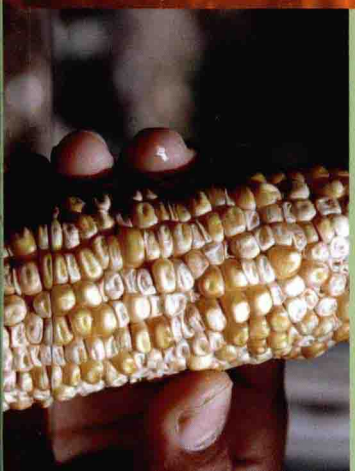
Mycotoxin Reduction in Grain Chains



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Preface

Mycotoxins are fungal secondary metabolites that may be found in human foods and animal feeds. These compounds belong to families of organic molecules that share no significant properties other than the ability to confer death, disease, and misery on humans and other animals that consume them. Mycotoxins, and the fungi that synthesize them, frequently are detected by discoloration or other symptoms of fungal growth, but insidious contamination where the infected foodstuff appears normal to the eye is a significant problem. In developed countries, food safety regulatory systems are effective and efficient at identifying contaminated materials and removing them from primary food and feed channels. Rare incidents where animals are killed following consumption of mycotoxin-contaminated pet foods make national headlines, and most consumers know neither the names of the toxins nor the consequences of their consumption.

In less developed countries, especially in rural areas, the food commonly consumed often is a miasmatic mixture of inferior grain consistently contaminated with one or more mycotoxins, yet outright toxic outbreaks with multiple deaths are not common. Continuous sub-acute exposure to mycotoxins, however, suppresses immune system activity and retards the normal mental and physical development of children, and is likely responsible for far more human debilitation than are the much more sensational outbreaks where deaths occur. The physical separation of contaminated and uncontaminated food is a prelude to discarding the contaminated material in the developed world, but merely increases the exposure of those in less developed countries who are too poor to be able to afford anything else. As long as food security remains a significant issue, the threat of starving tomorrow will always be more significant than the threat of cancer in some 10–20 years. Trade regulations that lead to rejection of food lots containing any mycotoxins, effectively reduce food safety in developing countries as only the best quality food makes it to international trade and all of the rest remains for local consumption in the country of origin. Climate change and the pressure to expand production into marginal areas to be able to feed 9 billion people will only increase mycotoxin contamination problems, which are most common in stressed plants growing in less-than-optimal environments.

Most mycotoxin exposure is a result of consuming one or more of the world's five most commonly grown grains—wheat, maize, rice, barley, and sorghum—although some people also may be exposed to high levels of toxins following the consumption of peanuts. In this volume mycotoxin contamination is evaluated for these five grains, with emphases on wheat (and barley) and maize. For wheat and maize the entire grain chain from breeding to storage to food processing is considered, while for rice and sorghum, where mycotoxin problems are much less important, a literature review is provided. In many cases the authors look at current status as well as to future needs and desirable innovations. Developing rapid, simple techniques for detecting mycotoxins remains a major challenge as does breeding host plants that are resistant to the fungal diseases and depress accumulation

of the toxins the fungi can produce. Proper post-harvest storage can retain grain quality and prevent the synthesis of new toxins even if toxin-producing fungi are present. While HAACP-type protocols are not yet available to prevent mycotoxin contamination many of the critical parameters are known, and an important goal is to increase the efficacy of processes and protocols already identified as significant.

This book is unusual in that it looks at all five of the world's major grains and evaluates the entire grain chain from planted seed to processed food. We hope that it provides answers to many questions about the problems posed by and the controls available for mycotoxins, and that some readers will find all they need to know (and perhaps more than they want to know) within these pages. At the same time we know that there are many who will likely find this book as a first comprehensive introduction to these compounds and to the broadly interdisciplinary research that is needed to understand their implications, impacts, and costs in today's world. For them we hope this book, supported by a European Union FP 7 project—MycoRed, provides a good guide for where to go next. It is clear that mycotoxins are a significant problem that is becoming more widely recognized as such, and that the broadly integrated efforts of a variety of life, physical and social scientists is needed to effectively address it.

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