Foreword and Cover pages

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Foreword and Cover pages

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Title:
Advances in Genomics, Biodiversity and Rapid Systems for Detection of Toxigenic Fungi and Mycotoxins

Guest Editors:
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For Peer Review Only

Guest Editorial

Introduction to the MYCOGLOBE Conference on “*Advances in Genomics, Biodiversity and Rapid Systems for Detection of Toxigenic Fungi and Mycotoxins*” and outcome of the relevant Discussion Groups*

The accumulation of mycotoxins in foods and feeds represents a major threat to human and animal health as they are responsible for several chronic health risks, including immunosuppression, cancer induction, and digestive, blood and nerve defects. Mycotoxins negatively impact agriculture and associated industries in different ways and the economic consequences of mycotoxin contamination are profound. Regulations have been established in most countries worldwide to protect consumer health and ensure fair practices in food trade.

Because of the scale of the problem several research projects have been funded by previous EU framework programmes (V and VI FP) to develop strategies for minimizing the risk of toxigenic fungi and mycotoxins in food crops. In this context the MYCOGLOBE project was supported by the European Commission within the VI framework programme as a Specific Support Action aiming at the “*Integration of Mycotoxins and Toxigenic Fungi European Research for Food Safety in the Global System*”. The project was set up to share the results of EU research with other countries that have bilateral science and technology agreements with the EU, within the wider framework of a global information system on mycotoxins and toxigenic fungi. MYCOGLOBE focused its activity on the participation and cooperation between EU and other countries to gather knowledge on mycotoxin crop contamination, mapping the mycotoxin occurrence in the most widely cultivated and exported crops, networking which includes training, working and expert groups, conferences, seminars and management seminars.

The MYCOGLOBE Conference on “*Advances in Genomics, Biodiversity and Rapid Systems for Detection of Toxigenic Fungi and Mycotoxins*”, held in Monopoli (Bari), Italy, 26-29 September 2006, was the sixth in a series of international meetings organized within the project. In keeping with the goals of the MYCOGLOBE project, the conference brought together experts from various parts of the world engaged in developing knowledge in genomics, biodiversity and novel technologies aimed to reduce and ultimately eliminate the adverse effects of mycotoxin contamination on the profitability of agriculture and related industries as well as the safety of food and feed supplies worldwide.

The Conference was organized in 3 main oral sessions, and included a poster session and Discussion Groups.

The first session on *Biosynthesis of Mycotoxins and Genomics of Toxigenic Fungi* included aspects relevant to EST profiling for elucidation of aflatoxin biosynthesis and the whole genome sequencing of *Aspergillus flavus* as well as comparative genomics of *Aspergillus flavus* and *Fusarium graminearum*. Other aspects of functional genomics in the biosynthesis of aflatoxins and ochratoxin A were also discussed.

The second session on *Biodiversity of Toxigenic Fungi* included biodiversity of *Aspergillus*, *Fusarium* and *Penicillium* in different continents as well as the role of biodiversity in plant pathogenicity and biological control.

The third session on *Emerging Detection Methods for Toxigenic Fungi and Mycotoxins* included a variety of molecular methods (real time PCR, microarrays, multiplex) for the detection of toxigenic fungi (producing ochratoxin A, trichothecenes or fumonisins) together with the use of electronic nose for differentiation of toxigenic and non-toxigenic fungi. Among the emerging methods for mycotoxins, capillary electrophoresis and fluorescence polarization were introduced together with microensors and immunological flow-through devices for rapid analysis as well as new immunoaffinity columns or liquid chromatography-mass spectrometry methods for multi-

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mycotoxin analysis. Analytical methods for biomarkers of exposure to fumonisins were also reviewed.

Five *Discussion Groups* were formed among participants (about 10-15 participants per group) based on the relevant expertise to discuss specific topics of interest aiming to: i) identify priority areas within specific topics of the discussion group that may be suitable to be part of a proposal to the following call for the VII Framework Programme of the European Commission, and ii) identify at least two different fungi and toxins to be studied. The following topics were selected for the Discussion Groups: i) Genomics, ii) Biodiversity, iii) Rapid detection of toxigenic fungi, iv) Rapid detection of mycotoxins, and v) Regulation of toxin biosynthesis. Following is the list of best ideas or priorities identified by each Discussion Group:

1. Genomics

Create and maintain a data base resource including: Sequence information; Expression data; Metabolic profile; Evolution/phylogeny; Comparative analyses (strain/genus).
Develop better tools/high throughput for functional genomics: Maintain a repository for mutants/disrupted strains; Harmonize and coordinate functional studies.
Train researchers to use: Databases/bioinformatics/annotation; Functional genomics tools and technology; Special emphasis for third-world countries.

2. Biodiversity

Approaches: i) Understand biodiversity of fungal populations at global level; ii) Use fungal biodiversity to inform plant disease-resistance breeding programs; iii) Develop specific markers for detection of specific toxigenic/pathogenic traits and/or fungal populations; iv) Provide scientific basis for mycotoxin risk assessment; and v) Provide scientific basis for forecasting new and emerging toxigenic fungi.
Specific target problems: i) Trichothecenes and *Fusarium graminearum* in cereals; ii) Ochratoxin A genes and *Aspergillus niger* group in grapes and other plant products; ii) Aflatoxin genes and *Aspergillus flavus* in maize and other plant products.

3. Rapid Detection of Toxigenic Fungi

Main priorities: i) Develop validated robust tools for trichothecene-producing fungi from biosphere to plate; ii) Develop molecular detection systems for ochratoxin A and aflatoxin producing species from spices from developing countries to avoid trade barriers; iii) Develop tools to detect ochratoxin A producing fungi in cereals; and iv) Develop quantitative multiplex methods to analyze interactions, biodiversity and epidemiology of food and feed relevant fungi.

4. Rapid Detection of Mycotoxins

Method development and performance validation: Global validation of methods requiring < 30 min with sample preparation or < 5 min without sample preparation; Collaborative study of point-of use methods.
Applicability and accessibility: Improve robustness of assays; Reduce cost of assays; Training; especially of third world personnel, to conduct assays.
Biomarkers: Identify and validate new markers and methods; Develop analytical methods to support biomarker identification and monitoring; Utilize biomarkers to monitor exposure and perform intervention strategies.
Quality assurance and risk management: Monitor contamination at critical points in the food chain; Identify and monitor breakdown products and “masked” mycotoxins; Improve/develop confirmatory assays.

5. Regulation of Toxin Biosynthesis

Selected ideas: i) Identify abiotic and biotic factors affecting regulation of mycotoxin biosynthesis and catabolism; ii) Identify inter- and intra-cellular signals and transduction pathways/mechanisms; iii) Identify specific and global regulatory factors at the DNA and chromatin level; iv) Identify key regulatory factors for targeting to minimize mycotoxins in food and feed.

The MYCOGLOBE project has been an extraordinary experience of a large and fruitful cooperation at global level between of various experts and Institutions dealing with prevention and reduction of the mycotoxin problem. This led to the constitution of the International Society for Mycotoxicology that will continue the networking and promotional activity started with MYCOGLOBE. We are deeply grateful to the European Commission for allowing us to share this experience with all participants that contributed to success of the project.

This special issue of *Food Additives and Contaminants* is a collection of selected papers which are representative of the various topics discussed at the MYCOGLOBE International Conference.

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Footnote

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Integration of Mycotoxin and Toxigenic Fungi
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Research for Food Safety in Global System

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