

# Ventilation for Indoor Air Quality

Rebuild Green Expo

John Proctor, P.E.  
Fairfax, CA 94930  
415-717-1700

Copyright 2018 John Proctor, P.E.

# Why Ventilate Your Home

- To reduce the level of pollutants:
  - Formaldehyde
  - Particles (PM 2.5, etc.)
  - NO<sub>2</sub>
  - Other Volatile Organic Compounds (VOCs)
- These cause Health Effects:
  - Cancer
  - Asthma
  - Heart Disease
  - Respiratory Disease

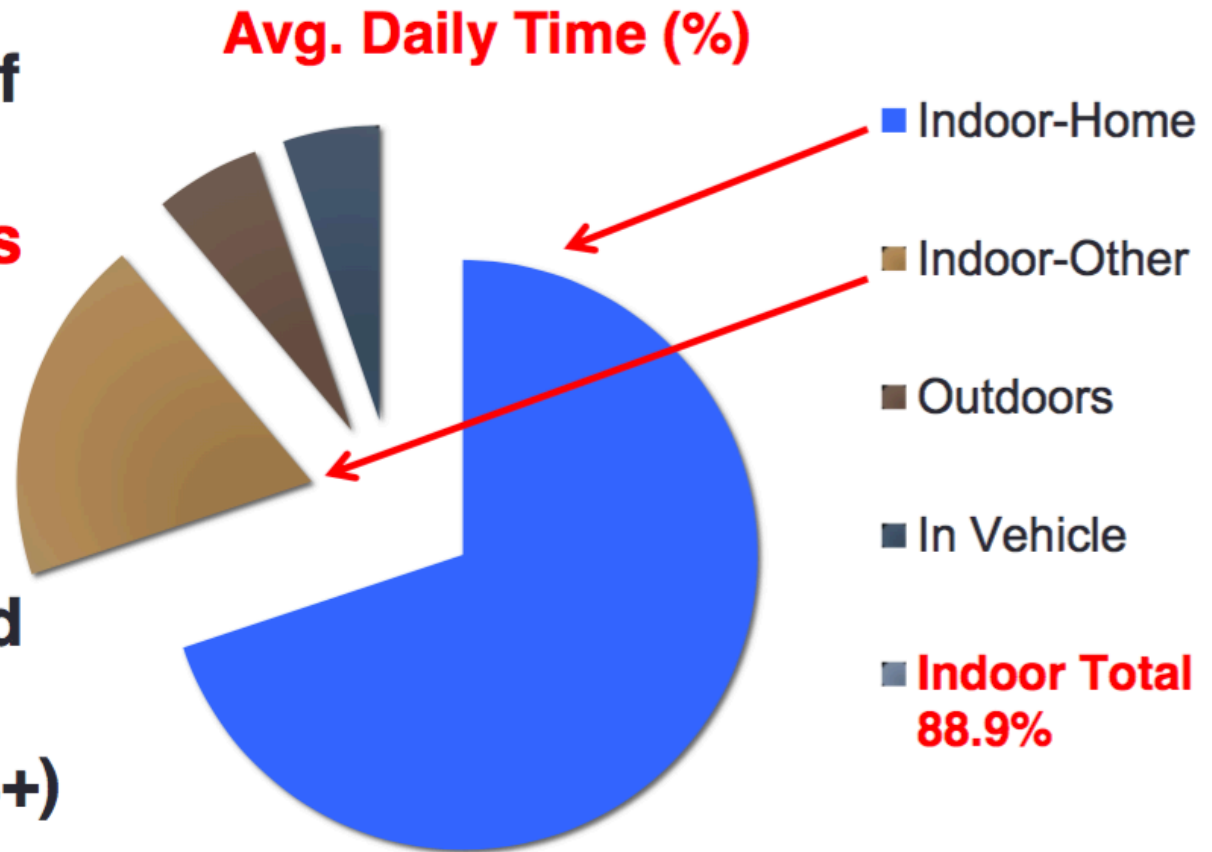
# Where Do These Come From?

- Building Materials
- Paint
- Cooking
- Furniture
- Carpet
- Pollutants are particularly strong in new construction, but they never disappear.

# Time in Indoor Air

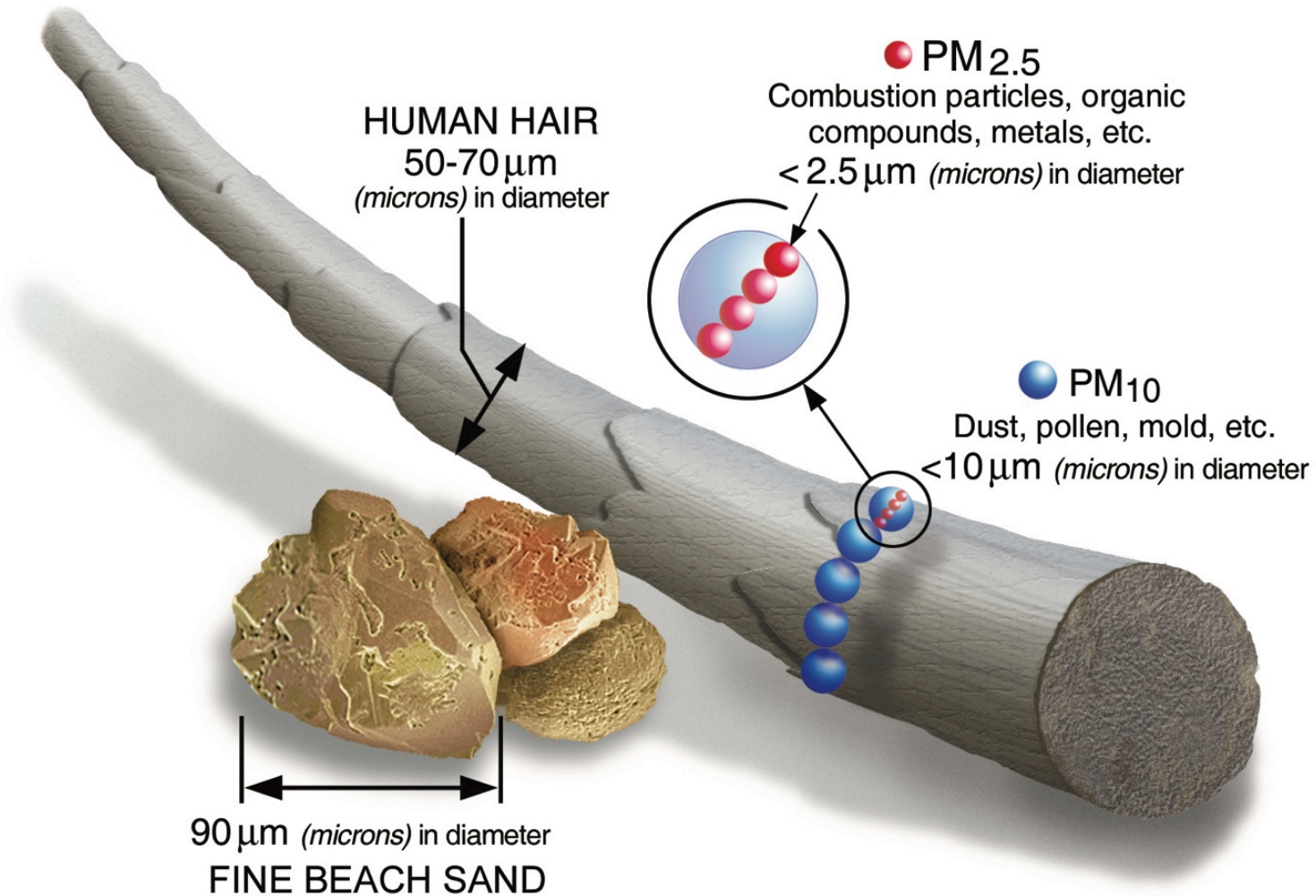
➤ About **90%** of our time is spent **indoors**

➤ **Vulnerable groups** spend more time indoors (**95%+**)



*Canadian Human Activity Pattern Survey 2, 2010-11*

# What is a PM2.5?



# How Much Continuous Ventilation is Barely Enough (CFM)? T24

## Bedrooms

Floor Area, ft <sup>2</sup>	1	2	3	4	5
<500	30	38	45	53	60
501–1000	45	53	60	68	75
1001–1500	60	68	75	83	90
1501–2000	75	83	90	98	105
2001–2500	90	98	105	113	120
2501–3000	105	113	120	128	135
3001–3500	120	128	135	143	150
3501–4000	135	143	150	158	165
4001–4500	150	158	165	173	180
4501–5000	165	173	180	188	195

# Types of Whole Building Ventilation

- Exhaust Only
- Supply Only
- **Balanced**
- Heat Recovery
- **Distributed** or Not Distributed
- **Continuous** or Intermittent

# Whole Building Ventilation Watt Draw

- Exhaust Only
- Supply Only
- **Balanced**
- **7 to 10 Watts per 50 CFM**  
(hvi.org)
- Slightly higher for Balanced
- **Heat Recovery**
- <https://contractors.encyvermont.com/Media/Default/docs/programs/new-construction/efficiency-vermont-hrv-erv-qpl.pdf>



# Controls

- On – Off
- Operation and Maintenance

# Spot Ventilation for Point Sources

- Vented Range Hood – 100 CFM
- Bathroom – 50 CFM
- Other – Hobby Room, etc.

# Why not just build houses that breathe?

- They take big pauses in breathing
- They heat up fast in the summer
- They cool off fast in the winter
- Thus driving huge utility bills
- You cannot turn the ventilation system off at times of high outdoor pollution

# Why Are Ducts El Primo?

- They generate LOSSES:
  - They are a really big heat exchanger
  - They are very effective at losing the capacity of your AC or HP through conduction and leakage

# Filtration

- A 1" pleated filter ruins the efficiency of your air conditioner or heat pump
- Title 24 minimum filter box is 2" deep.
- Build the filter box for a 4" pleated filter

Rec	
Filter thickness	4 inch
Material	Pleated
MERV	13
AC Tons	
1	350 Sq. In.
1.5	525 Sq. In.
2	700 Sq. In.
2.5	875 Sq. In.
3	1050 Sq. In.
3.5	1225 Sq. In.
4	1400 Sq. In.
5	1750 Sq. In.

# Big Ventilation and Bad Ventilation

- Whole House Fan
- Attic Vent Fan