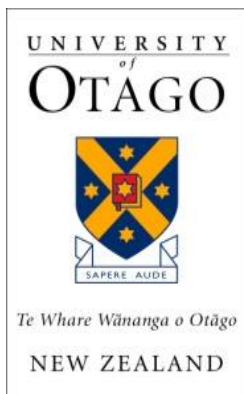


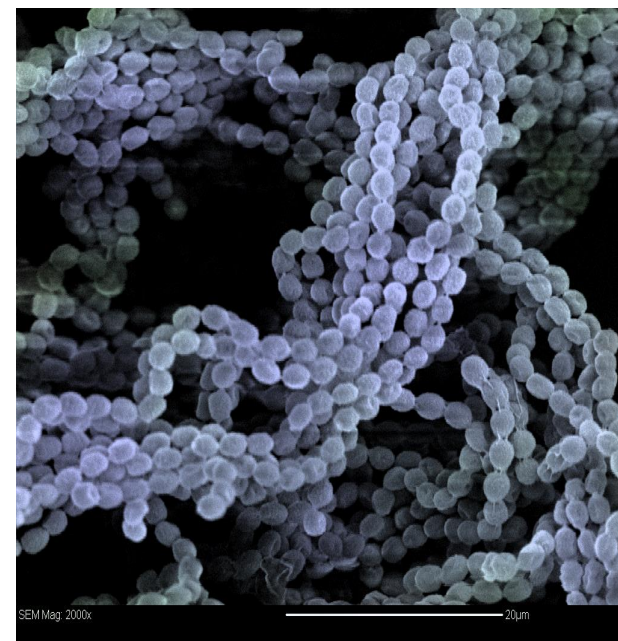
Towards healthier homes

Te ahu ki ngā kāinga ora

What we know about mould in our homes

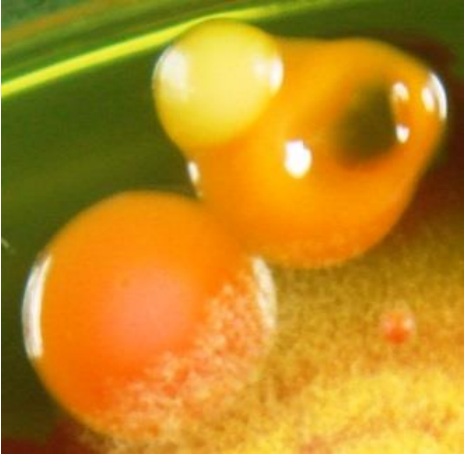


Dr Caroline Shorter
Department of Medicine, UOW

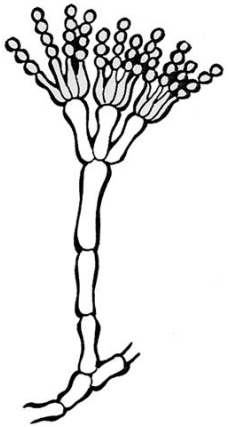


H E K A I N G A O R A N G A

Housing and mould



- NZ indoor mould situation
- Types of reported health problems with mould
- NZ Health studies
 - HOME study - development of asthma in NZ children
 - Te Whiti Te Rā study
- How can we reduce the factors contributing to mould in housing?
- Quick word on climate change



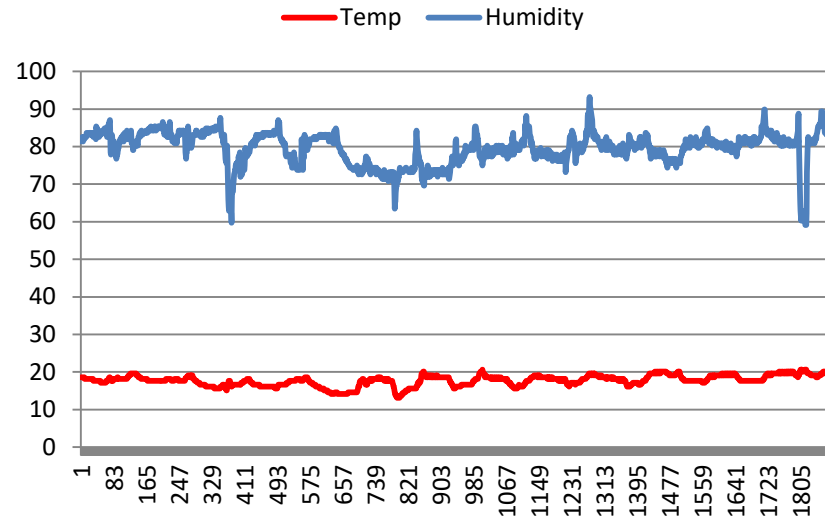
H E K A I N G A O R A N G A

New Zealand indoor mould situation

- High prevalence & greater amounts compared to many other countries
 - Worldwide mould reportedly occurs in 5 – 10% of homes in cold climates
 - 10 – 30% in temperate or warm climates
 - NZ: 2005 P H-C phone survey indicated 35% visible mould (occupants)
 - BRANZ housing condition survey 49% visible mould (assessors)
 - HOME study – building assessor 40%, self-report 86%
 - Census 2018 – 17% of dwellings sometimes or always have mould larger than A4



New Zealand indoor mould situation



Our climate favours mould growth
High indoor relative humidity in many parts of the country

Poor NZ housing and practices:
Lack of insulation, mechanical ventilation (fans), single glazing, reduced window opening, lack of winter sun, lpg heaters, drying washing indoors, unvented driers.

- Supply of water for mould to grow
- Condensation reported in 91% of Wellington homes (HOME study)

H E K A I N G A

O R A N G A

New Zealand indoor mould situation

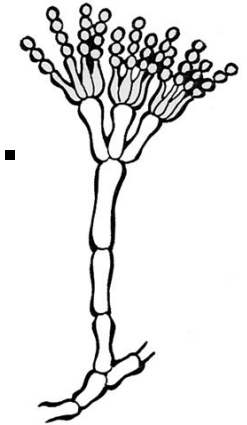
- Previous building standard failures have added to the problem
 - Leaky homes



H E K A I N G A O R A N G A

What health effects?

WHO 2009 meta analysis of associations with indoor dampness and health outcomes (updated from IOM 2004).



Sufficient evidence of an association

Asthma exacerbation

Upper respiratory (nasal and throat) tract symptoms

Cough

Wheeze

Asthma symptoms in sensitized asthmatic people

Asthma development

Respiratory infections

Hypersensitivity pneumonitis in susceptible people

Limited or suggestive evidence of an association

Bronchitis

Allergic rhinitis

H E K A I N G A

O R A N G A

What health effects?

Inadequate or insufficient evidence to determine whether an association exists (WHO 2009, IOM 2004).

Airflow obstruction in otherwise healthy people
Mucus membrane irritation syndrome
Chronic obstructive pulmonary disease
Inhalation fevers (non-occupational exposures)
Acute idiopathic pulmonary hemorrhage in infants
Skin symptoms
Gastrointestinal tract problems
Fatigue
Neuropsychiatric symptoms
Cancer
Reproductive effects
Rheumatologic and other immune disease



Depression has also been linked to fungal growth (OR 1.39)
(Shenassa et al. 2007 *American Journal of Public Health*, 97(10))

Health effects

- Mechanism underlying these associations is entirely unknown
 - Not allergic
 - Irritant?
- Associations –
- Most based on occupant reports and visible mould and dampness – could be open to bias
 - However, studies that have used independent assessors have still observed these effects
 - Not everyone
 - Most of the respiratory factors 30 - 50 % increased risk



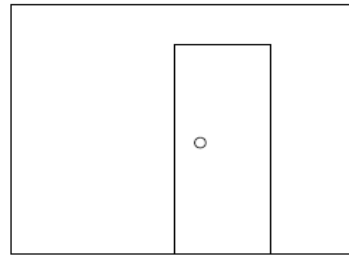
HOME Study



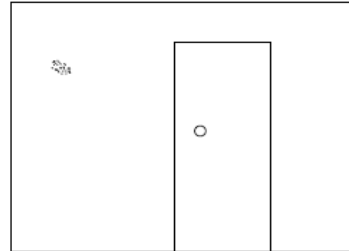
- Mould and dampness in home environment known to exacerbate asthma symptoms, but is it associated with the **onset** of wheezing?
- 450 children, 1 and 6 years old, living in Wellington region,
- Funded by the Health Research Council
- Cases: Recently prescribed and used their 1st treatment for wheezing = in the last 12 months, Lived in their homes for 6 months prior to 1st treatment
- Controls: No history of wheezing, 2 controls per case, matched on gender, age, area
- Participant families blinded to the mould aspects at recruitment.
- Researchers visited homes, took environmental samples, assessed mould, interviewed parents, carried out skin prick testing for allergy
- Building assessor carried out a Health Housing Index assessment, including mould and dampness indicators



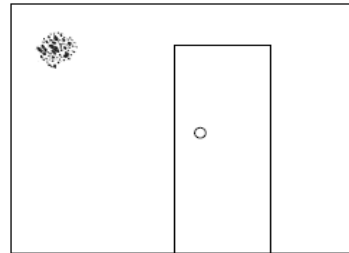
Mould severity scale



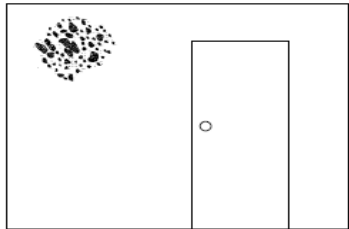
No visible mould
= 0



Small mould
= 1

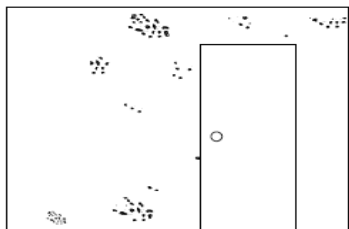


Moderate mould
= 2



Large mould
or
Extensive areas
= 3

OR

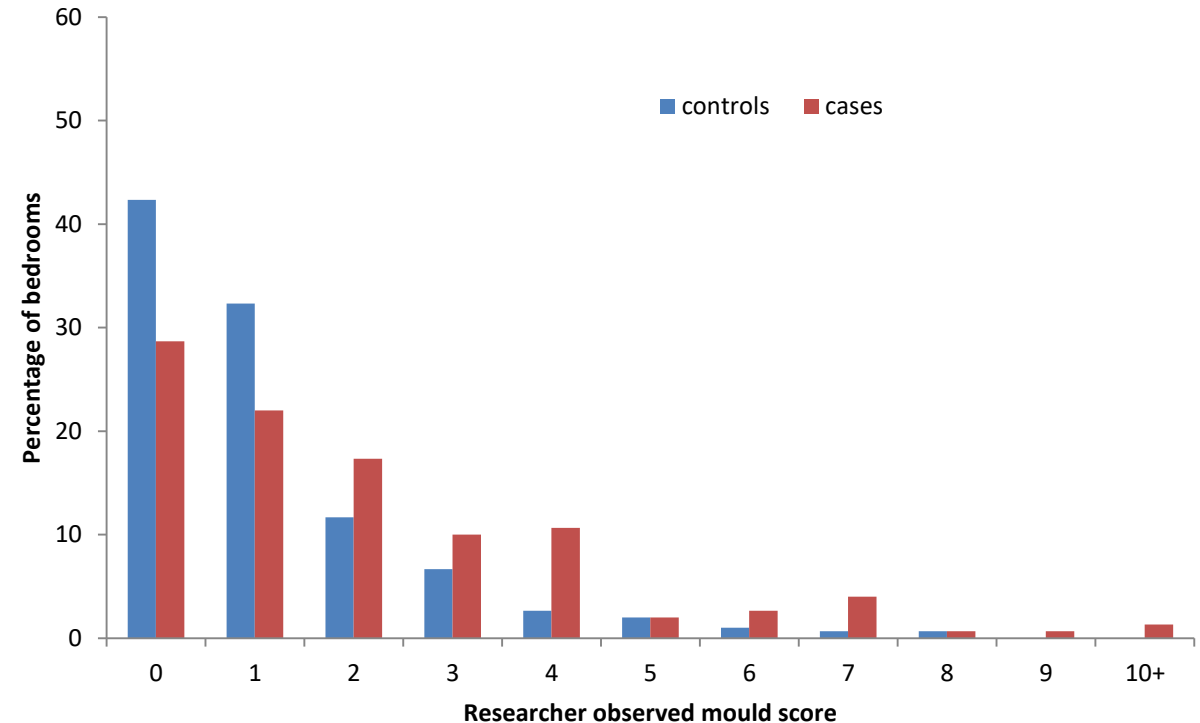


- 0 – 3 scale of the extent of mould
- Mould examined in 7 locations: curtains, windows, ceiling, walls, floor, bedding, wardrobe
- → gave a mouldscore for bedroom
 - Parental mouldscore
 - Researcher mouldscore
 - Minimum score = 0
 - Maximum score = 21

HOME study



- Children with new onset wheezing were more likely to have a mould score >1 than those who didn't wheeze
 - Both parental and researcher
 - Inspector identified mould in the house also associated with new onset wheezing
- Children with new onset wheezing were more likely to have mould in more than one location than those who didn't wheeze
- Each increase in the mould score increased the likelihood of new-onset wheezing
 - mouldscore of 7 child had 14.1 times odds of wheezing compared to a child with a mould score of 0.



Majority of visible mould found on windows and curtains!

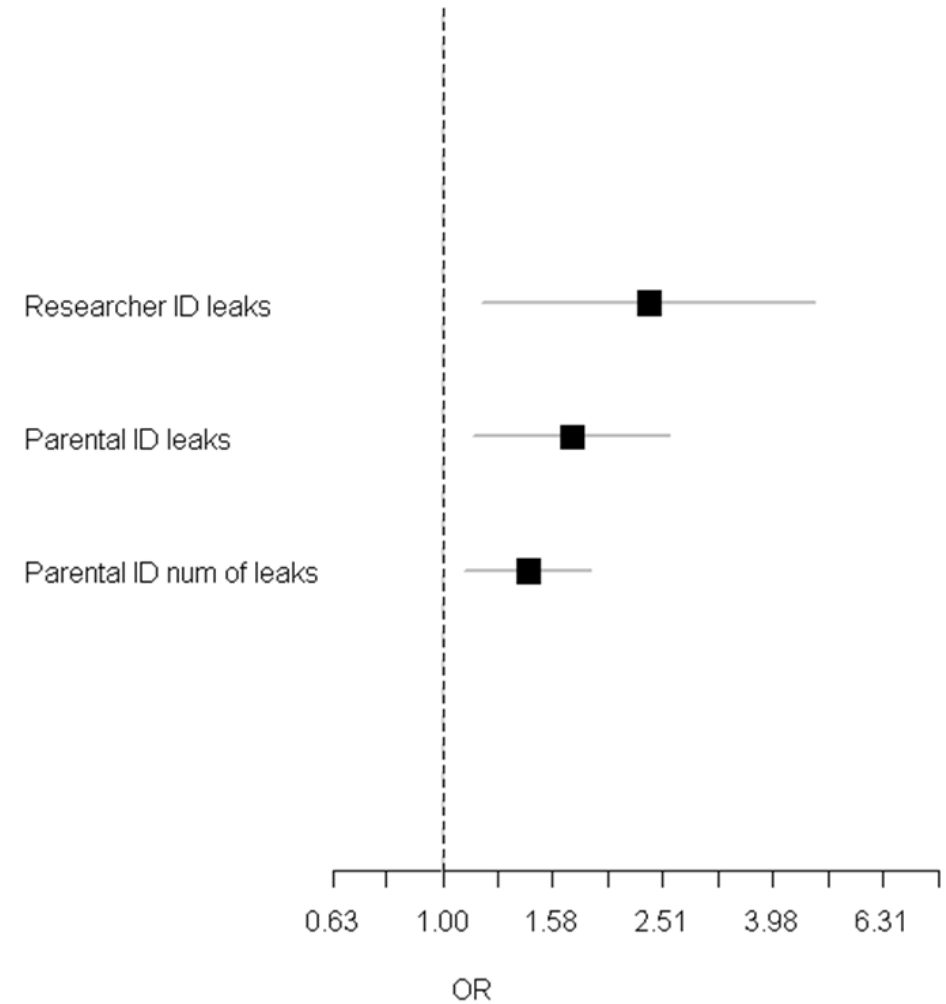


Leaks/water damage and condensation were also risk factors for new onset wheezing

48% cases have at least one leak vs 33% of controls



Odds ratios: Observed mould on case status



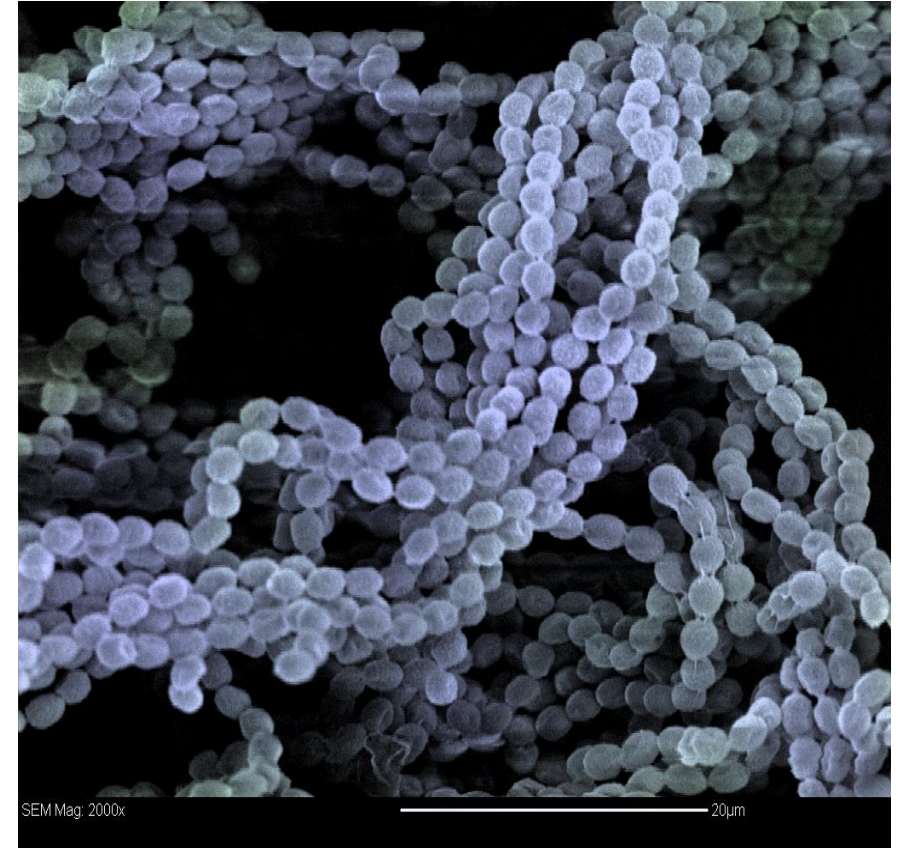
Te Whiti Te Rā

- Understanding the causes of **acute respiratory infection (ARI)** in childhood – Dr Tristram Ingham & Bernadette Jones
- Case-control study conducted in Wellington
- Case infants (under 2) hospitalised for acute respiratory infections
- Building inspector assessed 13 housing factors of their homes.
- Were hospitalised ARI children more likely to have homes with high respiratory hazard indexes and damp-mould indices than children who were not hospitalised?
- → **Yes!** Particularly for the dampness and mould indices
 - even after adjustment for season, housing tenure, socio-economic factors and crowding.
- The authors estimated that addressing these housing factors could lead to a 19% reduction in hospital admissions for ARI in under 2 year olds.



EM3 Study: Elevated mould, mycotoxins and moisture

- Recently become possible to measure a wide array of mycotoxins (toxins that fungi can produce).
- Examining the mycotoxin levels and the microbiota of NZ homes with a history of leaks compared to those without leaks, including a health questionnaire for occupants.
- 200 houses throughout NZ
- In conjunction with:
 - Ferrier Institute, BRANZ, Prendos, Biodet.



H E K A I N G A

O R A N G A

How do we reduce mould in homes?

- Not easy!! Fungi are highly successful at colonising and spores are very hardy



Jeffrey Simpson

@FadAstra

Follow



<New Zealand landlords>: the astronauts are obviously not opening the windows enough on the space station



Corey S. Powell @coreyspowell

The International Space Station has a chronic mold problem on the inside--and may even have mold spores surviving on the *outside*. Wherever we go in space, mold will follow. [news.agu.org/press-release/...](https://news.agu.org/press-release/)

Show this thread

12:16 AM - 3 Jul 2019

257 Retweets 1,135 Likes



H E K A I N G A O R A N G A

How do we reduce mould in homes?

- → Reduce dampness & leaks in existing housing stock
- Need houses to have the basics sorted
 - Insulation
 - Leaks repaired immediately
 - Fixing any water pooling under the house
 - Working extractor fans to reduce steam and moisture
 - Secure windows that can be opened
 - Means of heating entire home (+ no unflued lpg)
- Then we need to try and reduce moisture in our homes
 - Using extractor fans,
 - Not drying clothes inside
 - Opening windows often to improve ventilation, even for 10 – 15 min a day ('burnt toast blast').
 - Removing mould regularly, particularly around windows.



Cleaning mould in homes

- **Protect** yourself – gloves, masks, eye protection, ventilation
- Warm soapy water and **scrubbing** (where needed)
 - Mechanical action of removal very important
 - Some of the chemicals are respiratory irritants and encourage spray and walk away type cleaning
- Rinse – area to reduce chance any is left behind
 - Even small hyphae can restart colonies
- Dry the area with dry clean cloths
- Large areas may require professional help (1m²).



How do we reduce mould in our homes?

- Build new houses which are **resilient** to moisture accumulation and water ingress
- Are our building standards focused on health?



high court cases



Double glazed but
not thermally broken

New gypsum board pre-contaminated with fungi
(Denmark)

Pre-contamination of new gypsum wallboard with potentially
harmful fungal species

Abstract Gypsum wallboard is a popular building material, but is also very frequently overgrown by *Stachybotrys chartarum* after severe and/or undetected water damage. The purpose of this study was to determine whether ...

**B. Andersen, I. Dosen,
A. M. Lewinska, K. F. Nielsen**

Moisture extraction
systems – up to the task



H E K A I N G A

O R A N G A

Climate change

- New Zealand predicted to
 - Experience higher rainfalls in some areas
 - west (& drought in others - east)
 - More frequent extreme weather events including
 - increased flooding after major downpours
- For indoor fungi...
 - US EPA: Flooding → may allow water and moisture to permeate, damp conditions are ideal for the growth of indoor fungi and mould, increasing the likelihood of occupants' exposure and health effects.
 - Different species likely to abound – may favour *Stachybotrys* in some areas

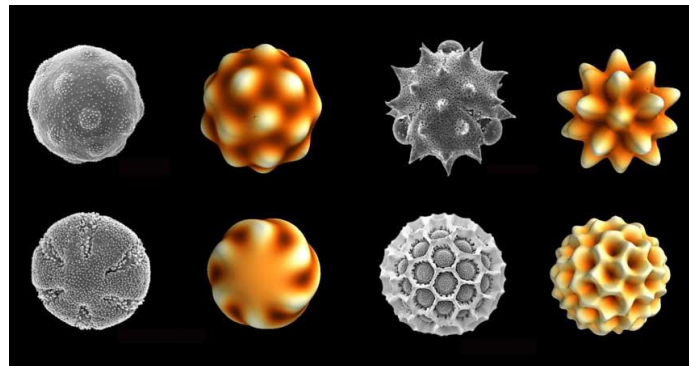
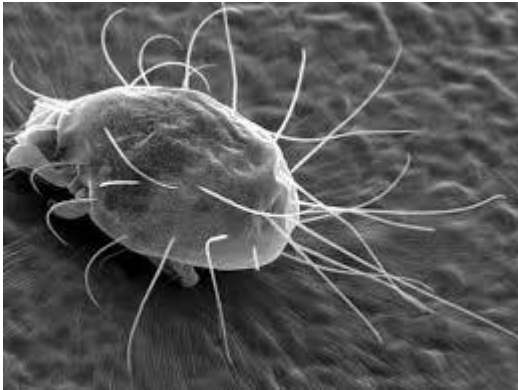


H E K A I N G A

O R A N G A

Climate change

- Other factors to consider...
 - Increased use of air conditioning systems → possibly a new environment for fungi to grow (eg in humid locations like drip pans & cooling coils).
 - Mould is far from the only indoor health issue with climate change!
 - New species of house dust mites, Mosquitos + tropical diseases (→ insect screens, mosquito proof water storage tanks), Pollen – increased ‘season of suffering’ – natural ventilation likely to increase exposure



H E K A I N G A O R A N G A



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Simon Hales
Nick Waipara, Adrienne Burnie
Vicki Cowan
Manfred Plagmann