MOULD AND DUST-MITES THRIVE IN HIGH RELATIVE HUMIDITY

New Zealand houses tend to be quite cold and have high levels of biocontaminants, especially mould and dust-mites. These can cause allergic reactions and asthma, and some are extremely toxic.

By Malcolm Cunningham, BRANZ Principal Scientist

In New Zealand houses it is normal to only heat the living area. Consequently, unheated bedrooms can fall to quite low temperatures and have very high indoor relative humidities compared to dwellings in other developed countries.

Relative humidity is a percentage measure of the amount of water vapour actually held by the air relative to the maximum amount of water vapour that can be held at that temperature. The relative humidity rises as a body of air is cooled, and if you cool the air enough, moisture will condense out of it. These high room-air relative humidities give rise to even higher humidities in cold areas of the room, such as on walls where mould can grow, or at the base of carpets where dust-mites can proliferate.

Reactions can be severe

Human reaction to mould exposure falls into two classes – allergenetic or toxic. Some people are allergic to mould spores and to mould metabolites (chemicals released from mould into the air). However, some moulds, *Stachybotrys* in particular, release toxins that are poisonous to everyone.

Stachybotrys is a mould that only appears if there is liquid moisture available, in other words, the mould environment must be very wet. This is just what happens with dwellings suffering from the notorious 'leaky building syndrome'. Consequently, it is very common to have *Stachybotrys* present on the wet framing and linings of leaky buildings. The destructive inspection required to assess the degree of leakage in such houses, and the whole process of repairing these houses, has to be done by trained people to prevent excessive *Stachybotrys* spores and metabolites entering the indoor spaces and poisoning the occupants.

Reduce the indoor humidity

The fundamental methods to control indoor relative humidities are:

- control of moisture sources
- more heating
- more ventilation
- more insulation
- active dehumidification.

Control of moisture sources is often overlooked as an important way to reduce humidity. Unflued gas heaters are an example of very high moisture generators. These can produce up to a litre of water vapour per hour and, without good ventilation, their use can lead to condensation and mould problems.

Ventilation is most effective if it takes place at source, so a rangehood over a stove will vent cooking moisture outdoors effectively while an extractor fan in the bathroom will control relative humidity there, especially if used with a humidistat or timer.

Heating is an important way to reduce indoor relative humidities. It is much more effective in raising indoor temperatures and lowering indoor relative humidities if the house is also well insulated. Dehumidifiers have their place, especially to supplement the above measures, as do proprietary systems that ventilate roof space air or outdoor air into the house.

Much enlarged dust-mite.

Remember the subfloor

We also find that indoor relative humidities can be quite high in houses with suspended floors over ground with no ground cover, especially if the subfloor space is not well ventilated. Without ground cover there can be high evaporation rates from the soil, giving rise to high subfloor relative humidities, which can contribute to high indoor relative humidities because some moist air can leak from the subfloor space into the indoor spaces.

Evaporation from the ground can be controlled by covering the ground with an impermeable membrane such as polythene, lapping the runs well and taping the polyethylene around the base of piles (see BRANZ Bulletin 457 *Ventilation of enclosed subfloor spaces* for more detail).

Difficult to keep relative humidities low

As a rule of thumb, wall relative humidities should remain below 80% to prevent mould growth.

In principle, it is also possible to control dust-mites by controlling room relative humidity as these creatures cannot survive at low relative humidities. The precise relative humidity required depends upon temperature, but generally room relative humidities need to stay below 40% for most of the time to ensure that base-of-carpet relative humidities remain below 60–70%.

However, scientific studies in New Zealand have found it very difficult in practice to keep relative humidities below 40%, particularly in bedrooms. There are two reasons for this. First, rooms need to be kept warm (greater than say 20°C) to maintain these low relative humidities, and this can be too expensive for people living in poorly insulated houses. Second, if these low relative humidities are achieved, they cannot be sustained if unheated outdoor air is let into the room by opening windows. Keeping the windows closed is simply not a Kiwi habit. As a nation we do not like our rooms with all the windows closed and we are wary of fresh air being supplied by mechanical means.

Good insulation is the key

The most effective relative humidity control in areas where it matters, such as on the indoor surface of exterior walls and at the base of carpets, requires good wall, floor and ceiling insulation. This makes it cheaper to heat the room to a level that gives moderately low room relative humidities, and once insulated these wall and base-of-carpet relative humidities will be much closer to the room relative humidity value, making them non-viable for biocontaminants.

More information is available in BRANZ Bulletin 460 'Internal moisture control'.

HEALTHY HOUSE INDEX

BRANZ, in collaboration with the Wellington School of Medicine and Health Sciences Housing and Health Research Programme, is developing a Healthy Housing Index (HHI). This is a single number that indicates the healthiness and safety of a house by aggregating in some way the physical aspects and condition of a house.

The index is aimed at Territorial Authorities, District Health Boards, designers, many government departments and organisations, large landlords, such as HCNZ, and iwis. It will provide a quantitative tool for improving occupant health, assessing housing stock condition, policy development, targeting of resources, setting of targets for improvement and auditing progress towards those targets, designing and auditing retrofit regimes, regulation, advocacy and providing a common language for communication between agencies.

A pilot study was undertaken in the Hutt Valley over 2004 and 2005 in which 100 homes were inspected for their condition, and accident and health statistics of the occupants collected. This study has allowed a connection to be made between a trial index and the accident rate in the home. Work is now in progress to make the connection to the health data.

Because of the wide range of end users and their influence, the HHI has the potential to have a significant impact on New Zealand society. Once it is fully developed BRANZ plans to market the index to possible end users and establish courses to train healthy house assessors.