Joint study of *Fusarium* and related mycotoxins in food: detection and control 'FUSARIUM- FOOD SAFETY' - BL/02/C46 - BL/10/C47

(Geographic) study area : China: Beijing – Shanghai – Hainan – Henan; Belgium: Ghent – Louvain-la-Neuve

Data used:/

Context and objectives

Many cereals, but also other agricultural crops are susceptible to fungal attack, either in the field or during storage. These fungi may produce as secondary metabolites a diverse group of chemical substances known as mycotoxins. In terms of exposure (humans and animals) and severity of chronic disease, mycotoxins appear at present to pose a higher risk than anthropogenic contaminants and pesticides. A number of mycotoxins have been found to be carcinogenic.
The project focuses on *Fusarium* species and related mycotoxins, as these seem to become one of the major issues in global mycotoxin research. In China, *F. graminearum* is the most dominant species, while in Belgium *F. graminearum* and *F. culmorum* are most frequently occurring. However, more than 20 common *Fusarium* species exist, capable of producing more than 100 toxic secondary metabolites.

At the current stage in mycotoxin research, an interdisciplinary approach seems to be the only promising way to find answers for this widespread mycotoxin problem. Therefore, the first and major objective of this proposal is to bring together experts from both China and Belgium on *Fusarium* and related toxins. The 4 different partners are complementary as they are focused on different aspects of this research topic. Multidisciplinarity and cross-border research are the key issues in this project.
More specifically research is done in both Chinese and Belgian research institutes on:
1. Development of rapid field detection techniques for mycotoxins (antibody-based rapid tests, molecularly imprinted polymers);
2. Survey of *Fusarium* toxins in vegetables and herbs, available on the Chinese market;
3. Study of the *Fusarium* spp. diversity on maize and banana in China and of the variations and distribution of the fumonisin biosynthesis gene cluster inside these *Fusarium* populations.

Methodology

The project is divided into five work packages:
Workpackage 1. **Development of antibodies and antibody-based assays**
- Monoclonal antibodies are being raised in mice according to the hybridoma technology. ELISA and rapid field tests, such as clean-up tandem based immunoassay and the flow-through assay will be developed for the simultaneous detection of several *Fusarium* toxins.
Workpackage 2. **Development of molecularly imprinted polymers (MIP**)
- Specific recognition sites are created in a polymeric matrix, mimicking the binding sites of antibodies. A MIP for the *Fusarium* toxin zearalenone is under development.
Workpackage 3. **Survey of *Fusarium* toxins in plant-based food products, available on the Chinese market**
- Chinese herbs were collected and analysed for mycotoxin contamination by a multi-mycotoxin LC-MS/MS method. Also, distribution and identification of *Fusarium* spp. is carried out using morphological and molecular tools. Further, tea and food supplement samples will be analysed.
Workpackage 4. **Study of the *Fusarium* spp. diversity on maize and banana in China and of the variations and distribution of the fumonisin biosynthesis gene cluster inside these *Fusarium* populations**
- Field trips are organised for the collection and isolation of *Fusarium* on banana and maize in Hainan and Henan provinces. The project will contribute to the study of the *Fusarium* spp. diversity in China, especially the *Fusarium* species potential producer of fumonisin. *Fusarium* samples will be identified morphologically and molecularly. Also the variations and the distribution of the fumonisin biosynthesis gene cluster inside these *Fusarium* populations will be studied.
Workpackage 5. **Organisation of workshops on *Fusarium* and related mycotoxins in Belgium and China**

Results

The project is still ongoing. Until now, following results were obtained for the different work packages:
WP1: A rapid immunochemical column test for simultaneous detection of two *Fusarium* toxins was developed. Up till now, no good monoclonal antibodies were obtained for deoxynivalenol and T-2 toxin; new immunogens were therefore prepared. (UGent, CAU)
WP2: Developing of a zearalenone MIP is in progress. (SJTU, UGent)
WP3: Traditional medicinal herbs (25 samples) were collected in China, brought to Belgium and analysed by LC-MS/MS. In two out of 25 samples ochratoxin A was detected; no *Fusarium* toxins were detected. The distribution of *Fusarium* spp. and other fungi was investigated in the 25 medicinal herb samples. In one sample *Fusarium* spp. were detected, while *Aspergillus* and *Penicillium* spp. were the most common contaminants. (SJTU, UCL, UGent)
WP4: The first field trip is currently ongoing (October 28 till November 7, 2009). Banana samples are collected and studied for *Fusarium* contamination in Hainan province, while maize samples are collected and studied for *Fusarium* contamination in Henan province. (SJTU, UCL)
WP5: The workshop in China will be held on November 8, 2009 in Shanghai. It will be co-organised by SJTU and CAU. This workshop will be a satellite event at the Fifth International Forum on Food Safety which will be organised from November 9 till 10, 2009 at SJTU. During this workshop there will be presentations from SJTU, CAU, UCL, UGent and several invited Chinese researchers from different institutes. Also, Chinese policy makers/regulators will be invited to attend this workshop.

Different exchanges of experts took/take place:
October 17–October 24, 2008: Prof. Van Peteghem and Prof. De Saeger (UGent) visited SJTU and CAU in an explorative mission.
January 20-February 19, 2009: Dr. Aibo Wu, SJTU, visited UGent and UCL. He performed research on ZEA MIP development at UGent. Further at UCL, Dr. Aibo Wu started the organisation of the first collect mission and workshop in Shanghai.
October 28-November 9, 2009: Dr. Van Hove and Dr Munaut take part in the first collect mission and workshop in Shanghai.
November 6-13, 2009: Prof. De Saeger takes part in the workshop in Shanghai and meets with all partners of the project.
November 6-December 1, 2009: MSc De Smet performs research on ZEA MIP at SJTU.

Products and services

The project is still ongoing.
A first peer reviewed paper has been submitted to Analytica Chimica Acta: Basova E. et al. An immunochemical test for rapid screening of two *Fusarium* toxins.
Joint peer reviewed publications will be prepared when more results will be obtained during the project.

Execution

Period: May 1, 2008 – January 31, 2011

Research Team/network:

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