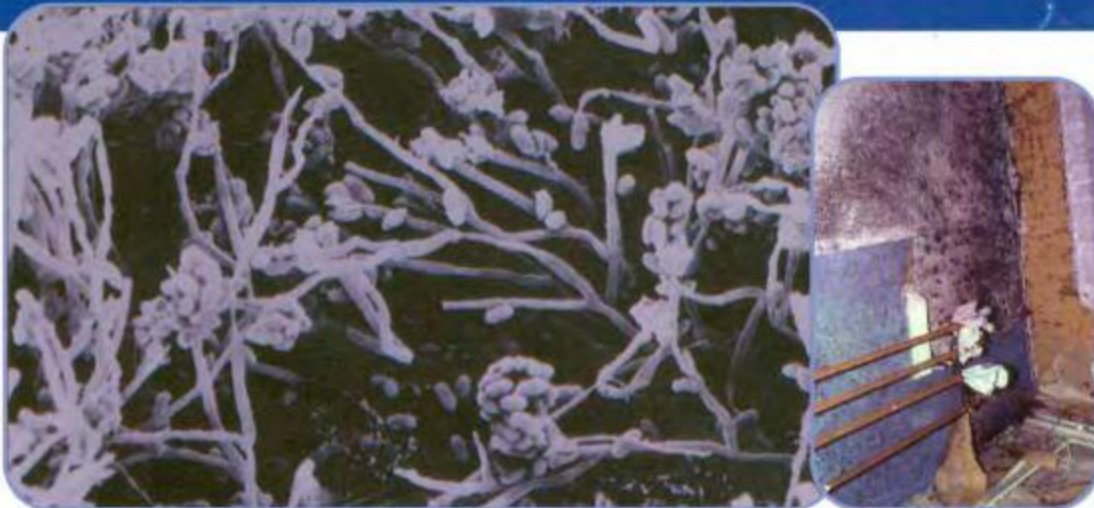


TOXIC MOULD – THE ISSUES!

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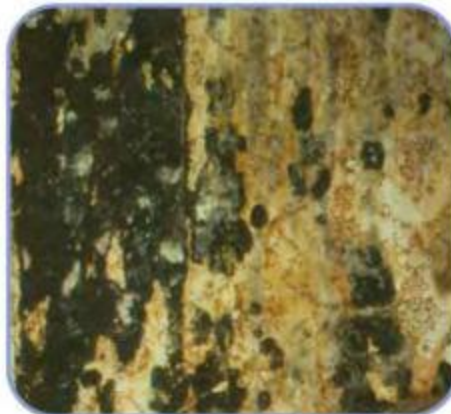
Stachybotrys chartarum (the so-called toxic mould) is today's most notorious mould. In 1993/94, doctors from the Cleveland area in the US attributed the cause of 37 cases of pulmonary haemorrhage and hemosiderosis in young infants to *Stachybotrys*. Twelve of these infants died. This incident and a number of high profile, high cost lawsuits stimulated media interest in this mould in the US and has led to an explosion of mould-related insurance claims. The best known settlement is the \$32.2 million paid to Melinda Ballard, the New York heiress, when her 11,500-square-foot Texas dream home was affected by *Stachybotrys*. While the numbers of multi-million pound claims are rare even in the US, the number of mould-related claims is on the increase. In the last fifteen years, there has been nearly twenty-nine thousand residential mould related insurance claims and 98.7% of these have been made in the last five years. The average claim paid out by the insurer was \$11,787 (source: Policyholders of America).

There are a number of important statements to be made regarding moulds in general and toxic mould in particular. Firstly the term "toxic mould" is not accurate, the mould itself is not poisonous but it produces toxic compounds (mycotoxins) which can affect animals and humans if present in sufficient quantities. Secondly mould spores are always present in the UK air and like dust are found on virtually every surface. Therefore we are continually exposed to moulds and the finding of mould spores within a dwelling does not mean a moisture problem; the direct follow-on from that is exposure to mould does not always present a health problem. Does this mean you can ignore the problem? Is mould growth harmless?

The answer, as you might expect, is a resounding NO and hopefully the following

article will outline the reasons why. This article concentrates on *Stachybotrys chartarum* but many of the statements made are true for other moulds.

WHAT IS STACHYBOTRYS CHARTARUM



This dark brown or black mould (also referred to as *Stachybotrys atra*) is commonly found outdoors in the soil or on plant debris and spores enter buildings along with wind-blown dust. The spores, like dust, will settle out on surfaces and remain dormant perhaps for years until the correct conditions for growth occur. The key factor for initiation and maintenance of mould growth is the presence of available water, since all the other requirements (source of spores, suitable oxygen and temperature levels, and adequate nutrients) are normally present in the building. This mould is unusual in a number of ways, which limits its occurrence in buildings.

It requires a lot of moisture (above 90% equilibrium relative humidity) for growth and therefore it is most commonly found in buildings which have sustained flooding or water damage from internal burst water

pipes or externally from leaking guttering for example. However, extreme and persistent condensation can provide suitable conditions for growth. It also is strongly cellulolytic and its growth is restricted to cellulose containing materials such as wallpaper, plasterboard and wood. Given ideal conditions however, this mould will spread, dominating the flora on the damp wall, and produces large amounts of spores. Another unusual

aspect of this mould is that, unlike other surface moulds, spores are produced into a film of slime so that they are not as readily disseminated in the air as are the "dry spored" indoor fungi such as *Penicillium*. Of the surface moulds occurring on damp surfaces *Penicillium* and *Cladosporium* are probably the most commonly isolated in the UK. *Stachybotrys* is uncommon but occurs in this country, from our own studies we have published data that around 15% of the damp dwellings investigated had this mould.

Identification requires expert knowledge since there are a number of other dark spored moulds found growing on damp cellulose materials for example *Cladosporium*, which is an extremely common indoor mould. While DNA based methods are available for the identification of this mould, in most cases traditional microbiological techniques are cheaper.

MYCOTOXINS AND HEALTH

No article can be written about *Stachybotrys chartarum* without the mention of the variety of toxic compounds this mould produces. Unlike allergens, which affect only sensitive individuals, mycotoxins in sufficient concentrations can elicit a response in anyone. *Stachybotrys chartarum* produces a wide range of mycotoxins termed marcocyclic trichothecenes, of which the satratoxins are produced in the greatest amount. These are highly toxic compounds capable of inhibiting protein synthesis. The mouse LD50, the figure that indicates a dosage that will kill 50% of the mice challenged, is around 1mg kg⁻¹, a corresponding value for Britain's only venomous snake, the Adder is 6.4 mg kg⁻¹.

Other common indoor mould genera (e.g. *Penicillium*, *Aspergillus* and *Fusarium*) can produce mycotoxins some of which are identical to those produced by *Stachybotrys*

chartarum and for this reason the thought that there is only one "toxic" mould should be dispelled.

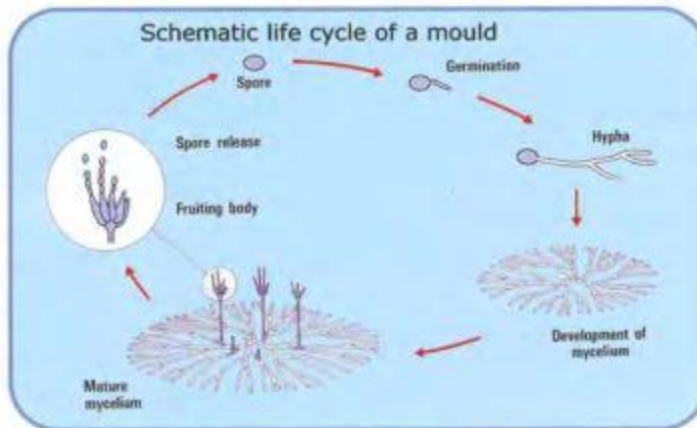
It is thought that these mycotoxins are implicated in the various health effects attributed to this mould. Almost all reported cases of *Stachybotrys* related illness of humans has occurred in Eastern Europe and are linked to direct contact to contaminated animal fodder or feedstuffs. A variety of symptoms have been described including dermatitis, conjunctivitis, fever, headaches and fatigue. Since the 1970's there have been a number of anecdotal reports of ill health resulting from the inhalation of spores or fragments of this mould. The media hype of a few years ago surrounding the Cleveland cases and the various high profile law suits has spurred scientist on to evaluate the link between mould and ill health in a greater number of cases. It is clear that exposure to fungi from water-damaged buildings results in a range of complaints from non-specific "sick building"-like complaints to those affecting the respiratory system, skin, eye and central nervous system (such as vertigo, memory loss and irritability). Recently, researchers in the US reported that *Stachybotrys chartarum* produces molecules that are capable of lysing red blood cells and can lead to bleeding from membranes exposed to these molecules.

Surfing the internet will lead to a myriad of websites and pages suggesting or stating as fact the various health effects associated with the inhalation of *Stachybotrys* spores often tying them to the Cleveland case however there is an obvious lack of "official government" websites supporting these statements. In fact the Centres for Disease control and Prevention (CDC) in Atlanta clearly come out against the hype and states "...a possible association between... pulmonary haemorrhage among infant and *Stachybotrys chartarum* (*Stachybotrys atra*) has not been proven."

While this is true, we do not know the effect of exposure to low levels of mycotoxins nor is the effect of multiple exposures to mixtures of mycotoxins plus other air pollutants present in the air. Thus it is impossible to exclude the role of mycotoxins as an agent affecting the health of occupants. Therefore, it is clear that materials contaminated with this mould should not be handled without proper personal protection and that environments in which this is found should be considered unhealthy.

REMEDICATION STRATEGIES

There are no formal British or European health standards set for moulds, therefore, since mould growing in homes indicates a moisture problem, irrespective of the mould species involved, all mould contamination must be dealt with both in terms of identification and repair of the moisture



problem and the remediation of the mould growth. It is important to note that exposure to mould mycelium and spores can cause allergic reactions in some people and, therefore, as respiratory sensitizers, mould growth and its removal is subject to the Control of Substances Hazardous to Health (COSHH) Regulations 2002.

Prior to remediation commencing an assessment should be conducted which will answer the following questions:

- What is the source of the moisture?
- What types of materials are affected?
- What is the extent of the mould contamination?
- Is it necessary to relocate occupants during remediation?

The answers to these questions will dictate the plan of action, for example mould affected wallpaper will normally be stripped off and dumped, whereas historical material may need specialised drying and renovation. The extent of the mould growth will also influence the route of control either using in-house staff or bringing in specialised contractors. Currently in the UK there is no official guidance on the remediation of mould growth (good basic information can be found in the Building Research Establishment Digest 370 and IP12/95). Further afield in the US and Canada, there are several documents that have been published to provide guidance on mould remediation and worker training. Probably the most famous is the New York Guidelines ("Guidelines on Assessment and Remediation of Fungi in Indoor Environments", New York City Department of Health), initially it dealt with *Stachybotrys* but in 2000 this guidance was reviewed and now refers to the remediation of general mould problems. Other guidance documents include the US Environmental Protection Agency's "Mold Remediation in Schools and Commercial Buildings" and the Health Canada's "Fungal Contamination in Public Building: A Guide to Recognition and Management". The Health Canada document is the only one to deal directly with *Stachybotrys* and provides a detailed flowchart to aid with the assessment of the problem.

The removal of moisture is the ideal

strategy for long-term control of mould growth thus repair work to the building structure or improvement of the insulation may be required. However, such remedial work may be prohibitively expensive to implement in some properties due to constraints imposed by the design and construction of the building. Thus the use of surface biocides and anti-fungal coatings can be an alternative to treating mould growth.

When conducting remediation work using these products, the phrase to remember is 'treat, clean, treat'. Surfaces must be cleaned to remove all mould and surface contamination down to a sound surface. Then, a suitable HSE registered surface biocide should be applied to kill any remaining mould. Any building materials that cannot be cleaned or have lost their structural integrity due to water or mould damage need to be removed. These items should be placed in sealed plastic bags for disposal. Materials that have not been severely affected or damaged may be salvaged. Clean again thoroughly with a HSE registered surface biocide to kill off any remaining mould spores. The use of a vacuum cleaner even those fitted with a High Efficiency, Particulate Air (HEPA) filter should be reserved for use with delicate items such as books. Wait until the surface is dry and if required redecorate using fungicidal paints.

SUMMARY

Toxic mould is not a myth, it is present in the UK and some significant health effects are potentially linked to this mould but it is not as devastating as the media would have us believe.

When faced with a (toxic) mould problem – don't panic, act promptly and seek suitable advice. The Centre for Research in Indoor Climate and Health offers an extensive advice and research services to a range of clients encompassing a variety of constructional materials, fabrics and fittings. These include identifying organisms causing fouling and decay on surfaces and within materials either supplied to our laboratory or as an on-site diagnosis service; together with advising upon remedial measures.

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