# The National HMO Network

WINTER CONFERENCE

Nov 2022

# Dr Hector Altamirano-Medina

## Institute for Environmental Design and Engineering at the Bartlett School of Environment, Energy and Resources

Dr Altamirano-medina is an Associate Professor at the Institute for Environmental Design and Engineering at the Bartlett School of Environment, Energy and Resources. He is an interdisciplinary scientist interested in the health and well-being impact of the built environment and a wide-ranging experience in the indoor environment and operational performance of buildings, the development of mould and humidity conditions, in-situ monitoring, field surveys and experimental setup of buildings and their components.

He trained as an architect and energy and environmental designer at the Universidad Central de Chile and the Architectural Association School of Architecture in London. He has several years of experience working for the Chilean Government, Universities, NGOs, and in consultancy. The outcome of Dr Altamirano-Medina's PhD research at UCL on the Humidity in Dwellings project (2005-2007) for DCLG was incorporated into Appendix A of the ADF 2010 and now forms part of the Building Regulations for England and Wales. Dr Altamirano-Medina is working on moisture-related research projects prepared in partnership with industry and public institutions and with the strong support of the UK Centre for Moisture in Buildings (UKCMB), where he serves as Academic Director.

# Challenges caused by excessive moisture and how they can be addressed.

Dr Hector Altamirano-Medina

# A moisture safe future


- Hector Altamirano – h.altamirano-medina@ucl.ac.uk
- UKCMB Academic Director
- UCL Institute for Environmental Design and Engineering
- Bartlett School of Energy Environmental and Resources


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- The UKCMB is an independent, not for profit, public good organisation initially run by:
  - the Building Research Establishment (BRE),
  - Heriot Watt University and
  - the London School of Hygiene and Tropical Medicine
  - University College London

- The UKCMB works together with partners from academia, government, industry and the public to substantially **improve** the way moisture risk is understood and managed in the UK

- Very little research in the UK on moisture in buildings, a lack of good guidance, and minimal public and industry understanding.

# Consequences of excessive moisture in buildings

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- Excessive moisture can alter the balance of the building and may affect both its integrity and the health and wellbeing of its occupants. The most common consequences found in buildings with excess moisture

- Condensation
- Expansion and contraction
- Corrosion
- Spalling: frost damage
- Efflorescence: salts crystallisation
- Delamination
- Reduced thermal resistance
- Wood rot
- Dust mites
- Mould growth
- Health effects of mould and dust mites




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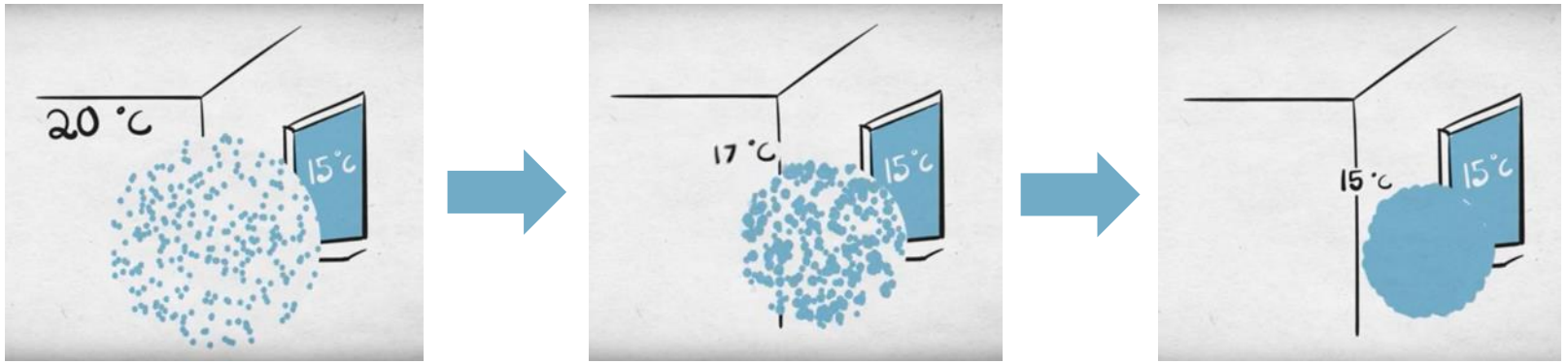
# Condensation

- When there is more water vapour than the air can hold it becomes full up and condenses into liquid water (**condensation**). This happens when warm moisture rich air reach a cold surface like windows or cold walls in winter.

- Condensation form as air suddenly cool against the surface and the **holding capacity of the air is reduced**

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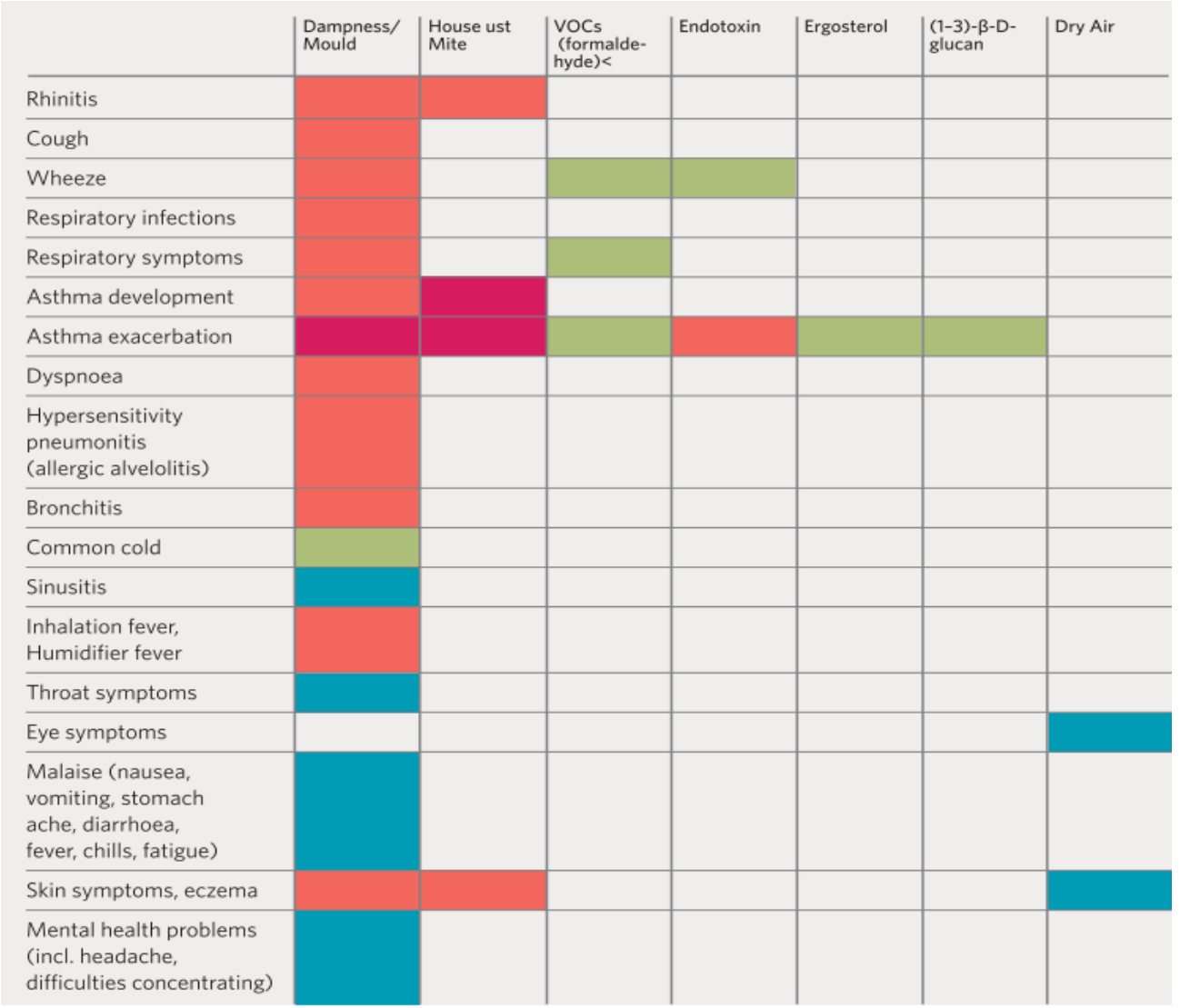
# Health Effects

- Literature reveals evidence of a possible association but more evidence is required
- Limited evidence of an association exists
- Good evidence of an association exists
- Evidence of a causal relationship exists



| | Dampness/ Mould | House ust Mite | VOCs (formalde-hyde)< | Endotoxin | Ergosterol | (1-3)-β-D-glucan | Dry Air |
|---|---|---|---|---|---|---|---|
| Rhinitis | | | | | | | |
| Cough | | | | | | | |
| Wheeze | | | | | | | |
| Respiratory infections | | | | | | | |
| Respiratory symptoms | | | | | | | |
| Asthma development | | | | | | | |
| Asthma exacerbation | | | | | | | |
| Dyspnoea | | | | | | | |
| Hypersensitivity pneumonitis (allergic alvelolitis) | | | | | | | |
| Bronchitis | | | | | | | |
| Common cold | | | | | | | |
| Sinusitis | | | | | | | |
| Inhalation fever, Humidifier fever | | | | | | | |
| Throat symptoms | | | | | | | |
| Eye symptoms | | | | | | | |
| Malaise (nausea, vomiting, stomach ache, diarrhoea, fever, chills, fatigue) | | | | | | | |
| Skin symptoms, eczema | | | | | | | |
| Mental health problems (incl. headache, difficulties concentrating) | | | | | | | |

# Health Effects

http://www.nhs.uk/chq/Pages/Can-damp-and-mould-affect-my-health.aspx?CategoryID=87

NHS choices Your health, your choices

Health A-Z | Live Well | Care and support | He

You are here: Common health questions / Can damp and mould affect my health?

## Can damp and mould affect my health?

Yes, if you have damp and mould you're more likely to have respiratory problems, respiratory infections, allergies or asthma. Damp and mould can also affect the immune system.

### Who's affected?

Some people are more sensitive than others, including:

- babies and children
- elderly people
- those with existing skin problems, such as eczema
- those with respiratory problems, such as allergies and asthma
- those with a weakened immune system

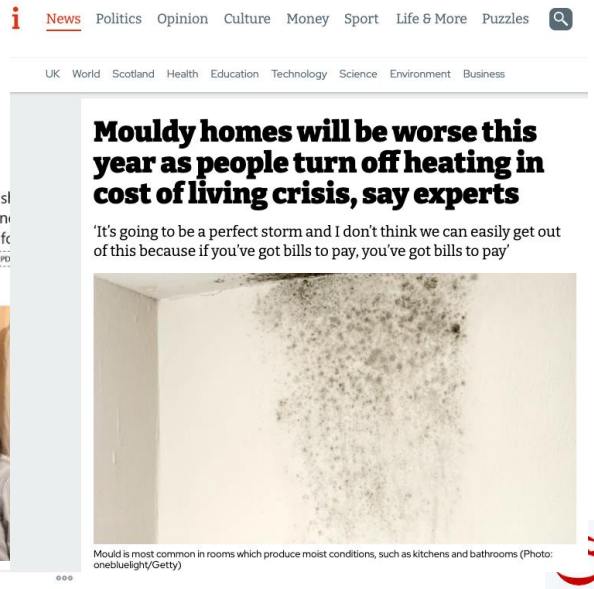
These people should stay away from damp and mould.

### How does it affect your health?

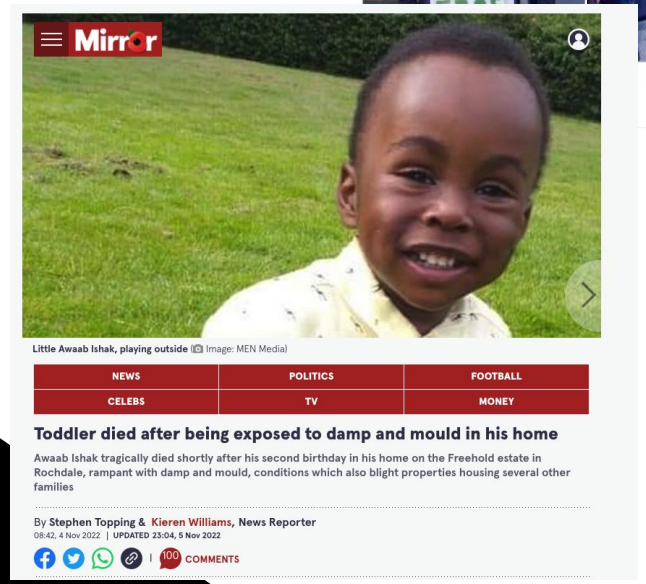
Moulds produce allergens (substances that can cause an allergic reaction), irritants and, sometimes, toxic substances. Inhaling or touching mould spores may cause an allergic reaction, such as sneezing, a runny nose, red eyes and skin rash. Moulds can also cause asthma attacks.

# Really a problem?

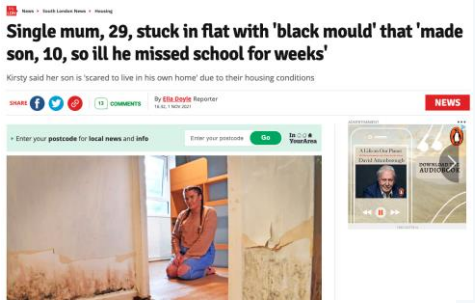














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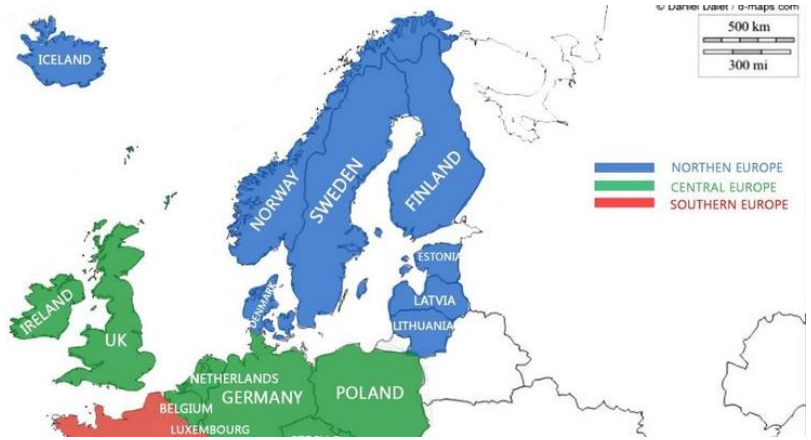



- **18% of occupants** in northern European countries lived in damp housing
  - Gunnbjörnsdóttir MI et al. Prevalence and incidence of respiratory symptoms in relation to indoor dampness: the RHINE study. Thorax. 2006 Mar 1;61(3):221–5

- **10 - 25% of homes** in European countries with climates similar to that of the UK were estimated to have dampness
  - World Health Organization. Environmental burden of disease associated with inadequate housing. Copenhagen; 2011.

- **16.5% of the** European building stock had signs of dampness
  - Haverinen-Shaughnessy U. Prevalence of dampness and mold in European housing stock. J Expo Sci Environ Epidemiol. 2012;22(5):461– 467

# Really a problem?

- In **1982** was estimated that in England 2 million dwellings (11.8% of all household), were affected by dampness, with condensation being the cause in 60%. Sanders & Cornish
- The **1986 English House Condition Survey** was estimated that 3.5 million dwellings (20% of all households) experience some mould or damage to decoration due to damp.
- The **1991 English House Condition Survey** found that 10.4 million homes were affected by mould growth
- The **1996 Northern Ireland House Survey** found that 16% of homes experience some form of dampness or mould (95.000)
- The **1996 English House Condition Survey** had found that 15% of all households had scores in the Mould severity index. (2.6 million)


Severity of mould growth

| mild | moderate | severe |
|---|---|---|

| | |
|---|---|
| Any room | 1 |
| Moderate | +1 |
| Severe | +2 |
| Living rooms | +1 |

- The 2011 English House Condition Survey found that 7% of homes had some problems with damp (1.4 million), 3.5% affected by condensation and mould
- The 2015 English House Condition Survey found that 5% of homes had some problems with damp

# Mould growing in buildings could have a large effect on:

- Aesthetics of the building
- Cost / maintenance of buildings due to mould related damage
- Health of occupants (Physical and Mental health)

image source: www.mold-kill.com

# How to prevent mould growth in buildings?

Orchid / Orchidaceae
22.000 and 26.000 species

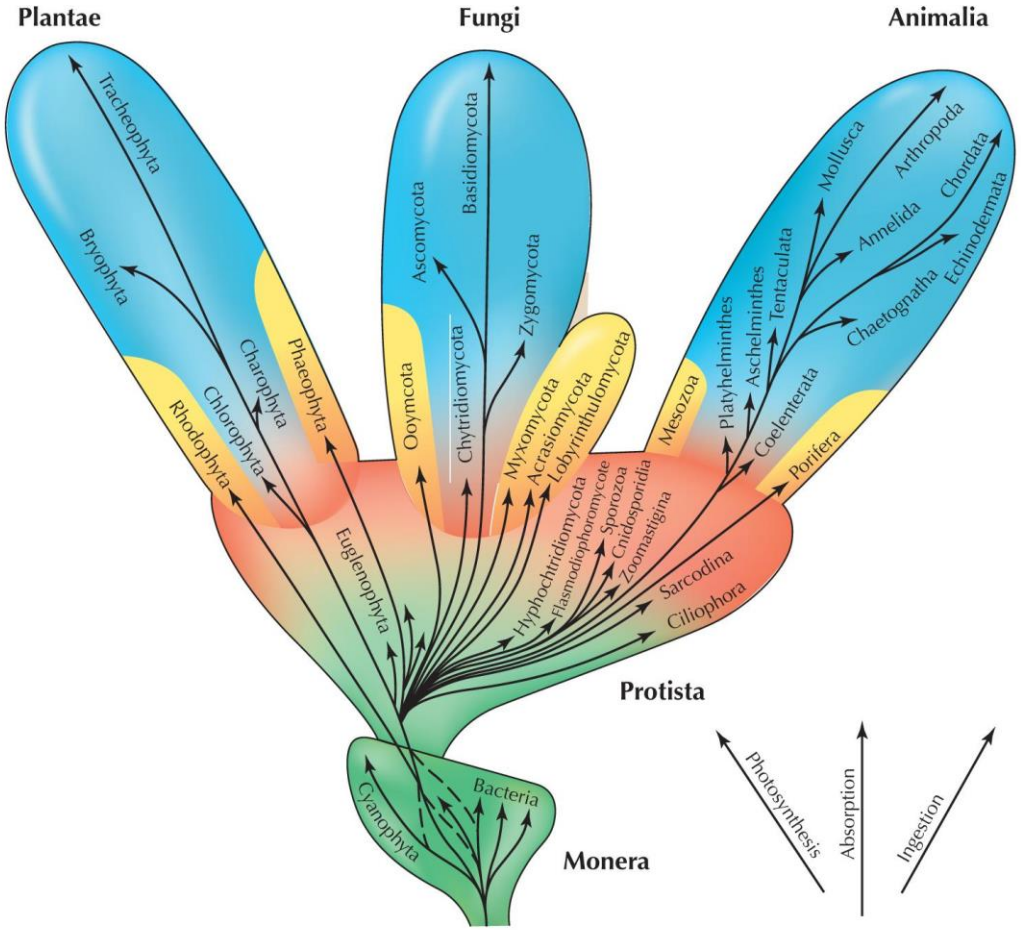
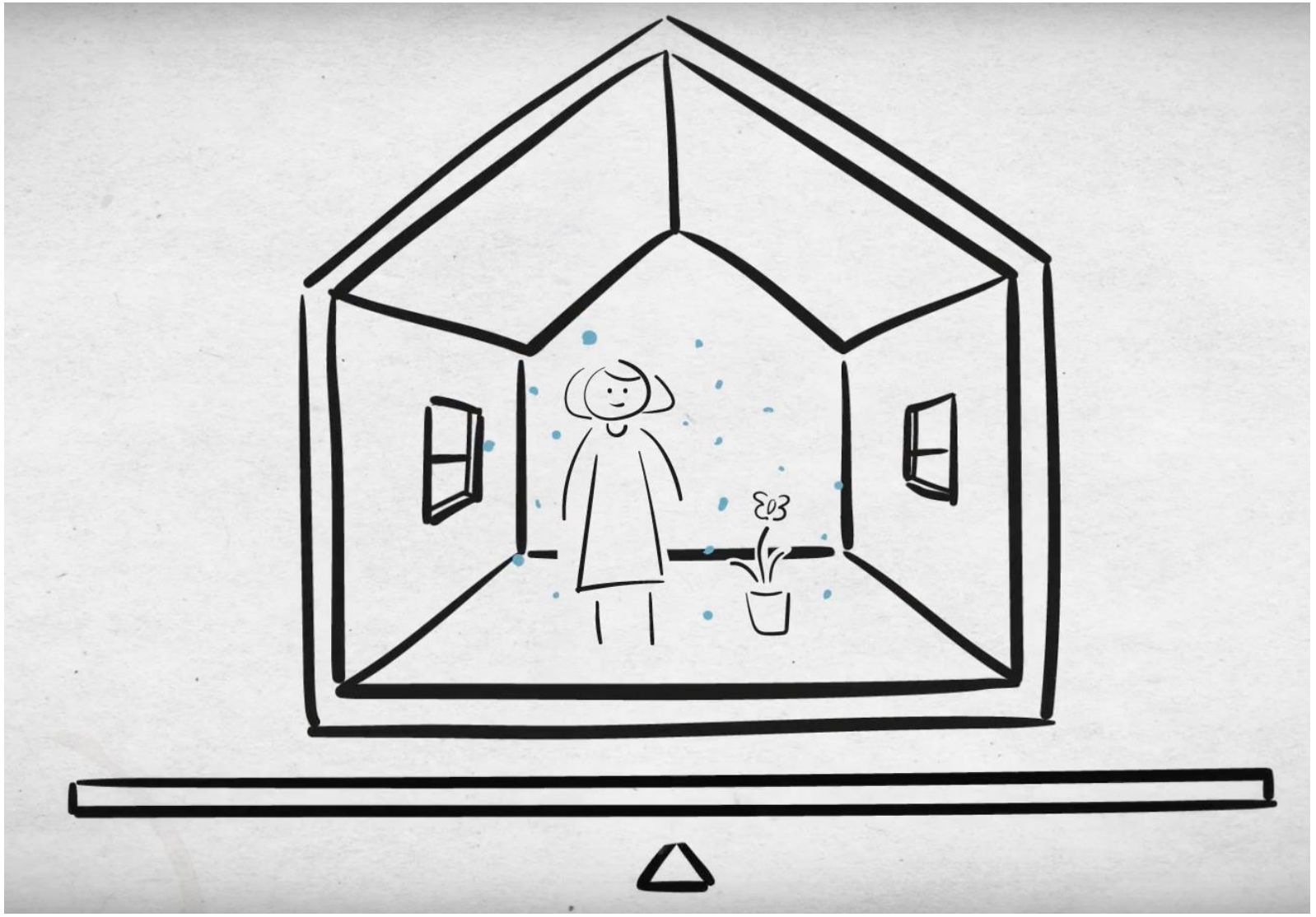




**FIGURE 5.15.** Whittaker's five-kingdom tree. This system contains five kingdoms based on three levels of organization: prokaryotic (kingdom Monera), eukaryotic unicellular (kingdom Protista), and eukaryotic multicellular and multinucleate (kingdoms Fungi, Animalia, and Plantae). The three kingdoms at the top of the figure are distinguished mainly by differences in nutrition (see the *inset*).

**5.15,** redrawn from Whitaker R.H., *Science* **163:** 150–160, © 1969 American Association for the Advancement of Science



# Management Team

- **Patricia Hart,** Communications and Coordinator
- **Peter Rickaby,** Business Manager
- **Colin King,** Commercial Director
- **Valentina Marincioni,** Technical Director Working Group Manager
- **Yasemin D. Aktas,** Deputy Academic Director
- **Hector Altamirano,** Academic Director





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# Technical Working Groups


**TWG 1** focuses on improving monitoring and modelling processes and techniques; risk assessment and reduction through monitoring and modelling.


**TWG 4** aims at designing out moisture during the retrofit of existing buildings, focusing on pre-retrofit survey; moisture and timber in existing buildings; designing out escape of water and minimising risk.


**TWG 2** aims at identifying determinants for moisture in air; developing moisture-related metrics for ventilation; understanding the impact of changing construction on the overall ventilation of a building.


**TWG 5** focuses on damage after flooding and guidance on strip-out; post-damage monitoring of buildings; moisture and resilience.


**TWG 3** aims at designing out moisture in new buildings; minimising moisture in construction and delivery; developing moisture guidance for occupants.


**TWG 6** engages with insurance companies, disseminating the knowledge of other TWGs on moisture risk reduction.


**TWG 7** The recently set-up TWG 7 focuses on moisture in buildings and occupants' health.

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# Doctoral Researcher - Affiliates

Through UCL, UKCMB has been able to encourage individuals taking up doctoral research studentships to focus their research on **moisture-related topics**. UKCMB has facilitated the funding of research studentships at UCL by network members.

Morena Ferreira

Hengrui Zhu

Athina Petsou

Pedro Maximo Rocha

Spyros Efthymiopoulos

Naomi Grint

Jalal Ahmed

Negin Jahed

Toby Cambray

Morana Novak

Hector Padilla

Gulala Aziz

# Policy and standards work

- Members of the UKCMB have been actively involved in the development of:
- **BS 5250** – 'Code of practice for control of condensation in buildings'
- **PAS 2030, 2035 and 2038**
- **BSI Retrofit Standards Task Group**
- **BSI CB401 Retrofit Committee**
- **Part C, F & L of the Building Regulations**

# Training for Moisture in Buildings: Understanding and Managing Moisture Risk in Building

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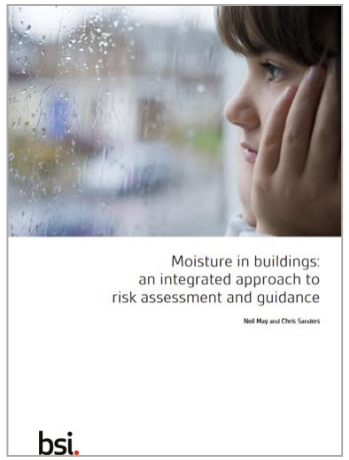
This course is for new starters and professionals in the building industry who wish **to learn the practical implications of assessing and managing moisture risks** in their new-build designs and retrofit strategies.

- The course is based around the four principles set out in Moisture in buildings: an integrated approach to risk assessment and guidance by Neil May and Chris Sanders (BSI, London, 2018) and in the forthcoming new edition of BS 5250 Control of condensation in buildings.

- These principles, known as **'the four Cs',** are:
  - **Context**: understanding the building's history, setting, construction, condition, occupancy pattern, etc.
  - **Coherence:** adopting a consistent, integrated, whole-building approach to all aspects of new-build and retrofit.
  - **Caution:** identifying, assessing and managing moisture risks, and, where knowledge is limited, erring on the side of caution.
  - **Capacity**: ensuring adequate capacity in building systems rather than over-optimising, to allow for unexpected or changing circumstances.

PCA Property Care ASSOCIATION




CIBSE Training

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# Moisture Balance Calculator

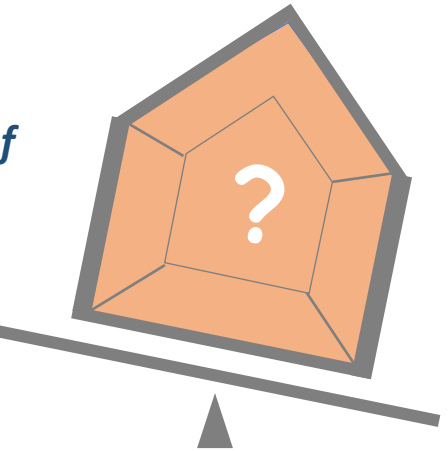
- This tool aims to give a better understanding of the moisture balance in your home and the factors at play. If your home is out of balance, you might be able to identify easy ways to regain moisture balance and create a healthier home

| MOISTURE GENERATION | OCCUPANCY | BUILDING CONDITION | HEATING | VENTILATION |
|---|---|---|---|---|
| The moisture generation section looks at the creation of water vapour from the main daily activities within the house (bathing, washing and cooking) | The occupancy section looks at amount of people in the house, when are they in and how it feels to be in the home in terms of space | The building condition section looks at leaks, repairs around the house, cleaning routines and any mould problems noticed. | The heating section looks at the temperature the home is kept at and how it is controlled | The ventilation section looks at the movement of air within the house, the daily ventilation routines and how the air feels within the home. |

- A balanced amount of moisture is needed to maintain a healthy home. This means having a building which is **not too dry and not too humid**. Keeping your home in balance can be tricky as there are a lot factors to think about such as the moisture you generate in cooking, washing and so on, and your heating, ventilation and maintenance.

  - A balanced home should have:
  - Good insulation standards and well built to avoid cold internal surfaces
  - Moisture generation is not too high
  - The home is well heated in cool or cold weather
  - Ventilation is increased at times when moisture generation is higher
  - Properly maintained to detect and fix any rainwater or plumbing leaks

***Possibly out of balance?***



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https://moisture-balance.netlify.com

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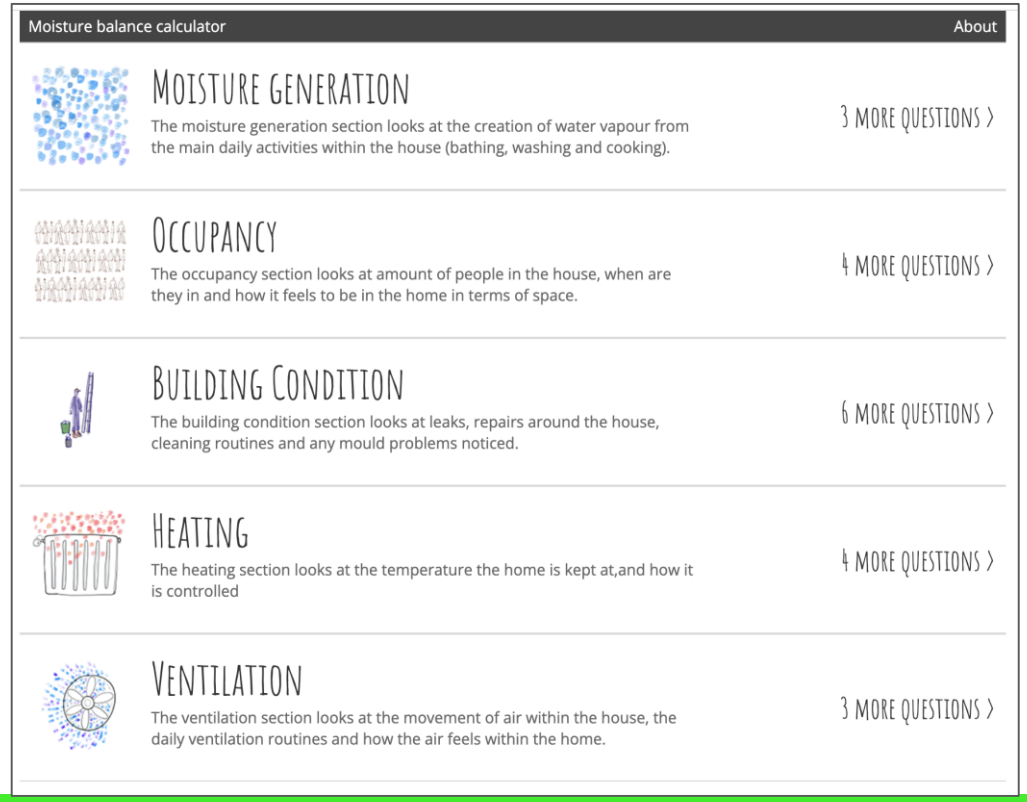

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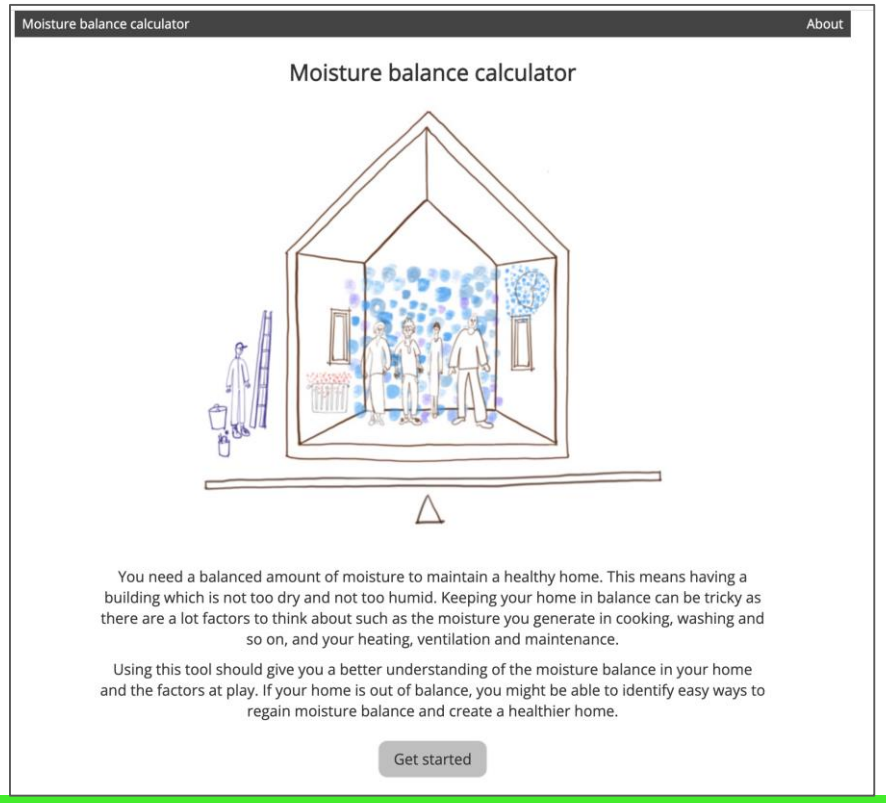


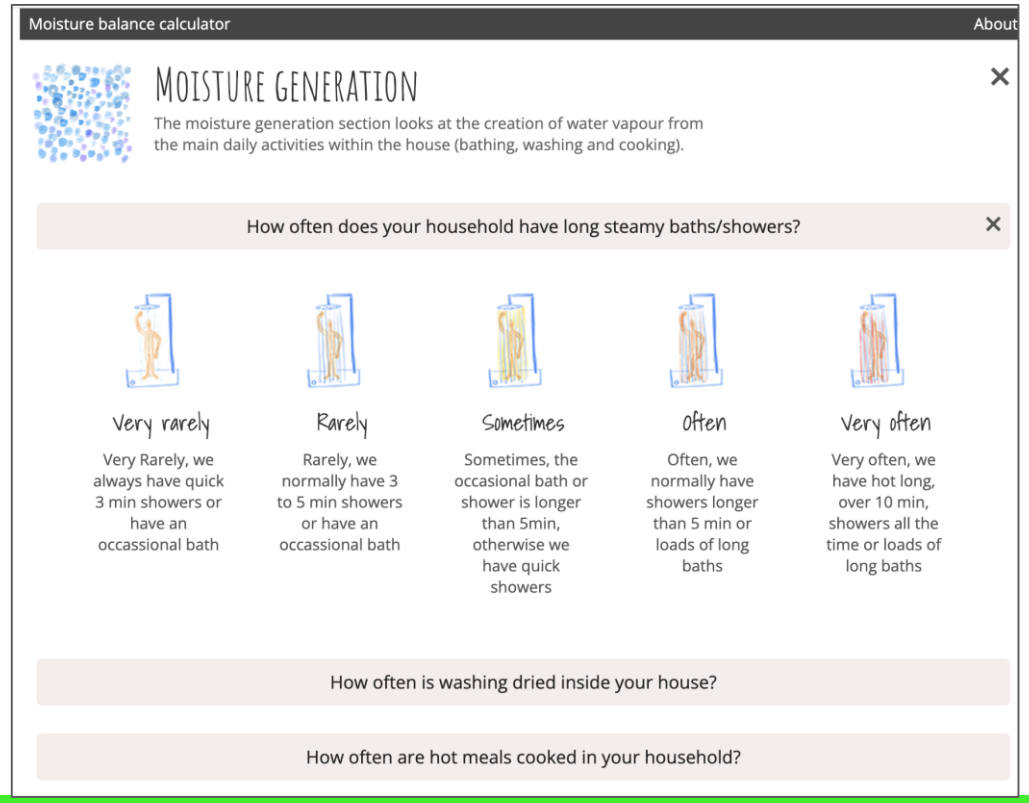

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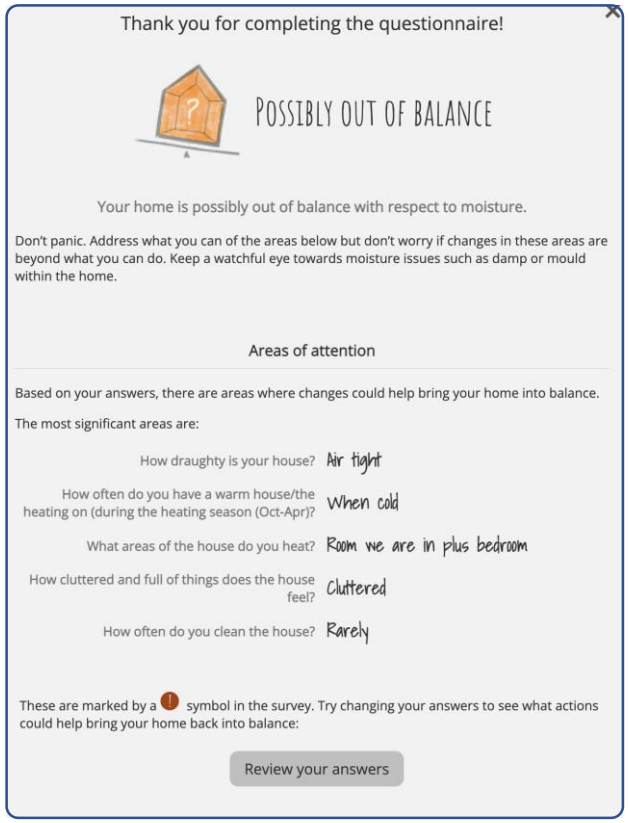
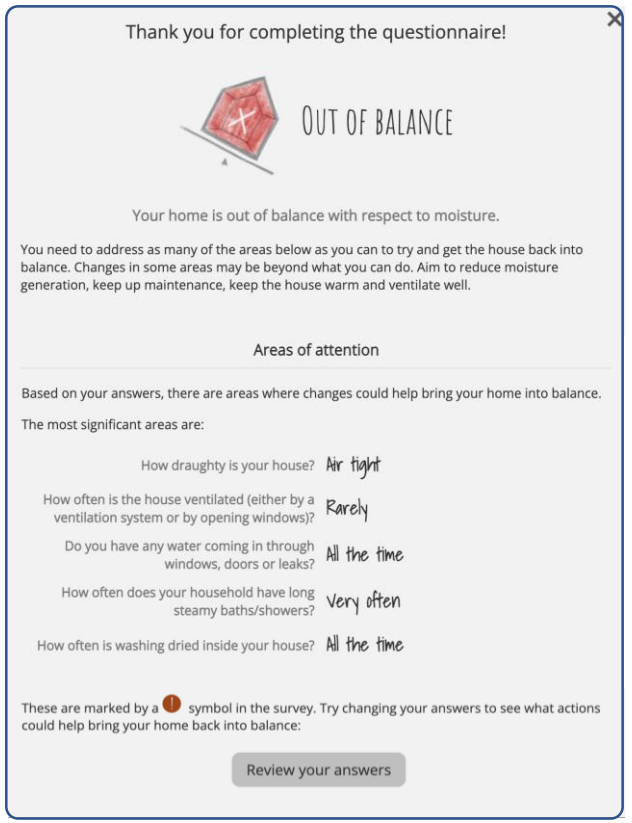
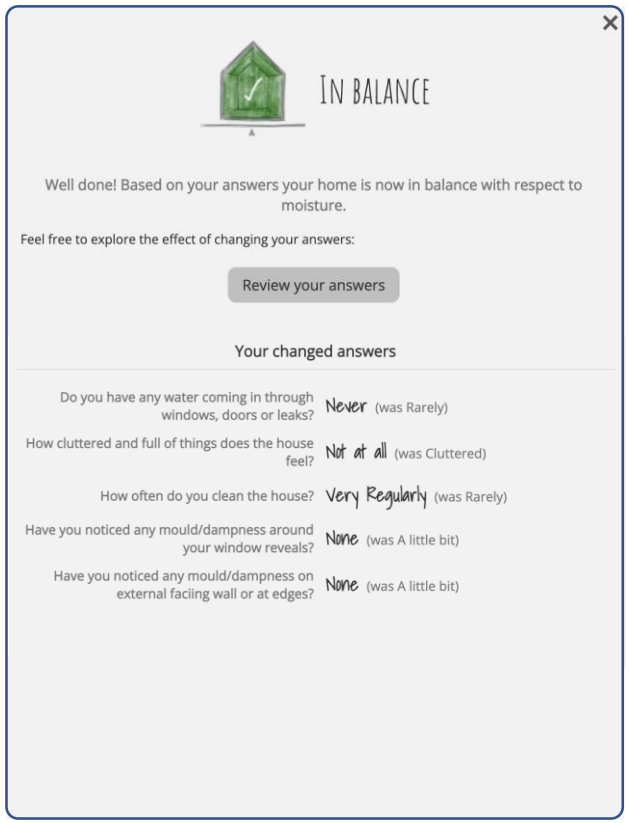


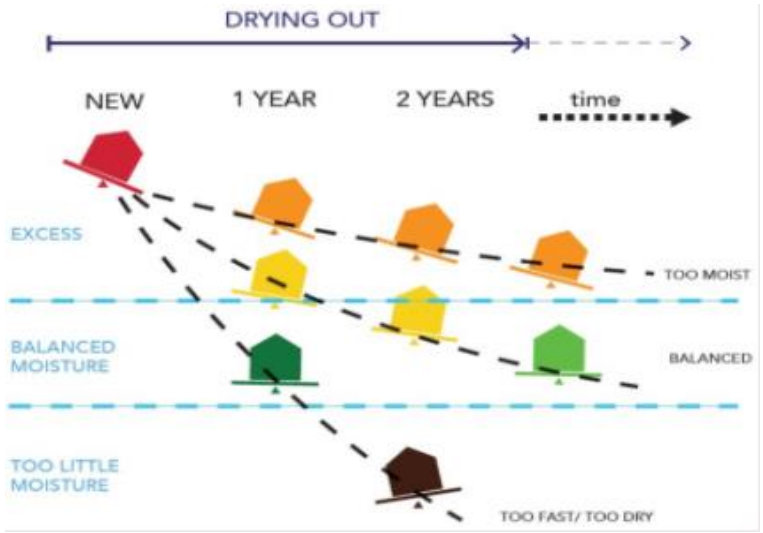



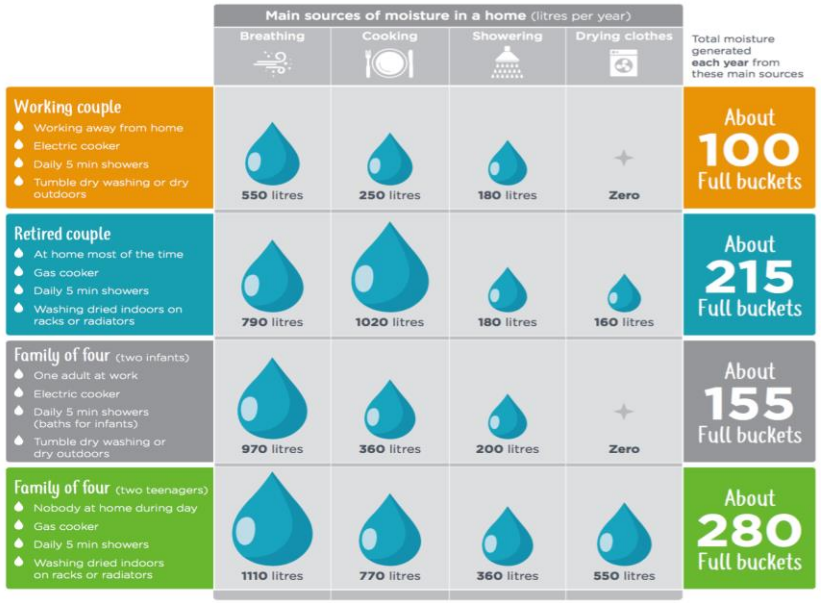



# Moisture in new homes

## A guide for occupants

- This guide explains **where moisture comes from** and the things you can do to **maintain the right moisture balance** in new homes. The guide discusses:
  - Moisture balance
  - Where moisture comes from
  - Drying out your new home Importance of ventilation
  - Tackling moisture-related problems

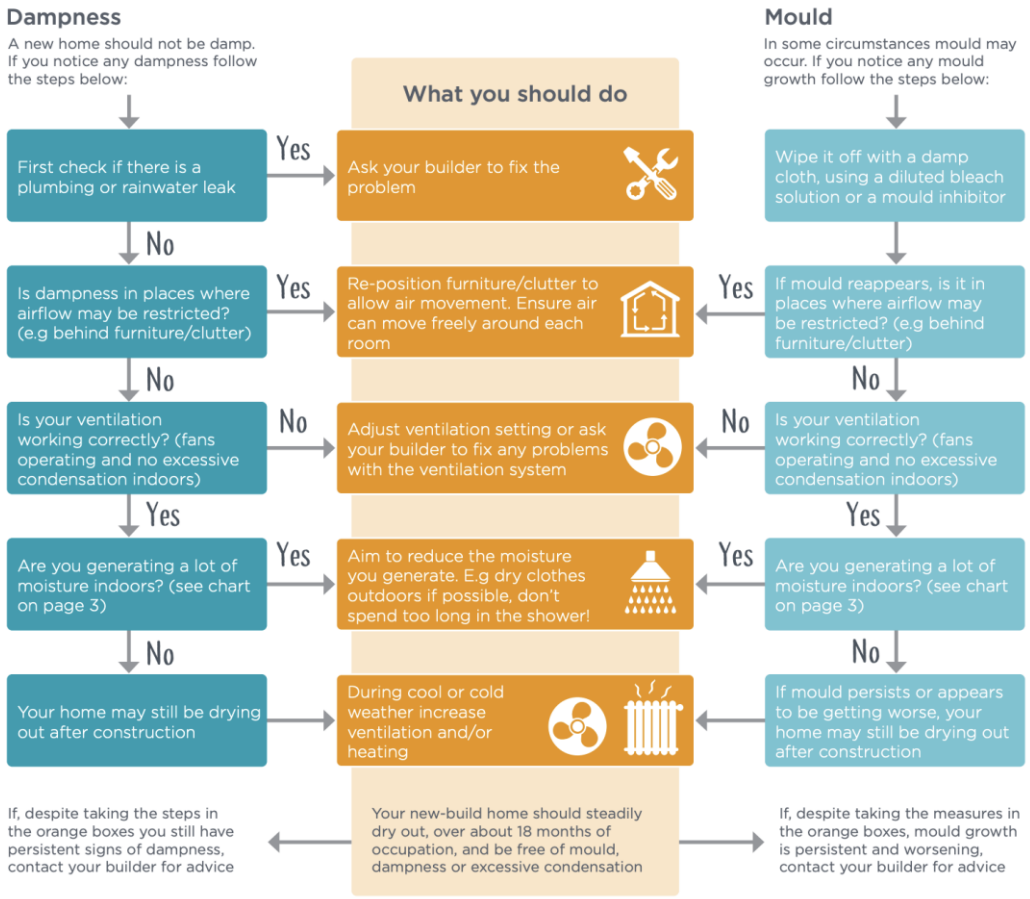


# Moisture in new homes

## A guide for occupants

- This guide was created to **help understanding moisture in a new-build** home. Supported by NHBC Foundation



# A moisture safe future

How can we help you?

https://ukcmb.org

# Questions

**Contact Hector Altamirano**
UKCMB Academic Director

E: h.altamirano-medina@ucl.ac.uk