



### C3 The Toxicology of Molds

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After attending this presentation, attendees will have a better understanding of: 1) mold growth and the development of mycotoxins; 2) mold-related diseases in humans and other animals; 3) detection of mold and mycotoxin exposure; and 4) the assessment of risk posed by molds and mycotoxins. Dr. Smith will use a case study to illustrate the difficulties encountered in defining mold-related injury.

Over the last few years, insurance companies, landlords, tenants, home owners and others have become acutely aware of the potential health effects and financial liability posed by molds in indoor air. Often such health effects and liability are assumed regardless of the specific mold or molds encountered. This presentation will impact the forensic community and/or humanity by describing the toxicology of specific molds, which is a necessary prerequisite to the evaluation of their potential to adversely impact indoor air quality and pose a human health risk worthy of study and remediation. This presentation provides basic toxicological information about molds required for the evaluation of indoor air environments and understanding the potential for adverse effects in people.

This paper has three objectives: (1) to provide an overview of the toxicology of molds; (2) to identify conditions leading to mold and mycotoxin growth, development, and exposure; (3) to describe adverse health effects attributed to mold and mycotoxin exposure; and (4) to describe the difficulties inherent in demonstrating a mold-related injury.

Recent multi-million dollar jury awards in high profile legal cases involving mold-related injury captured the attention of insurance companies, regulators, environmental firms, realtors, landlords, and the individual homeowner. In the midst of an explosion in the growth of mold-related assessment and remediation services, there is too little emphasis placed on recognizing mold related injury.

Molds are fungi, ubiquitous organisms that make up approximately 25% of earth's living matter. They play an important role in the breakdown of organic matter like leaves, wood, and plant debris. To flourish, molds require moderate temperatures (i.e., between 40 and 100°F), a nutrient base (such as the cellulose in wood or paper), and moisture. People become exposed to mold and/or mold-toxins (i.e., mycotoxins) through the consumption of mold and/or mycotoxin in foods, having skin contact with mold and/or mycotoxin, and through inhalation of mold spores/fragments and/or mycotoxins. Exposure to mold and/or mycotoxins is associated with immunosuppression, immunodepression, emesis and diarrhea, weight loss, nervous disorders, cardiovascular alterations, skin toxicity, decreased reproductive capacity, bone marrow damage, flu-like symptoms, including sore throat and headache, dizziness, dermatitis, fatigue, and general malaise. Asthmatics tend to be particularly sensitive to mold exposure, with 10 to 32% of all asthmatics showing some sensitivity. Perhaps the most sensitive group of people is those with compromised immune systems.

It is often useful to think of the adverse health effects associated with molds as falling into two basic categories; those caused by exposure to the mold organism itself and those caused by exposure to a mold-produced toxin or mycotoxin. In the former category, direct exposure to molds is known to illicit a wide variety of responses from humans and other animals. These responses include diseases characterized by the growth of mold on tissues (e.g.; athlete's foot) and secondary health effects (e.g.; increased incidence of disease), which may be related to the suppression or depression of immune system function. In the latter category, doctors have used certain mycotoxins to treat bacterial infections (e.g.; penicillin), while inadvertent exposure to other mycotoxins is clearly associated with the development of cancer and even death.

Recognizing mold-related injuries is critical to the identification of mold problems. This is because nearly half of the buildings with mold-related indoor air quality problems do not present visible signs of mold growth. Consequently, environmental companies often recommend thorough and competent testing to evaluate indoor environments for mold. Air sampling alone, however, will not provide sufficient evidence to indicate a mold problem and because there are no official standards or guidelines for regulating molds in indoor air, determining that a mold problem exists can be problematic even with good indoor air sampling information. Consequently, the most important feature of an assessment of a mold problem is the evaluation of mold-related injuries. In this presentation, Dr. Smith will present an overview of mold toxicology with special focus on the difficulties inherent in demonstrating mold-related injury.

#### **Mold, Toxicology, Toxic Molds**