Introduction

Despite the recent release of an update to the ANSI/IICRC S520 Standard and the IICRC RS20 Reference Guide for mould remediation,7 we report on the potential for manipulation of published thresholds8 for the assessment of airborne and surface microbial contamination. The potential for this to result in buildings/areas being “passed” after remediation, despite mould levels remaining relatively high, is reviewed. We review the existing Australian Mould Guidance, AMG (2010),9 with the aim to tighten both the thresholds contained therein compared against other methods, and the practical definitions for when to cease sampling, and how, and then interpret results to develop practical recommendations for clean-up/scope of works as required. We show using industry reports, how tables of sample mould and indoor air quality results on a per building or area basis can be manipulated to semi-plausibly gain a “pass result” which one can hypothesise could be used to gain a financial advantage favoring the remediator, assessor or the insurer. We highlight an opportunity for abuse resulting from failing to follow adequate reference controls and unequal sampling/mixing of mould or equipment or media can lead to false positive clearance results or conversely how generating mixed and matched thresholds taken from diverse sources can lead to false conclusions (a “fail result”) lacking in evidence or rigour. We highlight improvements to the AMG that should minimize under-sampling or manipulation of air or surface mould counts and/or taxonomic identification efforts used widely in microbiology. Case studies are presented that highlight aspects of these problems and recommendations are given to improve the existing Australian Mould Guidance to better meet the needs of key stakeholders.

Context

The aim of risk-assessment of water damaged buildings is to provide practical guidance for remediation of the built structure (real estate assets) and/or equipment (property contents) to for example protect persons from harm through unreasonable exposure to fungi. In many cases, real estate damage is covered partially or in full under Insurance. Claims assessment and those steps involved in moving from the initial water damage event towards a completed remediation is fraught with potential problems. Exactly what is and is not part of a claim depends on the insurance and the response to objective facts made by different parties to each claim. Despite there being available literature detailing how to respond to potential mould contamination data, we are of the opinion that inappropriate risk assessment based on poorly collected data and/or water damage impacting on the built environment is a major cause of financial loss to both claimants and the insurer. In turn, there are serious discrepancies between different published works regarding benchmarking what is considered suspect, normal, elevated or high risk microbial contamination. To this end, this paper articulates a way forward within an Australian context to minimize time and financial loss by defining a minimum set of recommendations for evidence gathering.

The practical problem is that many different persons can potentially make a determination of the hygienic state of a particular property. This is fundamental to the task of risk assessment. There are major long term ramifications of incorrect risk assessment and can result in contaminated properties being classed as normal and vice versa. The financial, time impacts and emotional distress caused to the different parties is a serious concern. A lack of standardization of approach hinders comparison of how different labs compare their data to determine risk.

Where things can go wrong

Building biology deals with the microbiology of the indoor living environment. When water damage occurs, the microbiological impact can affect the built structure, air quality, and personal property. The ANSI/IICRC S550:2015, pp. 35 defines only three categories of water damage: water category 1 (WCat 1) is “affected with water that is not as objectionable in appearance, odor, and potential to cause property damage or public health concern” compared to water category 2 (WCat 2) which is “affected with water that is objectionable in appearance, odor, and potential to cause property damage or public health concern” compared to water category 3 (WCat 3) which is “affected with water that is extremely objectionable in appearance, odor, and potential to cause property damage or public health concern.”

The aim of the pre-restoration report(s) and subsequent remediation efforts are to return the building and contents to Category 1 at post remediation verification (PRV). The problem is that this fundamental classification can be easily manipulated to favor either the claimant, the insurer or the remediator. This unfortunate triangle of opportunity develops when the evidence for decision making is flawed or obscured or manipulated to present a water damage event scenario and its repair methodology that is not based on fact or reason. We refer to such opportunity as “fraud points” and will articulate a broad set of behaviours that may occur more or less frequently on the way towards a repair outcome.

Why things go wrong

Water damage assessment is a branch of environmental science and occupational health and safety principles follow from the factual evidence. The problem is that junk science, laboratory fraud, deceptive assessment practices, and unproven or incorrect claims can all contribute and impact on the presentation of factual evidence.

High Order Examples

• Fabulating data.
• Misrepresenting control samples.
• Calibrating equipment using non-standard methods, sample modification to alter characteristics,
• Manipulation of analytical results,
• Substitution or omission of samples, files or data,
• Fabrication of records of analytical equipment readings.

Factors that can contribute to such fraud points include:

• Inductive oversight of lab and field data collection, interpretation, documentation and analysis.
• Corruption of protocols or procedures that don’t reflect published literature.
• Commercial intent over quality assurance/acknowledgment of ethics/legitimacy allowing for scientific misconduct.
• Rigour analytically approach to complex environmental data.
• Flawed analytical methodologies.

Graded Examples

• Non-existent or insufficient number of control samples, e.g. spore traps submitted without outdoor controls.
• Based target sampling, e.g. tape lifts only from visibly mould contaminated areas.
• Under-sampling, e.g. only taking samples from easy to remediate areas/surfaces as part of PRV.
• Threshold bias, e.g. some labs state that 1000 spores/m³ is normal while other literature exists showing that much lower levels are required for a normal classification (i.e. <500 spores/m³).
• Taxonomic error, e.g. mis-classification ID of sample Genus or Species due to a lack of expertise/representation of media (slides, cultures, reference works) or not in accord with D7391-09.
• Measurement error, e.g. incorrect counting procedures for spore trap evaluation.
• Data acquisition strategies, e.g. incorrect air sampling timing.
• Stratified sampling, e.g. using several methods (spores traps, petri plates and tape lifts) but under-sampling all areas.
• Over-reporting, e.g. tape lift ID to Species where not possible.
• Data reduction approach, e.g. use of ERMI to collect one sample from a large property and make a decision about the whole property based on only one sample.

Areas for improvement

The AMG (2010) provides a way to classify microbial contamination using: spore traps, tape lifts, and viable cultures of the air or surface. One of us (lab #1) has extensively used the AMG (2010) and tested its efficacy against many thousands of norms. The other two labs (lab #2 and lab #4) do not properly follow the AMG (2010) and Table 1 shows how easy it is to make wildly different conclusions regarding indoor air quality and mould risk to persons depending on the thresholds used. As told, it is important to sample from all or most rooms in a property to minimize the risk of report bias as well as make comment/readings on the surface and roof void.

Revisions to the AMG (2016)

The IICRC Standards are fundamentally qualitative practical cleaning methods and should be clearly defined in limitation against other more precise metrics used for the assessment and practical resolution of environments that present as quantified infection control risks. The revised AMG is promising on extending the hygiene classification of countable colonies from 55mm press plates to also apply for air sample collection of countable colonies onto 50mm petri plates. As well, we include in whole D7338-14 regarding how to assess fungal growth in buildings. Importantly, we tighten the thresholds about which conclusions about mould and/or spore contamination are made with regard to reporting on opinions of scientific and technical experts (E250-11 and E678-07) and which may be used or relied on (E1020-13) as part of criminal or civil litigation. In the event that field data, lab reports and subsequent expert reports have been used based on false thresholds or other metrics unsupported by the current literature or the principles of the relevant ASTM Standards (E1020-13), we can envisage obvious litigation recovery efforts based on opinions made and actions taken from false, pseudo-scientific or misleading information.

Literature cited

1. ANSI/IICRC Standard and Reference Guide for Mould Remediation, Edition 2015. Institute of Inspection, Certification. 2. ANSI/IICRC S550:2015 Standard and Reference Guide for Building Cleaning and Restoration. 3. Brandys, G.M. (2014). Current Protocols in Environmental Health Consulting Services, 2014. John Wiley & Sons, Inc. 4. Branagan, A.; Dill, C.; Zhao, Q. (2012). Comparison of 3 Australian Labs: Biological Health Services, Toorak, VIC, 3142; Mycolab, Wangara, WA, 6065, Australia. 5. PhD thesis: Building biology deals with the microbiology of the indoor living environment. When water damage occurs, the microbiological impact can affect the built structure, air quality, and personal property. 6. The ANSI/IICRC S550:2015, pp. 35 defines only three categories of water damage: water category 1 (WCat 1) is “affected with water that is not as objectionable in appearance, odor, and potential to cause property damage or public health concern” compared to water category 2 (WCat 2) which is “affected with water that is objectionable in appearance, odor, and potential to cause property damage or public health concern” compared to water category 3 (WCat 3) which is “affected with water that is extremely objectionable in appearance, odor, and potential to cause property damage or public health concern.” 7. Despite the recent release of an update to the ANSI/IICRC S520 Standard and the IICRC RS20 Reference Guide for mould remediation, we report on the potential for manipulation of published thresholds for the assessment of airborne and surface microbial contamination. The potential for this to result in buildings/areas being “passed” after remediation, despite mould levels remaining relatively high, is reviewed. 8. We review the existing Australian Mould Guidance, AMG (2010), with the aim to tighten both the thresholds contained therein compared against other methods, and the practical definitions for when to cease sampling, and how, and then interpret results to develop practical recommendations for clean-up/scope of works as required. 9. We show using industry reports, how tables of sample mould and indoor air quality results on a per building or area basis can be manipulated to semi-plausibly gain a “pass result” which one can hypothesise could be used to gain a financial advantage favoring the remediator, assessor or the insurer. 10. We highlight an opportunity for abuse resulting from failing to follow adequate reference controls and unequal sampling/mixing of mould or equipment or media can lead to false positive clearance results or conversely how generating mixed and matched thresholds taken from diverse sources can lead to false conclusions (a “fail result”) lacking in evidence or rigour. 11. We highlight improvements to the AMG that should minimize under-sampling or manipulation of air or surface mould counts and/or taxonomic identification efforts used widely in microbiology. Case studies are presented that highlight aspects of these problems and recommendations are given to improve the existing Australian Mould Guidance to better meet the needs of key stakeholders.