

# HACCP techniques for the management of fusarium toxins in cereals

Area of research interest: [Chemical hazards in food and feed](#)

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Conducted by: Campden and Chorleywood Food Research Association

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## Background

Mycotoxins are poisonous secondary metabolites produced by certain fungi present in cereal crops. Of current concern to the European cereals industry are the 'field' mycotoxins produced by the genus fusarium (such as deoxynivalenol, fumonisin B1 and zearalenone) and storage mycotoxins, in particular ochratoxin A. The stability of mycotoxins means that they can persist through the food chain and in some cases this includes accumulation in livestock tissue, which is subsequently eaten by the general public.

Developing management systems for the control of mycotoxins produced by fusarium is complicated, due to the numerous factors involved in the cereal production process. It was the aim of this project to identify points and risk factors in the commercial flow of grain that are critical to the management of mycotoxin contamination, in order to minimise consumers exposure to mycotoxins.

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## Research Approach

This research project provided an analysis of what is currently known about fusarium mycotoxins together with the commercial flow of the three major cereals grown in the EU: wheat, maize and barley, using food quality management techniques such as Hazard Analysis Critical Control Point (HACCP). This project identified the key factors influencing the production of these mycotoxins with the aim of highlighting quality control/assurance techniques to satisfactorily manage these risk factors within a commercial context and so reduce the risk of mycotoxin contamination to the consumer.

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## Results

Mycotoxin contamination by members of the genus fusarium generally occurs in the field, depending on a range of factors. Prevention of such contamination is achieved using quality assurance principles. This report describes the results of a survey of literature relating to contamination of grain by fusarium toxins, together with the trading and processing of grain within the EU. These data have been subjected to critical path analysis.

In-house and external literature databases, including the Internet, were searched and a library of approximately 3,000 entries compiled. This formed the basis of a literature review which was subsequently interrogated and analysed.

Analyses for the flow of grain from field to primary processor were performed within the context of a 'Universal set flow diagram', which describes the generalised flow of grain within the EU. These data were subjected to critical path analysis using HACCP (Hazard Analysis Critical Control Point) principles, and both critical and quality control points (CCPs and QCPs) were identified. Similar studies were performed for the manufacture of bread, beer, cornflakes and maize starch.

In the case of bread there are steps, particularly in the milling process, which can assist in reducing the risk of mycotoxin consumption by the consumer. Key points where control can be exerted concern the provenance of the grain and application of appropriate supplier assurance schemes (which incorporate mycotoxin surveillance programmes) and, depending on local conditions, introduction of equipment which can remove fusarium-damaged grains (such as gravity tables) in the screen room.

Commercial products produced from the dry milling (cornflakes) and wet milling (starch) of maize have been evaluated. The integrity of the original raw material is the key factor in minimising the risk of mycotoxin contamination. A number of process steps could contribute to significant reductions in some of the mycotoxins associated with maize.

The results of this exercise demonstrate that development of appropriate risk reduction practices, primarily on farms, will significantly assist in reducing the incidence of mycotoxin contamination in the food chain. A number of easily measurable quality parameters have been identified which enable such systems to be monitored and their efficacy can be verified by appropriate mycotoxin analyses. The overall efficacy of such systems can be enforced by appropriate supplier quality assurance programmes.

Research report

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