

# METR/ENVS 113

## Lecture 12: Indoor Air Pollution

SJSU Spring Semester 2020

Module 5: Local & Indoor Air Pollution

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# Lecture 12: Outline

- **Overview**
- **Indoor Air Pollution: Sources**
- **Indoor Air Pollution: Prevention and Control**

# References / Acknowledgements

## Is Your Indoor Environment Making You Sick?

Breathe California of the Bay Area



Presented by Dennis Achá, MPH  
METR113 Fall 2012 Semester

## References / Acknowledgements

- [http://www.clallam.net/HHS/documents/Health and Indoor Air Quality.pdf](http://www.clallam.net/HHS/documents/Health_and_Indoor_Air_Quality.pdf)
- <https://www.trane.com/commercial/Uploads/PDF/520/ISS-APG001-EN.pdf>
- <https://www.epa.gov/sites/production/files/2014-08/documents/appenb.pdf>



## Other Resources

- Healthy Indoor Air for America's Homes  
[www.healthyindoorair.org](http://www.healthyindoorair.org)
- U.S. Environmental Protection Agency  
[www.epa.gov/iaq](http://www.epa.gov/iaq)
- American Lung Association [www.lungusa.org](http://www.lungusa.org)
- Built Green [www.builtgreenwashington.org/](http://www.builtgreenwashington.org/)
- Ecology  
[www.ecy.wa.gov/programs/swfa/greenbuilding/](http://www.ecy.wa.gov/programs/swfa/greenbuilding/)
- Home Builder's Association [www.nbpa.org](http://www.nbpa.org)

<https://nchh.org/information-and-evidence/learn-about-healthy-housing/health-hazards-prevention-and-solutions/ventilation-and-indoor-air-quality/>

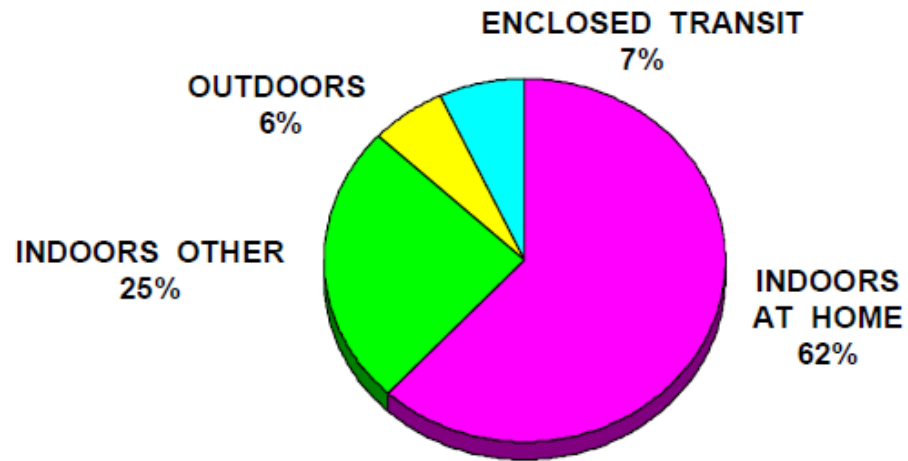
<https://www.cdc.gov/niosh/topics/indoorenv/hvac.html>

<https://www.epa.gov/indoor-air-quality-iaq/improving-indoor-air-quality>

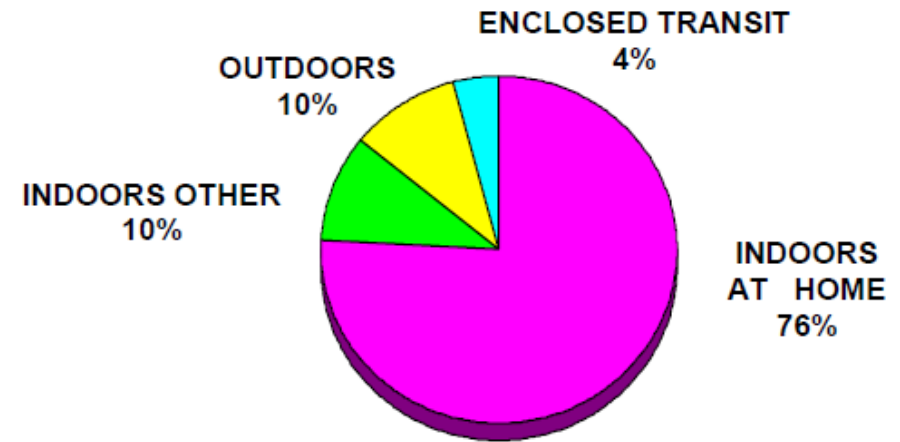
# *Indoor Air Pollution (Overview)*

# Time Spent Indoor vs. Outdoor

**California Adults and Teens**  
( Population Means )

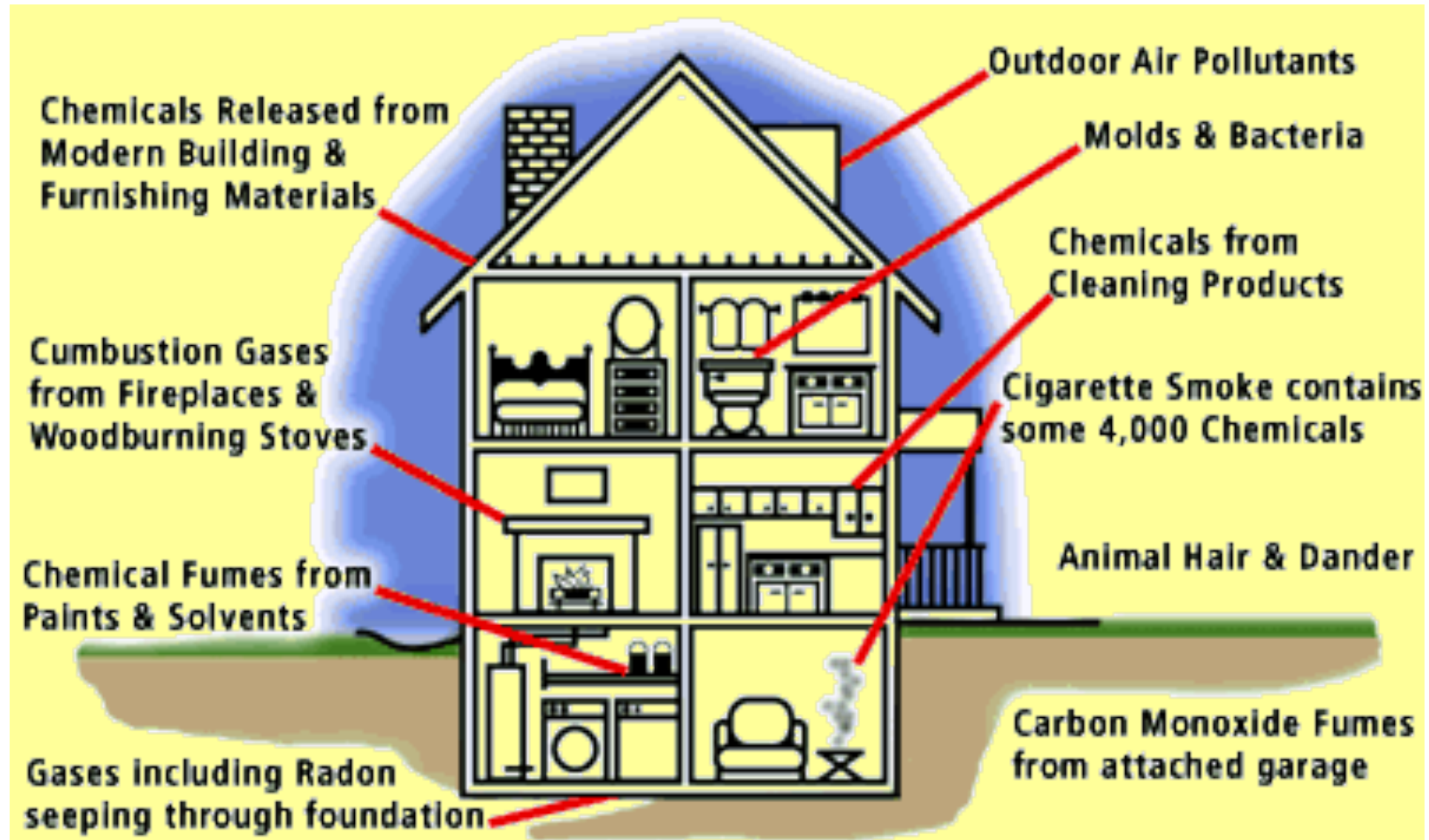


**California Children**  
( Under 12 years old, Population Means )



80 – 90% Spent Indoors (home, work, elsewhere)

# Where do indoor pollutants come from?







# Indoor Air Quality Health Effects

## Major Indoor Pollutants

Lethal	Serious Impairments	Irritation, Discomfort
<b><i>Tobacco</i></b> * 430,000 deaths per year, US Residential <b><i>Radon</i></b> * 15,000 to 20,000 deaths per year <b><i>Carbon Monoxide</i></b> * 500 deaths per year	<b><i>Lead</i></b> * 3,000,000 mild elevated levels * 250,000 serious elevated levels <b><i>Dust Mites</i></b> * Account for 1/3 of 14 million doctor visits per year <b><i>Mold</i></b> * Allergens, toxic particles, VOC's	<b><i>Formaldehyde</i></b> * strong irritant <b><i>Mold, Mildew</i></b> * Allergens, toxic particles, VOC's <b><i>Volatile Organic Compounds (VOC's)</i></b> * Irritants, possible or known carcinogens

Source: USEPA, CDC

J. Ponessa, Rutgers Cooperative Extension 3/01

Modified from Original

## Indoor Air Quality: Regulations

- Nothing analogous to ambient air quality standards for outdoor air
- Building codes for building materials & ventilation for newer structures
- Smoke / carbon monoxide alarm requirements
- CA Prop 65 warnings for household items (cleaning, paints, etc. ...)
- OSHA for workplace air.

*Indoor Air Pollution  
(Sources)*

## Sources of Poor Indoor Air Quality

**Carbon monoxide** – Fireplaces, stoves, cars in attached garages, water heaters, and other combustion sources in homes can emit carbon monoxide into homes. Ensure proper function of these equipment. Ensure proper ventilation especially if these sources are in enclosed places. Makes sure smoke alarms also have carbon monoxide sensors.

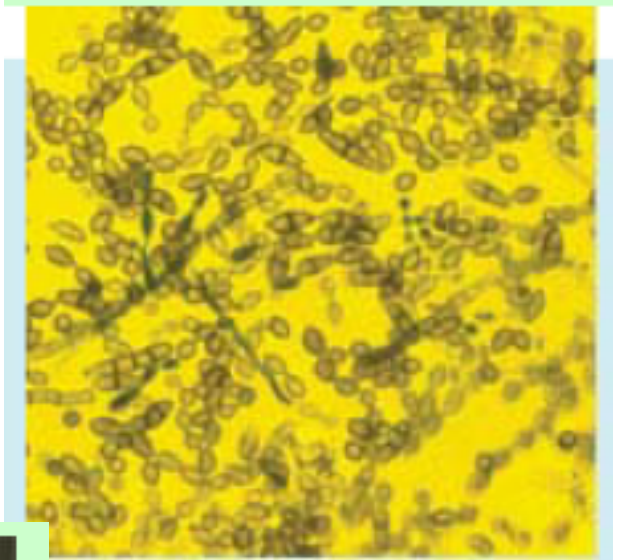


Smoke alarm w CO sensor



# Sources of Poor Indoor Air Quality

**Mold** – Mold can cause allergic reactions through inhalation of spores and mycotoxins. Bathrooms are a common source of mold, but it can occur anywhere where humidity is high, and ventilation is poor. Using a ventilation fan or opening a window will help to control moisture and inhibit mold growth. Check also plumbing leaks.



*Magnified mold spores.*



[https://www.medicinenet.com/mold\\_exposure/article.htm](https://www.medicinenet.com/mold_exposure/article.htm)



## Sources of Poor Indoor Air Quality

**Dust mites** – Dust mites feed off dead skin cells. They can trigger allergy and asthma attacks. Regularly vacuum soft surfaces such as carpeting, upholstery, stuffed toys and drapes. Wash pillows, blankets and bed sheets in hot water weekly.



## Sources of Poor Indoor Air Quality

**Pet dander and hair** – Pets can trigger allergy and asthma attacks due to dander and hair. Keep them out of the sleeping areas, and away from upholstered furniture, carpets, and stuffed toys. Vacuum and clean carpets, rugs, and furniture often.



# Sources of Poor Indoor Air Quality

## **Volatile Organic Compounds (VOCs) –**

Many VOCs are toxic air contaminants.

Common household cleaners release Volatile Organic Compounds (VOCs), both when used and stored. Keep all products away from children. Consider purchasing cleaners without VOCs. Check Prop 65 warning labels.





# Sources of Poor Indoor Air Quality

**Formaldehyde** - Formaldehyde is a toxic air contaminant. It is widely used in composite wood products that have resins, and is in building materials and insulation, glues, permanent press fabrics, paints, lacquers, and other coatings. Formaldehyde is also released into the air from formaldehyde-containing personal care products, like some shampoos, soaps, haircare products, body washes, and nail polish. Check for formaldehyde-free products.

 These Green Products are Available-  
Formaldehyde Free Insulation



**Thoroughly Tested**  
Thoroughly Tested safe, Non-corrosive, Non-toxic, Environmentally responsible, Contains no CFC, HCFC, or Formaldehyde.

INSECT RESISTANT RIGID INSULATION

 These Green Products are Available-No Added Formaldehyde Panels



These Green Products are Available-Low VOC Paint



# Sources of Poor Indoor Air Quality

**Radon** – Is a naturally occurring radioactive gas that can enter a home through cracks and openings in floors and walls that are in contact with the ground. Radon is among the leading causes lung cancer among non-smokers in the U.S. Testing your home is simple and inexpensive.

**Zone 1** counties have a predicted average indoor radon screening level greater than 4 pCi/L (pico curies per liter) (**red zones**)

**Highest Potential**



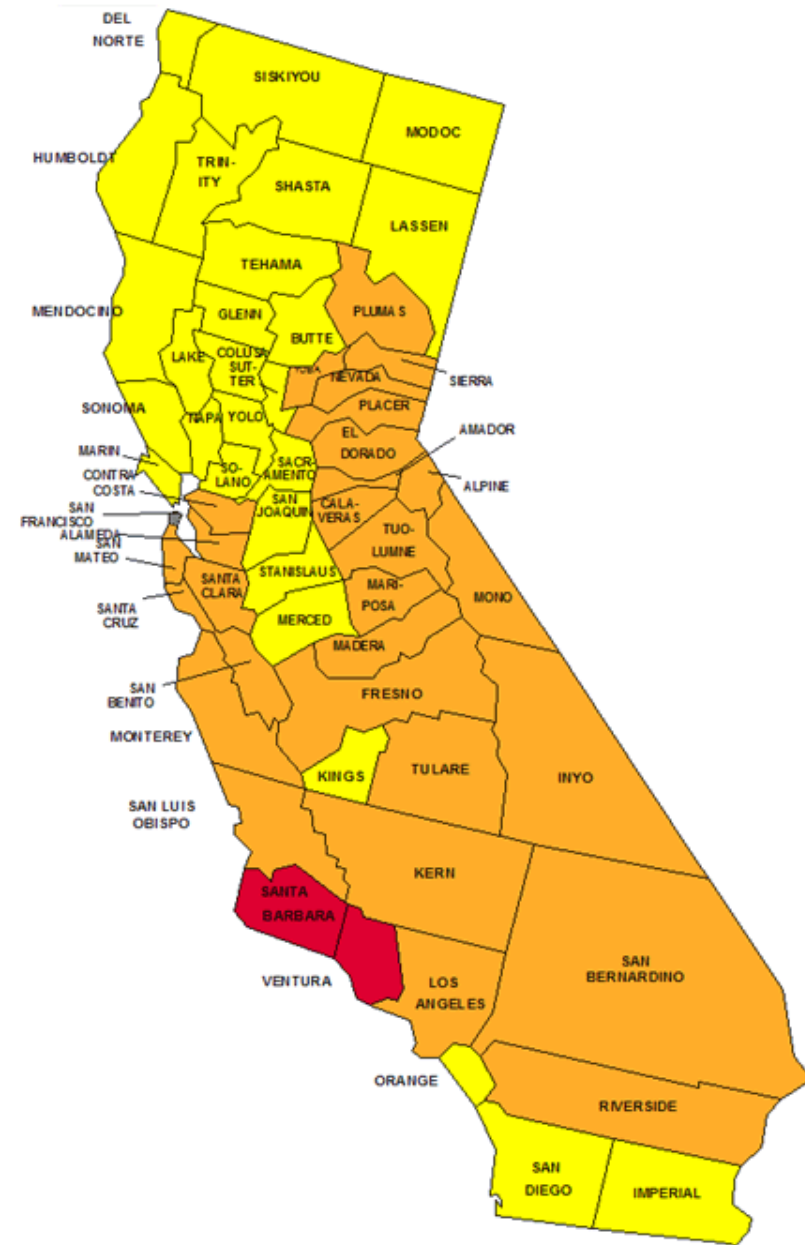
**Zone 2** counties have a predicted average indoor radon screening level between 2 and 4 pCi/L (**orange zones**)

**Moderate Potential**



**Zone 3** counties have a predicted average indoor radon screening level less than 2 pCi/L (**yellow zones**)

**Low Potential**

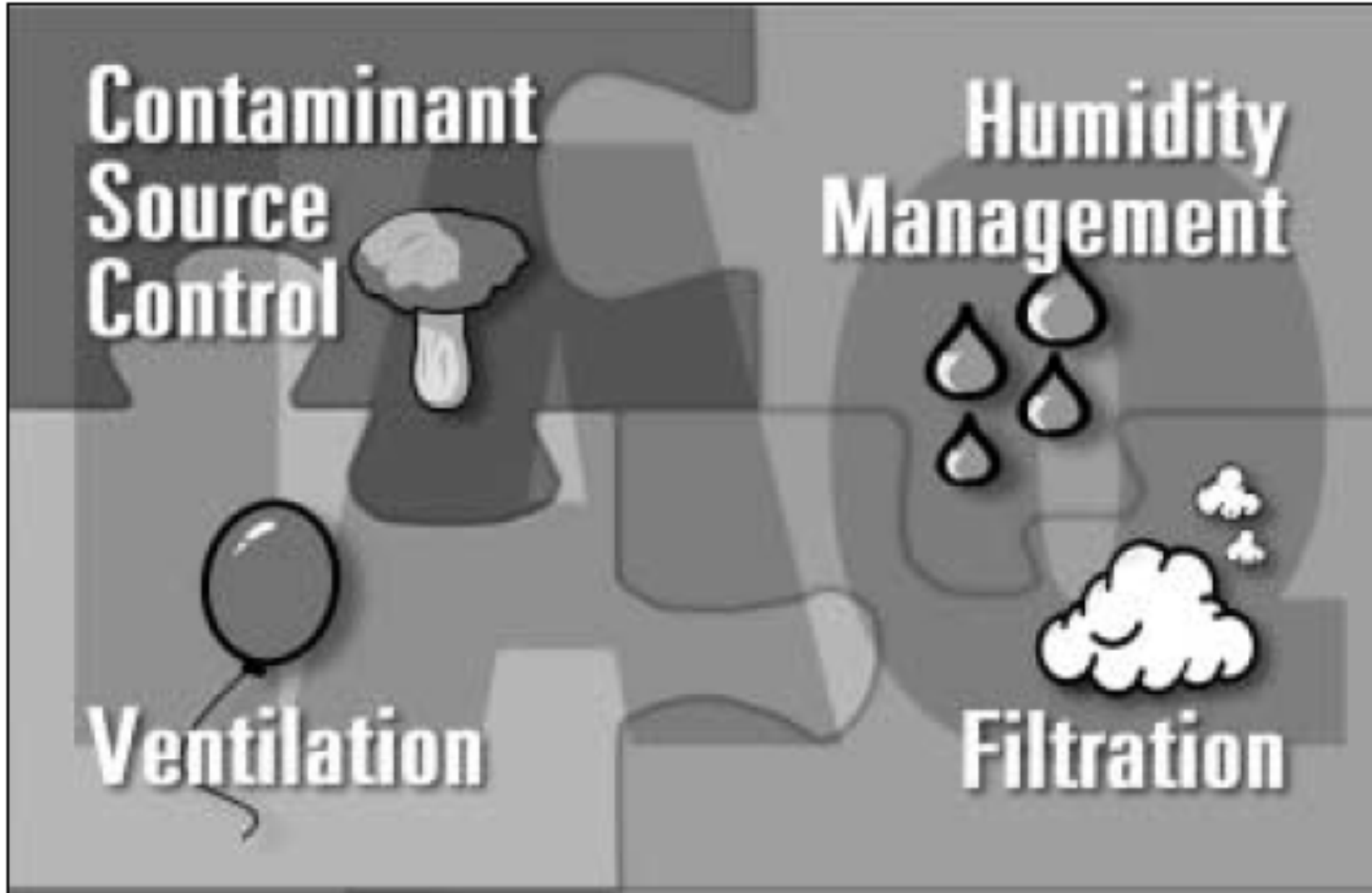


*Fix your home if you have a radon level of 4 pCi/L or more. You can test your home yourself. CA Dept. of Public Health # 1-800-745-7236.*

<https://www.epa.gov/radon>

*Indoor Air Pollution  
(Prevention & Control)*

# Preventative Measures / Controls



# Humidity & Ventilation Control



## Characteristics of “Good” Indoor Air to reduce mold growth

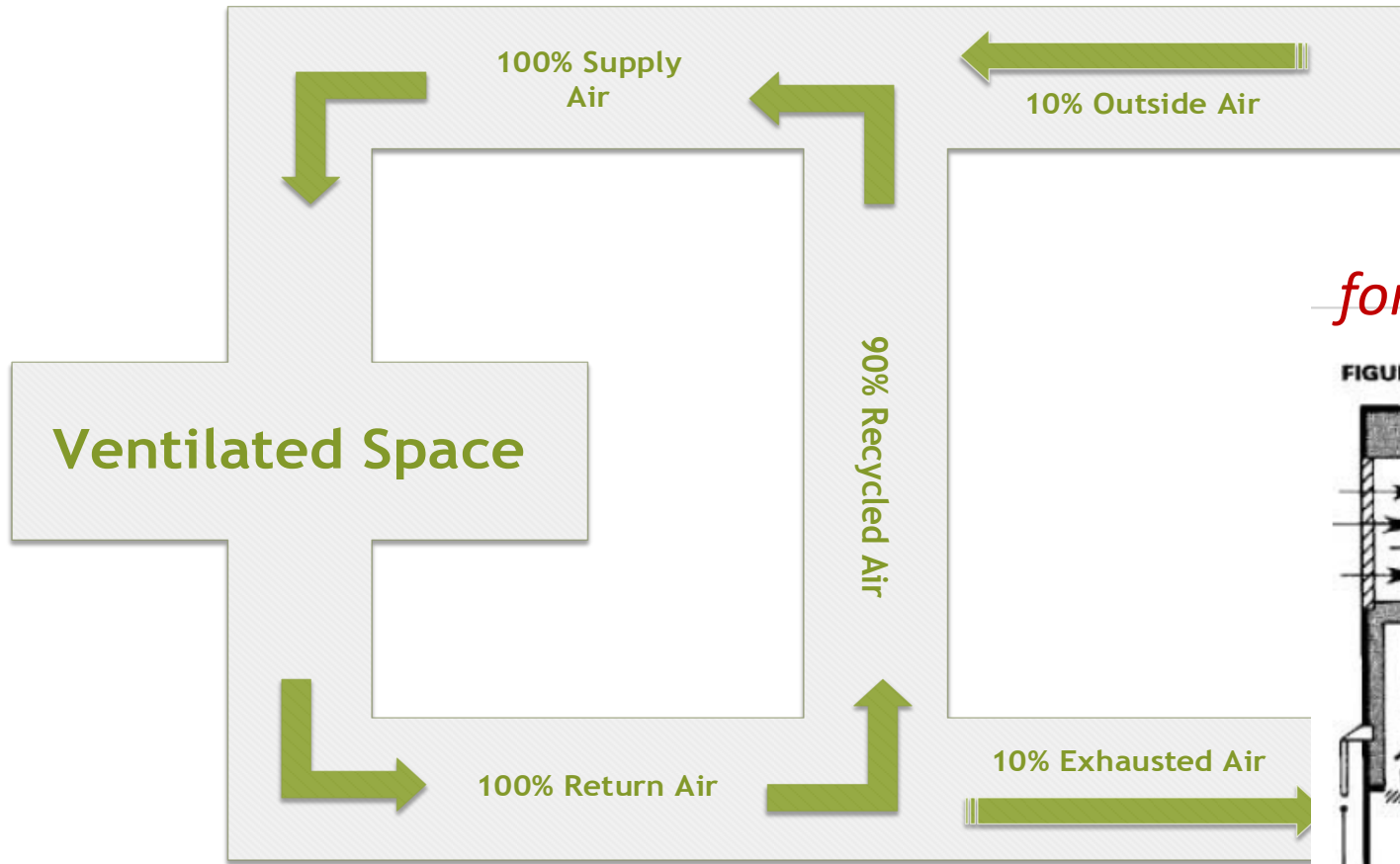


- Temperature: 72°-78°F
- Humidity: 40%-60% Relative Humidity (RH)
- Air Velocity: 20-30 fpm in ducts
- Dilution ventilation: 20 cfm/person
- In a “wet” room, like a bathroom, there should be 8 air exchanges/hour

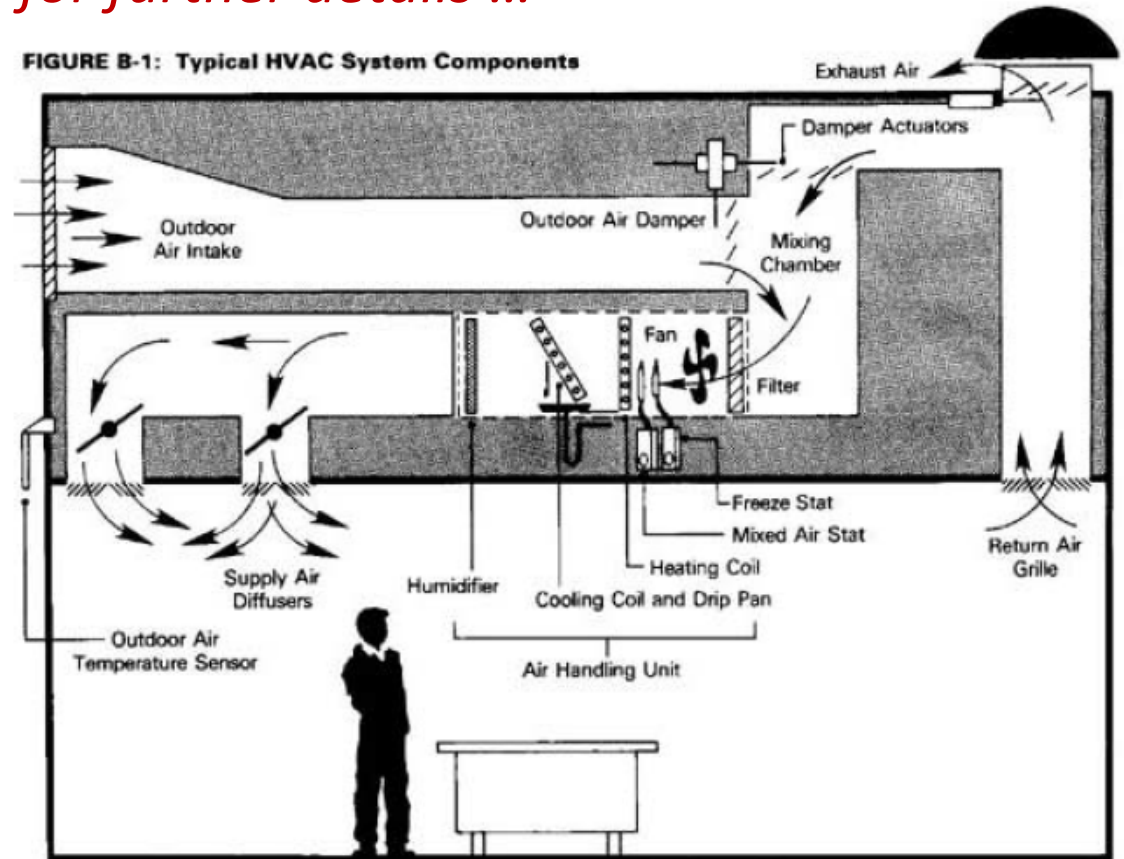
Dehumidifier



# Basic Ventilation System



*for further details ...*





# Particle Filtration

