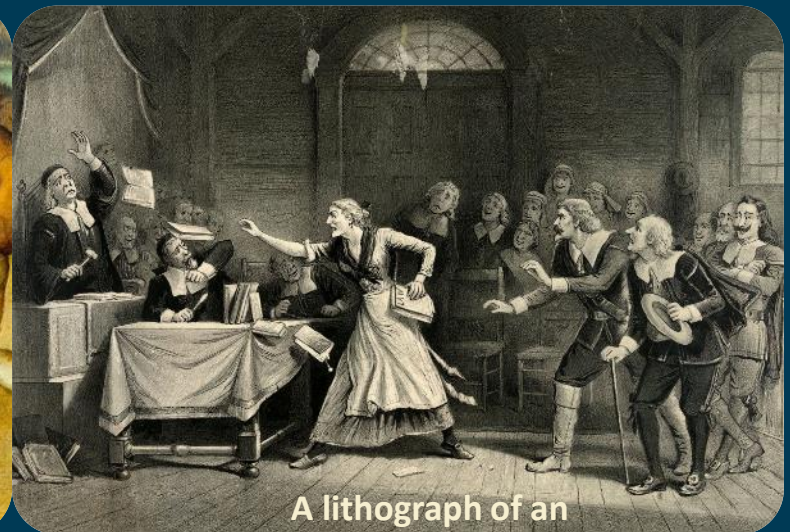


Source: Dr Anna Gordon, NIAB

A man suffering from ergotism (St Anthony's Fire)



The 'dancing plague' of 1518



A lithograph of an American witch trial

Ergot – why is it relevant now?

- 1) Increased prevalence of the disease on UK and EU arable farms.
- 2) Establishment of maximum levels for ergot alkaloids in processed cereal products (EU and NI), owing to concerns over consumer exposure.
- 3) Significant cost owing to cleaning and rejections.



Ergot and ergot alkaloid limits

- 01 January 2022, EU reduced ergot sclerotia limits from 0.05% to 0.02% in unprocessed grain.
- Also established maximum levels for ergot alkaloids (the mycotoxins found within ergot sclerotia) in processed cereal products (such as flour).
- Applies to EU and NI, but many GB customers sell flour or flour-based products into EU and NI. Affects significant proportion food cereal demand.



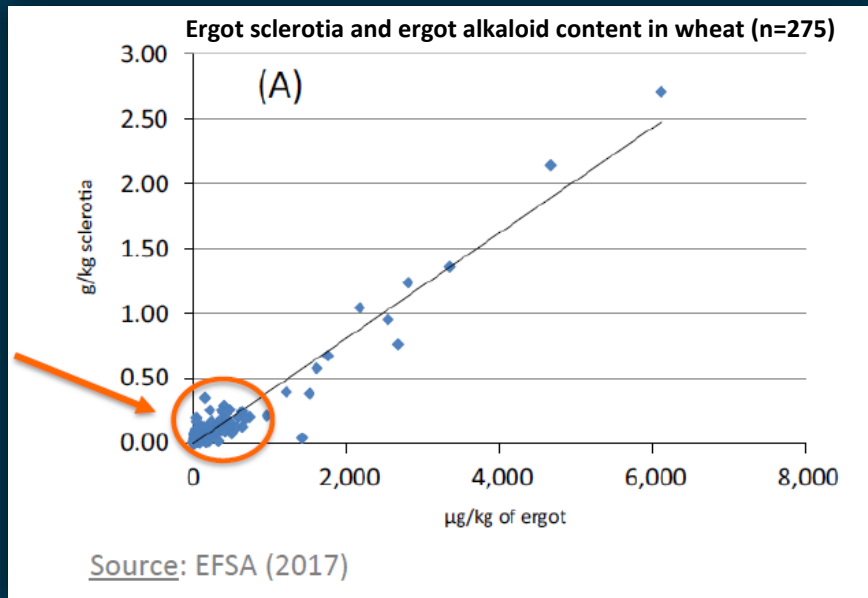
(1) In section 2, the entries '2.9 Ergot sclerotia and ergot alkaloids' are replaced by the following:

Foodstuffs ⁽¹⁾		Maximum level
2.9	Ergot sclerotia and ergot alkaloids	
2.9.1.	Ergot sclerotia	
2.9.1.1.	Unprocessed cereals ⁽¹⁸⁾ with the exception of — maize, rye and rice	0,2 g/kg
2.9.1.2.	Unprocessed rye ⁽¹⁸⁾	0,5 g/kg until 30.6.2024 0,2 g/kg as from 1.7.2024
2.9.2.	Ergot alkaloids ^(*)	Now 01.07.2025
2.9.2.1.	Milling products of barley, wheat, spelt and oats (with an ash content lower than 900mg/100g)	100 µg/kg 50 µg/kg as from 1.7.2024
2.9.2.2.	Milling products of barley, wheat, spelt and oats (with an ash content equal or higher than 900mg/100g) Barley, wheat, spelt and oats grains placed on the market for the final consumer	150 µg/kg Now 01.07.2028
2.9.2.3.	Rye milling products Rye placed on the market for the final consumer	500 µg/kg until 30.6.2024 250 µg/kg as from 1.7.2024
2.9.2.4.	Wheat gluten	400 µg/kg Now 01.07.2028
2.9.2.5.	Processed cereal based food for infants and young children ⁽¹⁾ ⁽²⁰⁾	20 µg/kg

(*) The maximum level for ergot alkaloids refers to the lowerbound sum of the following 12 ergot alkaloids: ergocornine/ergocorninine; ergocristine/ergocristinine; ergocryptine/ergocryptinine (α- and β-form); ergometrine/ergometrinine; ergosine/ergosinine; ergotamine/ergotaminine. In the lowerbound sum, the contribution of each non-quantified epimer is set at zero.'

Ergot alkaloid control

- Very difficult to control ergot alkaloids in grain relative to the very low legal limits in processed cereal products.
- There is a mismatch between the ergot sclerotia limit in wheat and the ergot alkaloid limit in processed cereal products, such as flour flour.
 - Study found if mill wheat containing ergot sclerotia at the EU/NI legal limit (0.02%), results in white flour with ergot alkaloids of 347ppb, well above the legal limit of 100ppb. The EU regulations do not make sense.



Ergot sclerotia 'threshold'		Ergot sclerotia quantity		Estimated concentration* of ergot alkaloids, across bulk		
				Average	Min	Max
GB legal limit		0.05%	0.5g / kg	944	571	1,525
EU/NI legal limit		0.02%	0.2g / kg	377	228	610

*Based on observed ergot alkaloid concentration in wheat ergot sclerotia (n=7). Dr Gordon, NIAB, 2019.

- Hence most mills have stricter limits for ergot sclerotia in grain (i.e. below 0.02%). Some have zero tolerance. Rejections add significant cost, inefficiency and frustration across the chain.

Ergot alkaloid transfer to grain not fully understood

- Removing sclerotia reduces ergot alkaloid content, but not always to zero. NIAB research, funded by AHDB found:
 - Transfer of dust / residue to grain.
 - Ergot infections lead to ergot alkaloids in 'healthy' grain above and below infection site.
- These forms are effectively invisible to a mill intake – rapid testing for alkaloids not available.
- Efficacy of colour sorting for small ergot pieces and grass weed ergot is not clear.



Tackling ergot at source is necessary

- Ergot infections lead to 'invisible' ergot alkaloids.
- Fragmentation of ergot sclerotia into smaller pieces, when grain disturbed and moved increases ergot alkaloid loading.
- On-farm control is challenging. Relative contribution of ergot risk factors poorly understood.
- Some interventions not appropriate for all farms.
- Agrochemistry for ergot limited.
- Further research needed. Review of AHDB guidance is welcome.



Key points

- Ergot presents a food safety issue.
- Ergot increasingly prevalent. Ergot alkaloid levels in grain rising.
- Ergot alkaloid limits in processed cereal products very low relative to levels found in grain, even when strict controls (e.g. zero tolerance) applied at intakes.
- Grain can be contaminated with ergot alkaloids in different ways. Not fully understood.
- Tackling ergot at source (i.e. preventing infections) is optimal, but further research is needed.

Thank you

Contact: JoeBrennan@ukflourmillers.org

Business card



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