Scary Mold and Boring Staph: A Tale of Two Microorganisms

By ACSH Staff — December 3, 2002

Public fear is often disproportionate to real risks. Take the cases of staph and, on the other hand, the "killer mold" that has been in the news so much lately.

**Staph**

*Staphylococcus aureus* (commonly called "staph") is a hardy bacterium that is microscopic in size. Food, surfaces, or products that are contaminated with the organism cannot readily be identified and avoided. Some strains produce a highly heat-stable toxin that causes illness in humans and enhances virulence. Consumption of food contaminated by *Staphylococcus* causes food poisoning. Other diseases caused by *Staphylococcus* include toxic shock syndrome (a disorder characterized by multisystem organ failure and high mortality) and scalded skin syndrome (extensive blistering of large areas of skin). Infectious diseases caused by *Staphylococcus* include skin infections, bacteremia, endocarditis, arthritis, osteomyelitis, pneumonia, and abscesses in virtually any organ.

*Staphylococcus* is ubiquitous in homes, schools, hospitals, and virtually all places that humans occupy. It is present on surfaces, in dust, and in the air. It is most often spread person-to-person but can be spread through contact with contaminated surfaces, via inhalation, and by consuming contaminated foodstuffs.

Cluster outbreaks of the disease are identified frequently in hospitals, picnics, etc. (food borne illness); newborn nurseries, daycare centers, and burn units (scalded skin syndrome); and in young women who use tampons (toxic shock syndrome). Outbreaks are associated with a very high attack rate (often greater than 75% of the population at risk), high acute morbidity, and significant mortality. Symptoms associated with food poisoning include nausea, vomiting, abdominal cramping, prostration, diarrhea, headache, muscle cramping, and hypotension. Symptoms of scalded skin syndrome include a rash, which may develop flaccid blisters, either localized or involving the entire skin surface. Complications include a high rate of secondary infections, fluid and electrolyte loss, and high mortality. Toxic shock syndrome is associated with the use of hyper-absorbent tampons, post-operative wounds, and childbirth (both vaginal deliveries and cesarean sections) and includes high fever; a diffuse rash that blisters on the palms and soles; hypotension (low blood pressure); and vomiting, diarrhea, kidney/liver dysfunction, blood clotting abnormalities, muscle aches, and disorientation (central nervous system dysfunction).

An estimated 3 million people in the United States contract food poisoning due to *Staphylococcus aureus*, although the number may be substantially higher. Hundreds of cases of scalded skin
syndrome and dozens of cases of toxic shock occur worldwide each year.

Still, the public is somewhat familiar with this agent and not particularly concerned about it. It gets infrequent media attention, and when it does, the media does not tend to dramatize the incident with metaphors. There are typically no repercussions from a case or cluster of illnesses caused by staphylococcal toxins. Industry practices are not changed, and no new regulatory or scientific guidelines are formulated to deal with it. There has not been any adverse impact on any industry due to *Staphylococcus*-induced illnesses, and property values are not adversely impacted. Insurance premiums do not increase due to the presence of staphylococcal organisms in buildings or from the diagnosis of staphylococcal disease. Litigation is rarely generated from the presence of *Staphylococcus*.

"Killer Mold"

*Stachybotrys chartarum* (atra) is a fungus of the Ascomycetes classification. Its spores are microscopic in size and it produces a variety of mycotoxins. Animals given massive doses of spores intranasally develop severe pulmonary injury, depletion of lymphoid tissues (due to damage to white blood cells) and hemolysis (damage to red blood cells). Although several outbreaks of illness in humans have been attributed to respiratory exposure to *S. chartarum*, the causal link between fungal contamination in the indoor environment and adverse health consequences has yet to be established. *S. chartarum* is found in homes, schools, and other buildings that humans occupy and can be found in dust, surfaces, and air samples.

In contrast to *Staphylococcus aureus*, diseases linked to *S. chartarum* exposure in indoor environments are less severe, generally consisting of nonspecific symptomatic complaints of flu symptoms, sore throats, diarrhea, headaches, fatigue, malaise, and "difficulty thinking." Disease endpoints and abnormalities in medical parameters have not been consistently observed, so there is no uniform case definition or diagnostic criteria for the disease. Some studies have reported defects in lung function, decreased white blood cells, and impaired immunological functioning while others have not. There is no definitive diagnostic test. Data linking exposure with health effects are unavailable for spore concentrations found in typical indoor air environments. Its relationship to the development of pulmonary hemorrhage and death in infants, while receiving widespread media attention, remains unproven. Only a handful of studies and case reports can be found in the medical literature, and these have been criticized for lacking adequate data to support a claim of cause and effect.

Although physicians have experience with other diseases due to mold (both infectious and allergic), they generally show limited concern about disease attributable to this organism.

Still, the general population and the media's interest and concern about *S. chartarum* is high. Special interest groups, involved in ongoing litigation or the threat of litigation, often initiate media coverage. This inflates and stimulates controversy, often through highly inflammatory metaphors and adjectives, such as "deadly," "poisonous," and "killer" mold. There is no animal or epidemiologic evidence to indicate that *S. chartarum* is a carcinogen, yet the popular press continues to raise this threat as if it were a proven fact.
Consequences of the Social Amplification of Fear

Repercussions stemming from the notoriety of this mold have been far-reaching. The investigation of childhood deaths linked to *S. chartarum* resulted in widespread, frequently acrimonious scientific debate that often found its way onto the front pages of newspapers. The mold has also been the subject of television and news programs. Extensive fear and public outcry result when the mold is found in schools dividing parents, teachers, and school administrations. This social and community conflict puts pressure on elected officials at local, state, and federal levels. It has also led to the development and implementation of policy agendas, including the involvement of the EPA, Tools for Schools, and Congressional witnesses requesting additional funding. Self-proclaimed medical and scientific experts have emerged and regularly appear in newspapers and on television programs as well as proffering themselves as expert witnesses in legal proceedings.

Conferences were held that dramatically altered industry practices, transforming mold clean-up from standard and routine cleaning activities to the sort of expensive and complicated methods used for asbestos abatement. Guidelines were introduced by various professional groups that required extraordinary precautions despite the lack of clear-cut health hazards. Changes in government regulations are contemplated as well.

Industrial hygienists and other "experts" who represent the interests of litigants have advised the closure of numerous public buildings (courthouses, banks, and schools) and have counseled homeowners to move out of homes in which the mold has been found. Most of these buildings have not reopen and have been permanently stigmatized. Property values of both commercial and residential buildings in which *S. chartarum* has been found have plummeted.

Some industries have capitalized on the financial opportunity associated with evaluation and management of this risk. New schools and teaching programs have arisen to teach building professionals, home and building renovators, restoration personnel and industrial hygienists how to develop and implement mold abatement projects. Insurance companies have been pressured to cover these more expensive abatement services and have raised insurance premiums accordingly. New commercial testing laboratories have been established in order to handle the exponential increase in demand for mold testing. New organizations have been created to regulate and to address quality control in this industry.

And, yes, it has generated lawsuits. People with alleged injuries due to the mold, building owners who have discovered the presence of the mold, and innumerable related parties have generated an enormous amount of expensive litigation. These highly emotion-laden situations play well on television and create enduring images that serve to personalize the risk, shaping perceptions and attitudes.

Science Quietly Weighs In Amidst It All
Recently the scientific controversy led to an investigation of the scientific evidence by prominent medical experts in academia. The Centers for Disease Control issued a formal statement retracting their position on the association between S. chartarum and infant deaths an unprecedented event. Yet this did little to derail the events already in progress, which were far outpacing their limited scientific underpinnings.

The consequences of having the public embrace a concept that has yet to be proven scientifically (danger in the air of their homes, schools, and workplaces) will be an increasing distrust of physicians, scientists, government, corporations, and other institutions. Whether the mold fear persists or subsides, it will reinforce anti-technology attitudes. The reputation of evidence-based scientific reasoning will take another devastating hit, causing its somewhat shaky acceptance by the community to deteriorate further. The chasm between risk assessors and their constituents will deepen as the public perceives that they have been misled or that their risk valuations are not shared by those responsible for managing these risks.

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Dr. Weiss,

What is your opinion on fungal colonization if a person has mold toxicity?

Brett Richards

Weiss replies:

I'm not quite sure what you mean when you say a person who has mold toxicity?

Many of the over 100,000 molds/fungi produce mycotoxins. These are large macromolecules that are non-volatile and concentrate in the cell walls of spores and myceliae. Concentrations are very low relative to toxic doses. Studies by Burge (Burge and Rao, 2002) and others show that in order to deliver a dose of 1 nanogram an organism (or person) would have to inhale and retain a million (1,000,000) spores in the nose and respiratory tract. This is an extremely unlikely scenario in the non-agricultural indoor environment. True toxicity may occur from ingesting molds (from grain, peanuts, cheese, etc.) and is sometimes found in Third World countries. Epidemiologic investigations of acute outbreaks due to ingestion of bread made from grain contaminated by fusarium with high expression of mycotoxins was noted to be short-lived, and symptoms completely resolved soon after people stopped eating contaminated bread (Haddad, Lancet). Long-term ingestion of food contaminated by aspergillus flavus has been linked to cancers of the liver (and possibly stomach and esophagus) due to aflatoxins. There is no documentation that people or animals that have had acute or chronic toxicity due to mycotoxins have ever been colonized by fungi. Fungal colonization, either localized or systemic, may occur when animals (or humans) are severely immunocompromized undergoing cancer chemotherapy or radiation therapy, or suffering severe uncontrolled diabetes or other, often life-threatening disease. Acute bronchopulmonary aspergillosis is colonization of the lungs by aspergillus (and less commonly, other invasive fungi), generally in patients with prior lung scarring or cystic fibrosis. Fungal sinusitis may occur in patients with scarred sinuses who have been on multiple courses of antibiotics that have removed normal respiratory flora. Animal studies and people who have become colonized by fungi do not show signs of mycotoxicosis.