Investigating Dampness and Mold: How Much Is Too Much?

Science-Based Advice for California Code Enforcement Officers and Others

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1. Know the indicators of dampness and mold in buildings that scientific studies have linked to health effects

2. Know the underlying cause of all mold problems in buildings (it's moisture!)

3. Know why you should be skeptical about making and interpreting mold measurements

4. Understand the important public health benefit of enforcing for mold and dampness in housing
What do we mean by dampness and mold

We focus here on a specific type of microbial growth – that of fungi

Moisture in a building can be unintended or intended
Observed dampness and mold indicate increased risk of adverse health effects

Dampness and mold in buildings are consistently linked to multiple respiratory health effects

10-20% of current asthma is linked to dampness or mold in US homes

WHO 2009, Kanchongkittiphon et al. 2015, Mendell et al. 2011, Krieger et al. 2010
The California Housing Code includes *both dampness and mold* as conditions that make housing substandard.

“Any building. . .in which there exists any of the following listed conditions to an extent that endangers the . . . health . . . of the . . . occupants . . . as determined by a health officer or a code enforcement officer . . . is declared to be a substandard building: . . . 

(a.11) **Dampness** of habitable rooms.

(a.13) **Visible mold growth**. . . excluding . . . mold that is minor and found on surfaces that can accumulate moisture as part of their properly functioning and intended use.”

http://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?sectionNum=17920.3&lawCode=HSC
There are four indicators of dampness and mold with documented links to increased health risks:

1. Visible mold
2. Mold odor
3. Water damage
4. Visible moisture

WHO 2009, Mendell et al. 2011
Presence of *any one or more* of these indicators is linked to increased risk of adverse health effects

- Visible mold
- Mold odor
- Water damage
- Visible moisture

- New asthma
- Asthma episodes
- Respiratory infections
- Respiratory symptoms
Mold will not grow without moisture

This moisture is not available in a dry building (except in places intended to be moist)

Mold, in places not intended to be wet, indicates an abnormal moisture source. This may also violate housing codes on moisture.

When you see or smell mold, think moisture!
Can we set specific limits for the amount of observed dampness and mold in buildings?

No. We cannot now specify a specific amount of observed dampness or mold as a maximum acceptable limit. But …

The more dampness or mold observed or smelled, the greater the health risks.

Mold odor is a very strong indicator of increased health risks: stronger odor is linked to larger risks.

Reponen 2012, Shorter 2018, Mendell and Kumagai 2017
There are public health benefits to enforcing for mold and dampness, even without clear guidelines.

Some agencies or code enforcement officers avoid this issue and simply do not enforce for mold in housing.

Dampness and mold are more common in rental, low-income, and minority homes in California.

Enforcement for mold and dampness would reduce the burden of disease especially in low-income and minority populations.

Hutchinson 2014
Determining the concentrations or types of mold has not been consistently related to health risks

Taking a sample to examine for spore counts, culture, or DNA has *not been consistently useful as a marker of adverse health risks*

We do not even know which microbial agents related to dampness cause the health effects

WHO 2009, Mendell et al. 2011, EPA web page on use of ERMI
Understanding effective remediation: a critical but complicated part of code enforcement

Specifics on effective remediation are beyond the scope of this presentation

There are many possible moisture sources in buildings – both current and past – and each requires a different solution
Key points for code enforcement and building investigation, related to dampness and mold:

1) Inspect for observed indicators of excess moisture
   - visible mold, mold odor, water damage, or visible moisture
   - the more of any of these, the greater the health risks
   - no known threshold
2) Focus on moisture as the underlying problem to find and fix!
   - mold tells you that a *moisture source* must be *found and remediated* to protect health
   - moldy or wet building materials also need to be remediated
   - if the moisture source is not fixed, the mold will return!

Key points for code enforcement and building investigation, related to dampness and mold:
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3) We do not recommend making mold measurements, and we advise skepticism because interpretations of mold measurements are not based on scientific evidence.
Key points for code enforcement and building investigation, related to dampness and mold:

4) Enforcement for mold and dampness would reduce the burden of disease in low-income and minority populations
Summary points for code enforcement and building investigation, related to dampness and mold

1) Inspect for observable indicators of excess moisture

2) Focus on moisture as the key problem that needs to be fixed!

3) Be skeptical about mold measurements

4) Keep in mind the public health benefits of enforcing for mold and dampness
References

Many of these are publically available, but if you cannot find them, email: IAQ@cdph.ca.gov

California Housing Code: [http://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?sectionNum=17920.3&lawCode=HSC](http://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?sectionNum=17920.3&lawCode=HSC)


Kanchongkittiphon W et al. *Indoor Environmental Exposures and Exacerbation of Asthma...Environmental Health Perspectives* 2015;123:6-20. (free online)

Mendell MJ et al. *Respiratory and Allergic Health Effects of Dampness, Mold, and Dampness-Related Agents... Environ Health Perspect* 2011; 119:748-756. (free online)


Mendell MJ and Kumagai K. *Observation-based metrics for residential dampness and mold with dose–response relationships to health... Indoor Air* 2017;27:506-17.


Also see the CDPH/Indoor Air Quality Section information on dampness and mold at: [https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/EHLB/IAQ/Pages/Mold.aspx](https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/EHLB/IAQ/Pages/Mold.aspx)