Investigating Dampness and Mold: How Much Is Too Much?

Science-Based Advice for California Code Enforcement Officers and Others

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH

Environmental Health Laboratory Branch
Indoor Air Quality Section

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Goals of this presentation

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

WHO 2009, Kanchongkittiphon et al. 2015, Mendell et al. 2011, Krieger et al. 2010

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

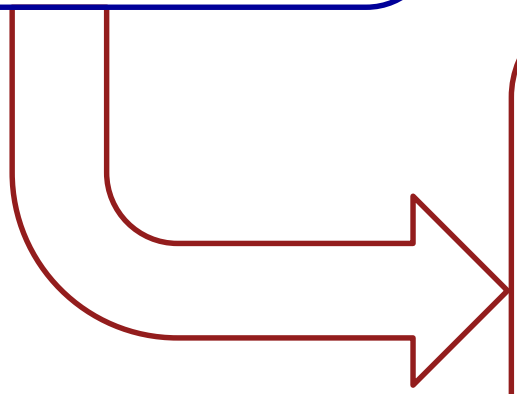
There are four indicators of dampness and mold with documented links to increased health risks

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

WHO 2009, Mendell et al. 2011

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

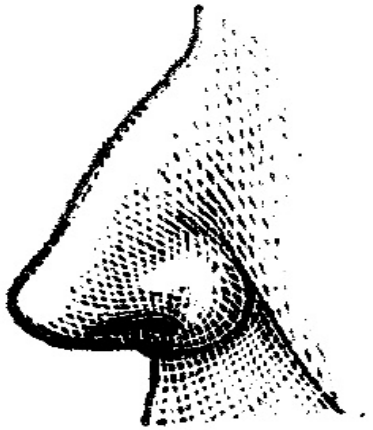
When you see or smell mold, think moisture!

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

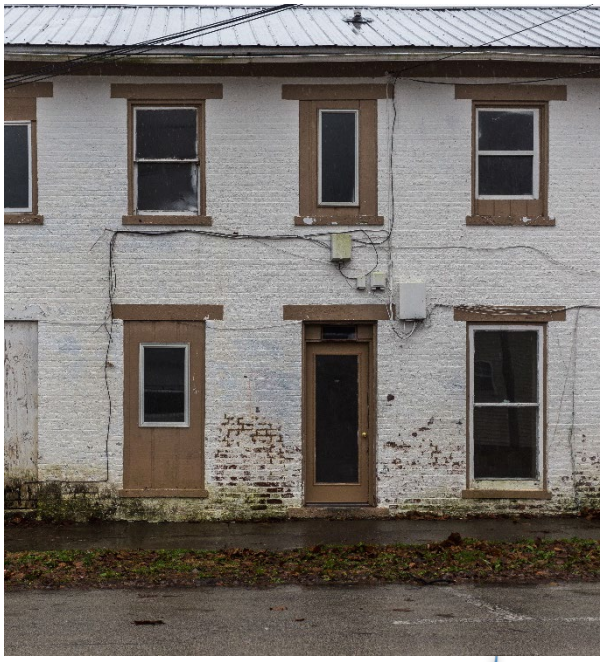
Mold odor is a *very strong* indicator of increased health risks: stronger odor is linked to larger risks



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

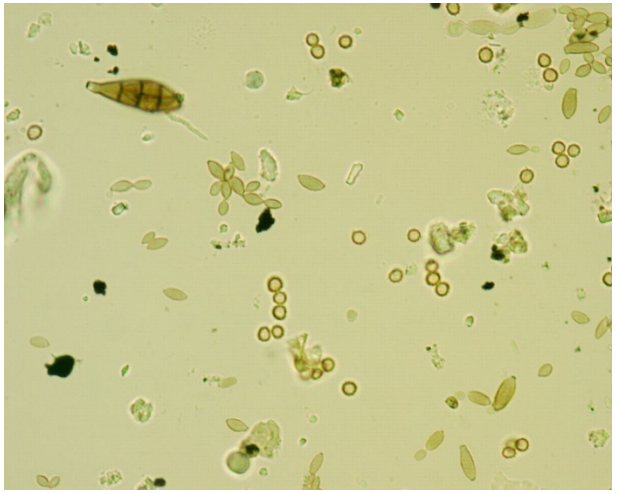


Dampness and mold are more common in rental, low-income, and minority homes in California

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

Key points for code enforcement and building investigation, related to dampness and mold:

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:

3) We do not recommend making mold measurements, and we advise skepticism because interpretations of mold measurements are not based on scientific evidence

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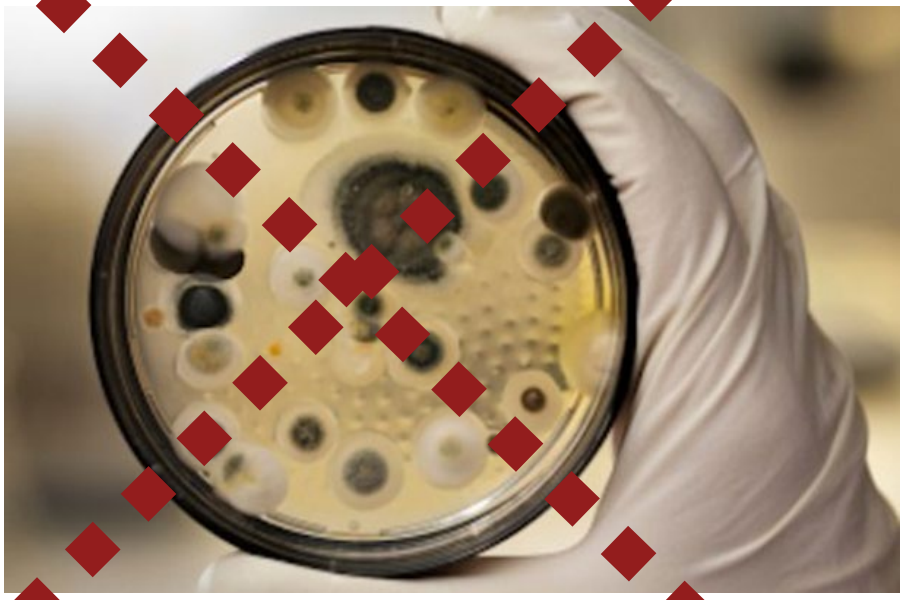

Key points for code enforcement and building investigation, related to dampness and mold:

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

World Health Organization (ed). *WHO Guidelines for Indoor Air Quality: Dampness and Mould*, 2009. https://www.who.int/airpollution/guidelines/dampness-mould/en/

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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)

Krieger J et al. Housing Interventions and Control of Asthma-Related Indoor Biologic Agents: A Review of the Evidence. J of Pub Health Mgmt & Pract 2010; 16: S11

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.

Hutchinson, J. *The Burden of Damp and Moldy Housing Conditions: CA Behavioral Risk Factor Survey 2013*. A report for the CA Breathing Asthma Program of the CDPH. August 2014.

EPA web page on use of ERMI, at: https://iaq.zendesk.com/hc/en-us/articles/211432888-Should-I-test-or-sample-for-mold-in-my-home-using-the-Environmental-Relative-Moldiness-Index-or-ERMI-

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