Preface

Mycotoxins are toxic fungal metabolites that cause severe health problems in humans and animals after exposure to contaminated food and feed, having a broad range of toxic effects, including carcinogenicity, neurotoxicity, and reproductive and developmental toxicity. The United Nations Commission on Sustainable Development approved in 1996 a work program on indicators of sustainable development that included mycotoxins in food as one of the components related to protection and promotion of human health.

From that program, the concern due to mycotoxin contamination of agro-food crops is in continuous growth worldwide since the level of their occurrence in final products is still high and the consequent impact on human and animal health significant. Moreover, the economic costs for the whole agricultural sector can be enormous, even in developed countries as shown by the losses in the United States alone that can be around $5 billion per annum. Different approaches have been used in mycotoxin research through years. First, implications of mycotoxins in humans were investigated in medicine; later agro-ecological aspects and the fundamental mystery of the biological role for production of secondary metabolites are still analyzed. Regulatory limits, imposed in about 80 countries to minimize human and animal exposure to mycotoxins, also have tremendous economic impact on international trading and must be developed using science-based risk assessments, such as expensive analytical methods used to detect mycotoxins eventually occurring in food and feed. On the other hand, decontamination strategies for mycotoxins in foods and feeds include treatments that could show inappropriate results because nutritional and organoleptic benefits could be deteriorated by the process. Alternatively, programs of mycotoxin prevention and control could be applied through evaluating the contamination of foodstuffs by the related mycotoxin-producing fungi and therefore screening the potential mycotoxin risk associated.

Because mycotoxins are produced within certain groups of fungi, the understanding of their population biology, speciation, phylogeny, and evolution is a key aspect for establishing well-addressed mycotoxin reduction programs. This perspective is of fundamental importance to the correct identification of the mycotoxigenic fungi, since each species/genus can have a species-specific mycotoxin profile which would change the health risks associated with each fungal species. The previous use of comparative morphology has been quickly replaced in the last two decades by comparative DNA analyses that provide a more objective interpretation of data. Advances in molecular biology techniques and the ability to sequence DNA at very low cost contributed to the development of alternative techniques to assess possible occurrence of mycotoxins in foods and feeds based on fungal genetic variability in conserved functional genes or regions of taxonomical interest, or by focusing on the mycotoxigenic genes and their expression. The possibility of using a highly standardized, rapid, and practical PCR-based protocol that can be easily used both by researchers and by nonexperts for practical uses is currently available for some species/mycotoxins and hereby proposed. Further progress in transcriptomics, proteomics, and metabolomics will continue to advance the understanding of fungal secondary metabolism

and provide insight into possible actions to reduce mycotoxin contamination of crop plants and the food/feed by-products.

Finally, we do hope that readers will find the chapters of *Mycotoxigenic Fungi*: *Methods and Protocols* helpful and informative for their own work, and we deeply thank all authors for their enthusiastic and effective work that made the preparation of this book possible.

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