Wheat Ergot: Genetic and functional analyses of resistance in wheat to *Claviceps purpurea*

The Wheat Ergot programme at NIAB is led by Dr Anna Gordon.

The focus of the programme is on the genetics and functional genomics underpinning resistance in cereals, primarily wheat, to the disease commonly known as ergot.

Ergot is caused by the fungal pathogen *Claviceps purpurea*. The fungus infects floral tissues of cereals, colonising the female parts of the flower and produce fungal conidiospores which are exuded from the florets in a sticky substance known as honeydew. The over-wintering fungal structures, called ergot sclerotia replace the grain. Historically ergot resulted in a human disorder known as St Anthony's Fire. Victims of St Anthony's Fire suffered from nausea, hallucinations and gangrene as a result of the toxic alkaloids produced by the fungus and are found in contaminating sclerotia.

Ergot sclerotia on hexaploid wheat and on blackgrass

Large-scale transcriptomics studies, comparing gene expression in different female parts of the wheat flower over time, and in *C. purpurea* are being used to determine how the pathogen changes the cellular and biochemical environment of the plant to achieve infection and reproduce, and to determine what molecular functional processes wheat deploys to reduce pathogen infection.

"Honeydew" containing conidia exuded from infected wheat florets

International collaboration:

Anna has been collaborating with Dr. Jim Menzies, Agriculture and Agri-Food Canada since 2009, on a joint study of a source of ergot resistance found in durum wheat.

Anna is interested in collaborating with other scientists, policy makers and farmers with an interest in Ergot. She is organising a ***Clavicipitaceae* workshop at the International Congress of Plant Pathology on 29th July 2018 in Boston**, USA, please register your interest in attending here or via https://www.surveymonkey.co.uk/r/MG97CMQ

DTP PhD student: Eleni Tente, Thesis title “How does *Claviceps purpurea* interact with the Gibberellic acid pathways in developing wheat ovules and what are the implications for resistance and yield”.

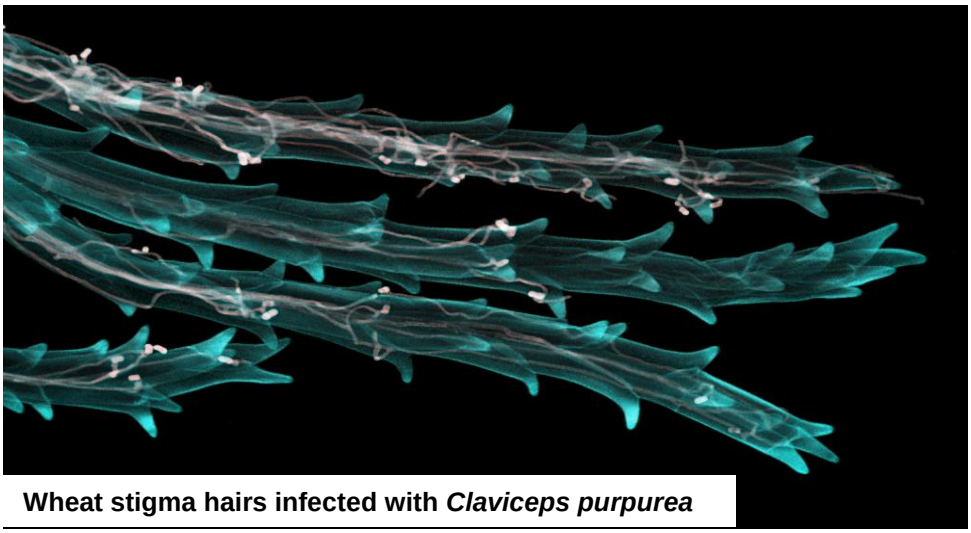
Jumbo Sclerotium

References:

Menzies JG, Klein-Gebbinck HW, **Gordon A**, O’Sullivan DM (2017). **Evaluation of *Claviceps purpurea* isolates on wheat reveals complex virulence and host susceptibility relationships.** Canadian Journal of Plant Pathology; published online August 2017 e print: http://www.tandfonline.com/eprint/SqA5WrVr8nSCigd6d5hG/full

Gordon A, Basler R, Bansept-Basler P, Fanstone V, Harinarayan L, Grant PK, Birchmore R, Bayles R. A, Boyd LA and O'Sullivan DM (2015). **The identification of QTL controlling ergot sclerotia size in hexaploid wheat implicates a role for the Rht dwarfing alleles.** Theoretical and Applied Genetics, 128. Pp. 2447-2460.

Volpi C, Raiola A, Janni M, **Gordon A**, O'Sullivan DM, Favaron F and D'Ovidio R (2013). ***Claviceps purpurea* expressing polygalacturonases escaping PGIP inhibition fully infects PvPGIP2 wheat transgenic plants but its infection is delayed in wheat transgenic plants with increased level of pectin methyl esterification**. Plant Physiology and Biochemistry, 73. pp. 294-301.



Wheat stigma hairs infected with *Claviceps purpurea*