IEQ Tales from the Crypt

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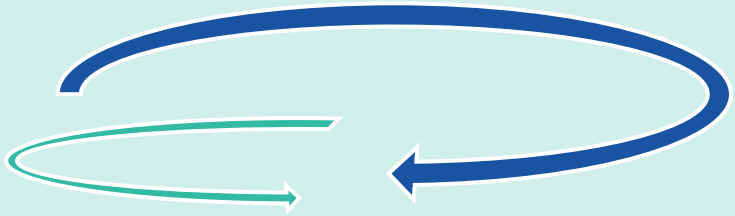
AURA ENVIROSCIENCE

Biochemistry, Immunology & Epidemiology

Commercial R & D

IAQA

Motivation: Solve Problems & Help People



AURA
ENVIROSCIENCE

The AURA EnviroScience Team

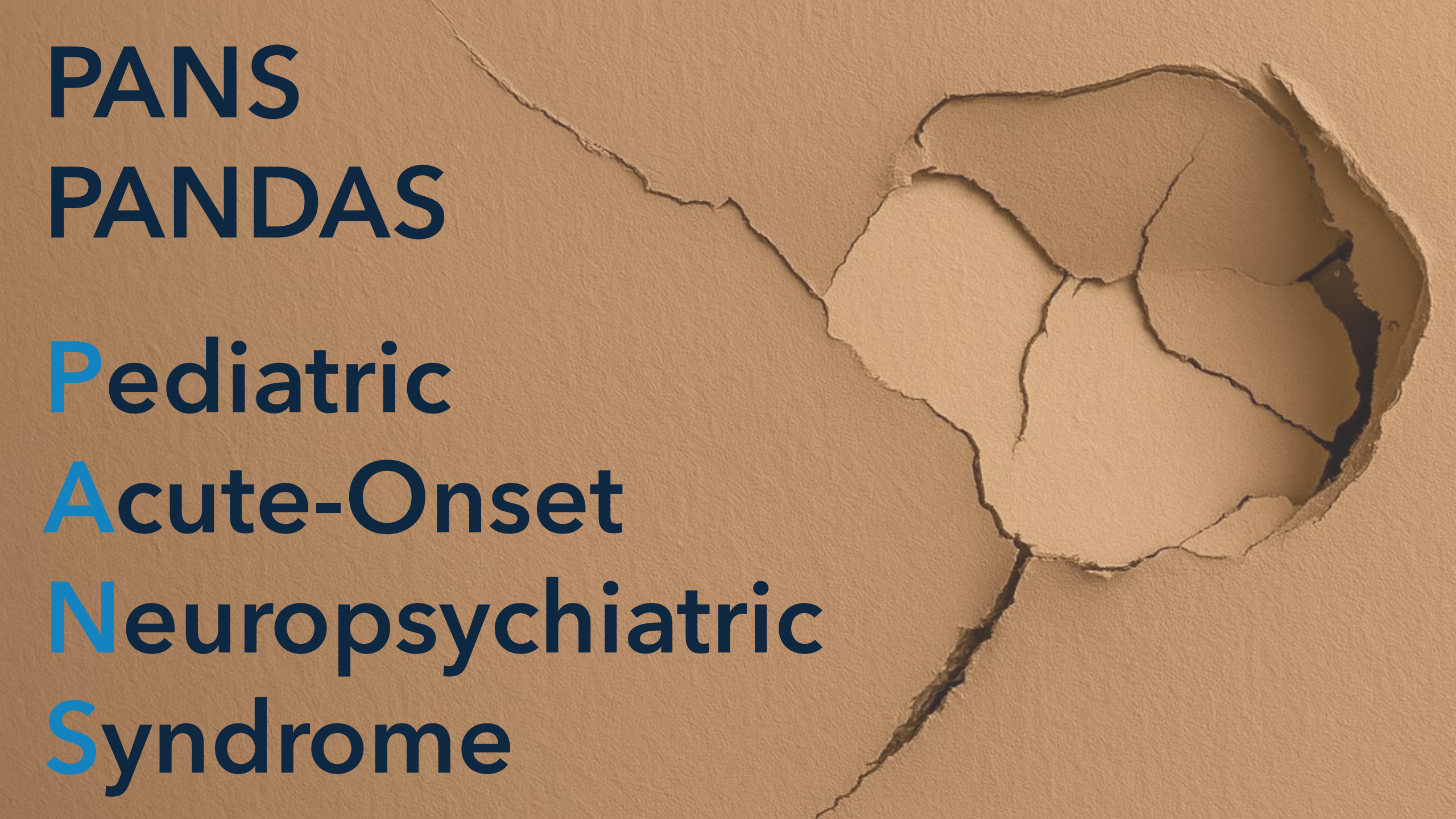
- Indoor environmental quality inspections
- Scientific consultations
- Litigation support

Residential clients with medical conditions

Not just "a case of the sniffles"

PANS
PANDAS

Pediatric
Acute-Onset
Neuropsychiatric
Syndrome



PANS/PANDAS

recognized by the American Academy of Pediatrics in 2025

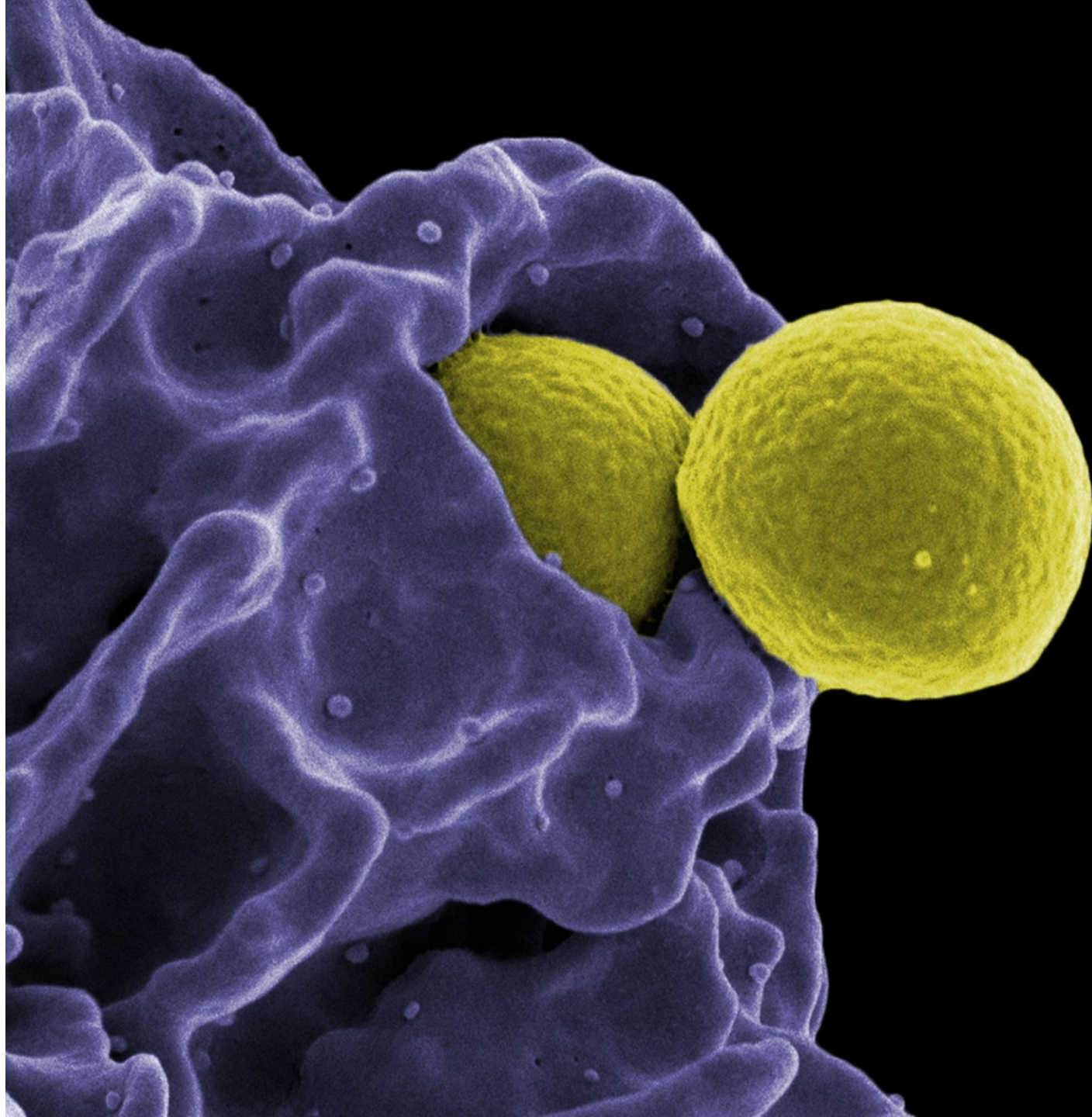
Sudden onset of symptoms

Triggered by infections or inflammatory event

"Minor" environmental exposures can trigger new episodes

CIRS

Chronic Inflammatory Response Syndrome



CIRS

PERSISTENT INFLAMMATION

MULTISYSTEM SYMPTOMS

COGNITIVE ISSUES

VISION

FATIGUE & WEAKNESS

GI DISTRESS

IMMUNE DYSREGULATION

Many underlying conditions can change our response to environmental exposures

Allergies, Auto-immune, CIRS, PANS, TILT, Infections,…

- Molds and Microbes
- Allergens (indoor, foods, or outdoor sources)
- Chemicals (cleaning/personal care, building materials)
- Infectious agents

Genetic markers may be a risk factor


It takes Team

Minor building issues can have huge consequences

- The building is a SYSTEM, not just a collection of rooms
- Understand the history of the house
- LISTEN
- How do occupant USE the building?
- Diagnose building problems and “operator errors”
- Develop solutions
- Follow-up

Building trust – with ALL family members

What happens during an inspection?

- **Conversation**

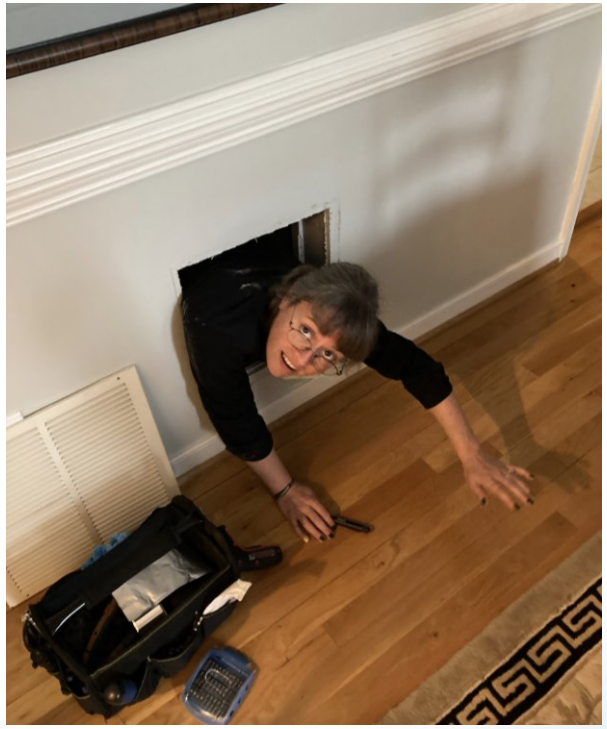
- **Thorough visual inspection**

<u>Measurement of</u>

- T
- RH%
- Ventilation/CO_2
- Airborne particulate (PM1-10)
- Volatile organic compounds (TVOCs)
- Formaldehyde
- Ozone
- Carbon monoxide
- Combustible gases

Laboratory testing optional!

You need to actually look…





working under close supervision

Mold:
Dead or Alive!
Your immune system does not “care”

Health risks of mold exposure in buildings:

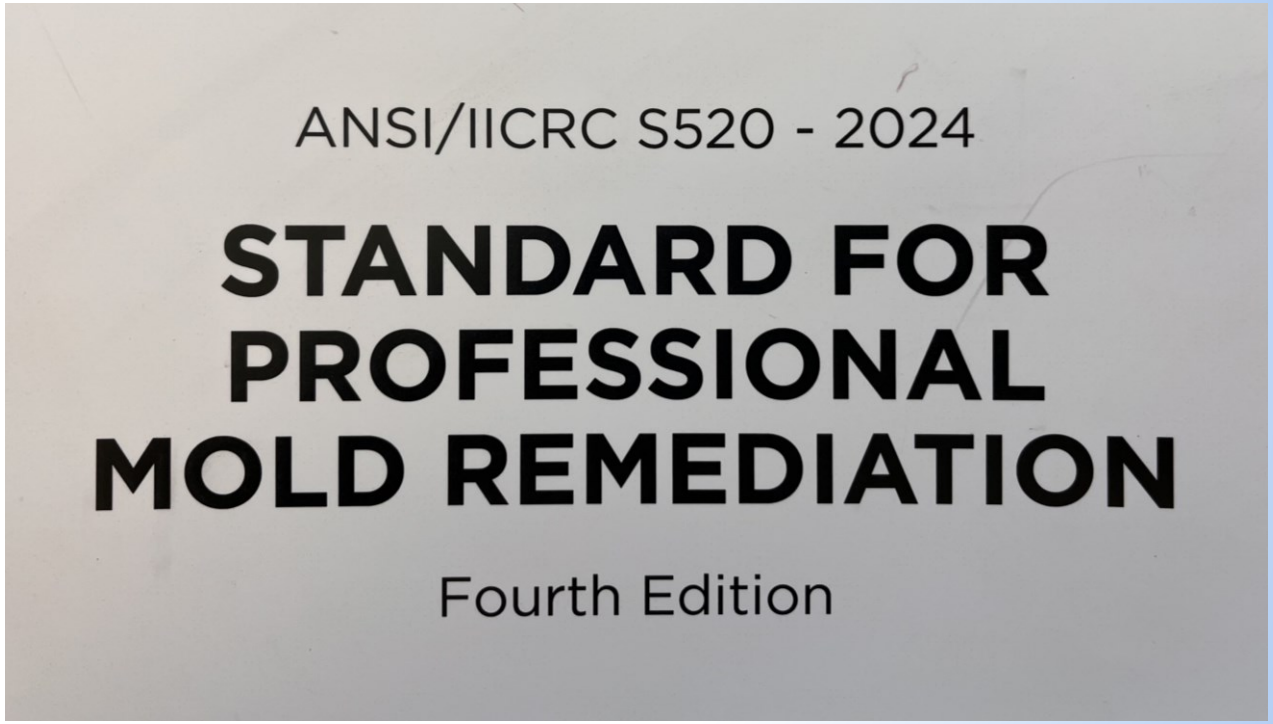
Immune reactions to biomass. Rarely infection

- Structural beta-glucans trigger inflammatory response via receptors (dectin-1)
- Allergens trigger allergic (IgE) reactions
- Mycotoxins can have various effects (immune response “upper or downers”, others cause cell toxicity, or are carcinogenic)

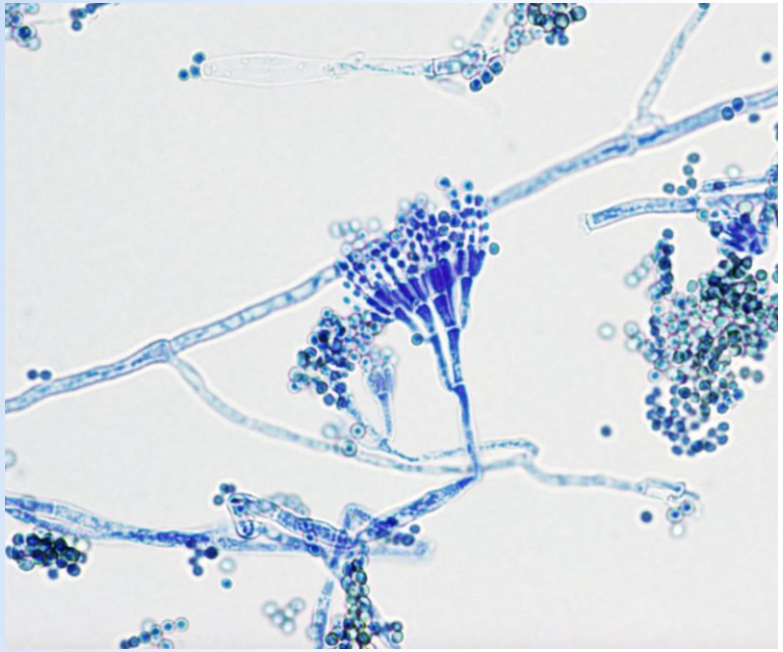
Mold Remediation

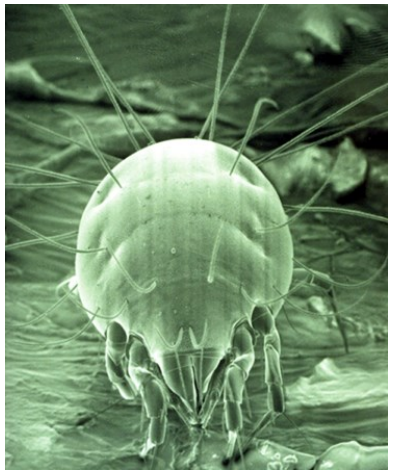
- **The goal of mold remediation is to REMOVE the fungal biomass, not to “kill” the mold.**

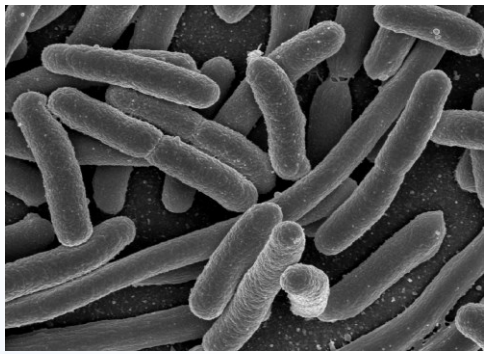
- Return from Condition 3 (actual growth) or 2 (settled biomass) to Condition 1 (normal fungal ecology)



This is NOT removal/remediation...







Moisture Control is “Everything”

Dampness leads to:

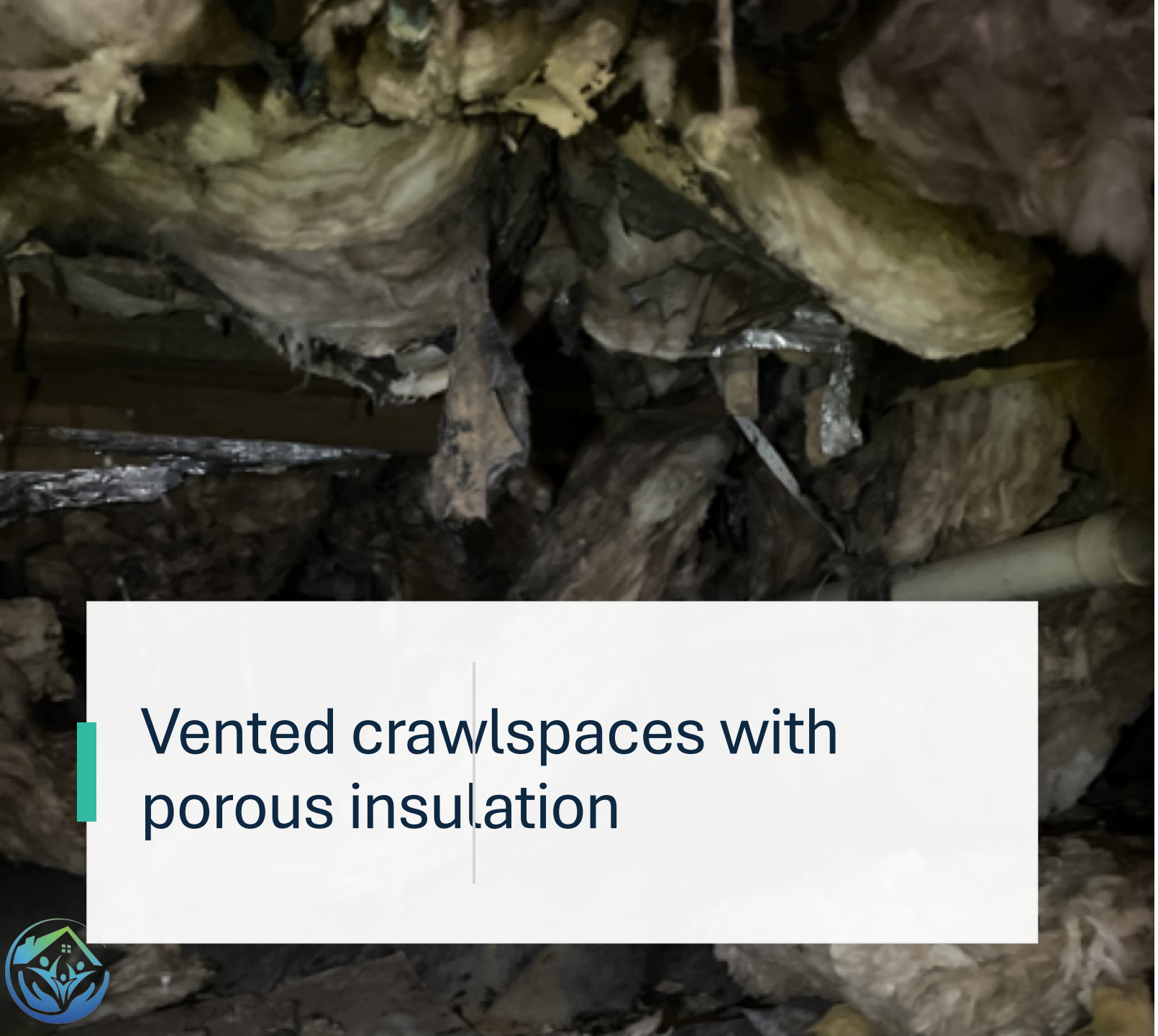
- Mold
- Bacteria
- Dust mites.
- Insects.
- Degradation of building materials.
- Odors. Off-gassing.

Crawlspaces

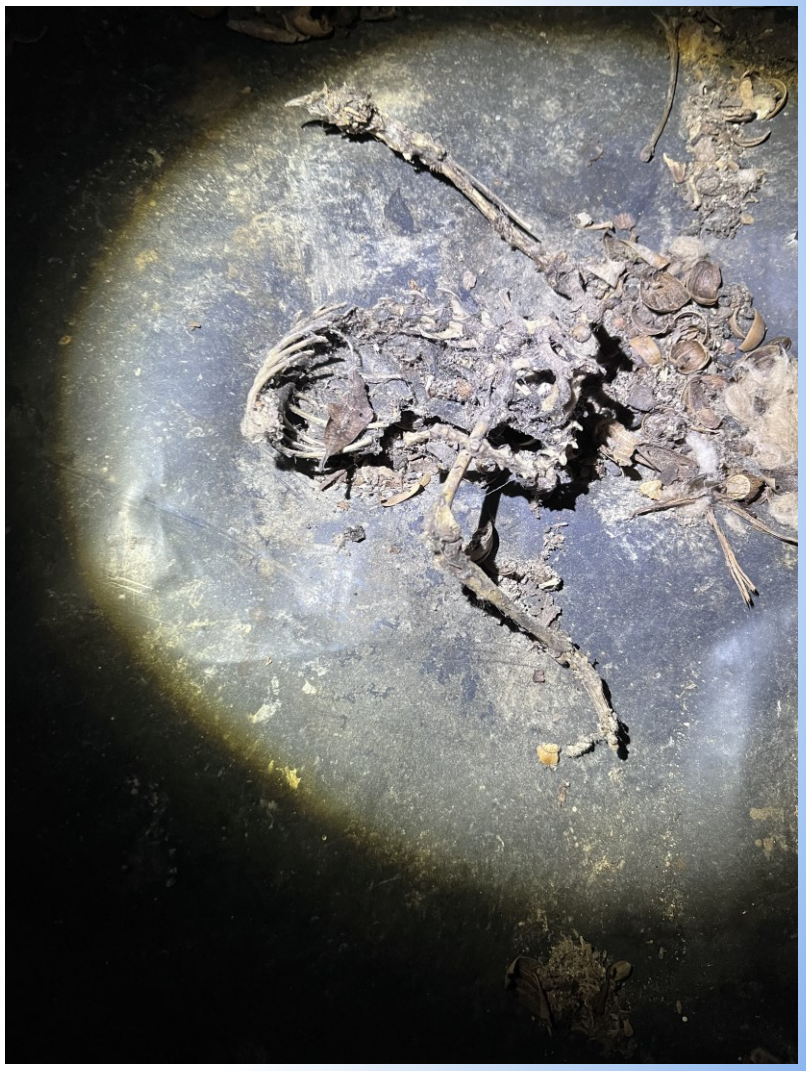
Crawlspace Issues we see in Virginia and beyond

- Vented crawlspaces
- Humidity control
- Porous insulation
- Drainage issues
- Pests
- HVAC components
- “Cat Pee” vapor barriers

Vented crawlspaces with porous insulation



Rodents nest in fiberglass batts



Termites travel through open-cell SPF

THIS is what we need!

A “short basement”:

- ✓Clean
- ✓Sealed and Encapsulated
- ✓Humidity-controlled (<50%RH)
- ✓No porous materials
- ✓Insulation over foundations
- ✓No stinky vapor barriers

Basements

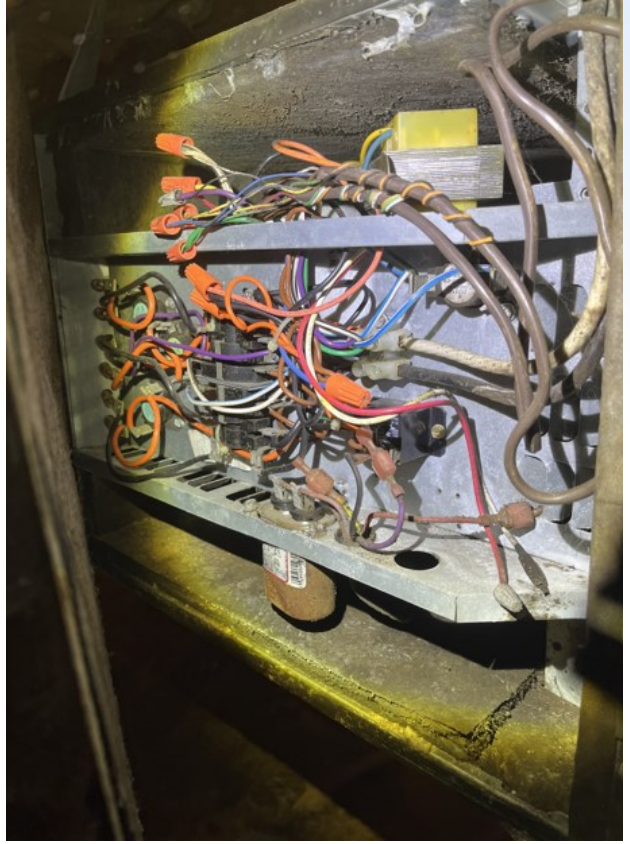
Fiberglass over wet foundations

Basement Carpeting

Cave crickets love moisture

A coat of paint is not water-proofing...

HVAC Components & Ventilation

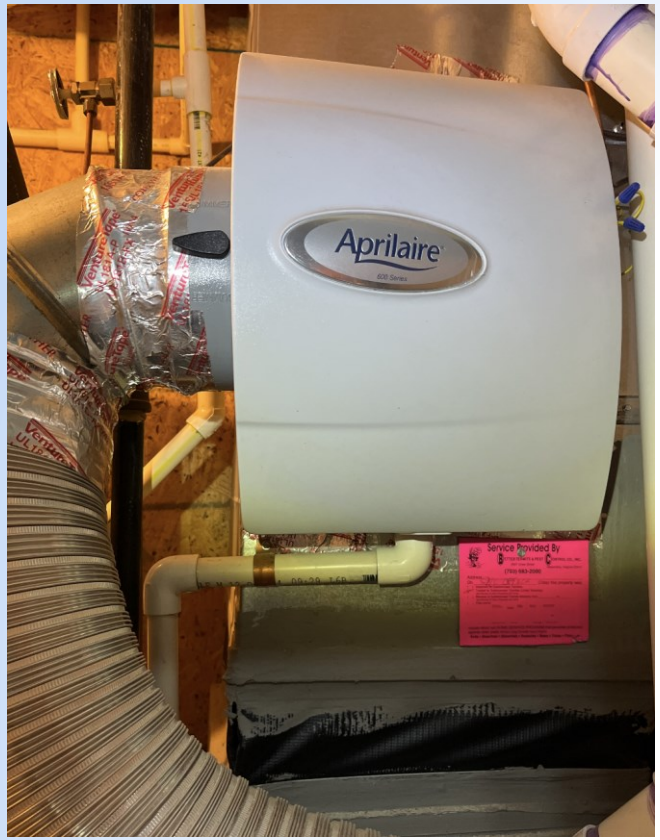


Location, location, location...

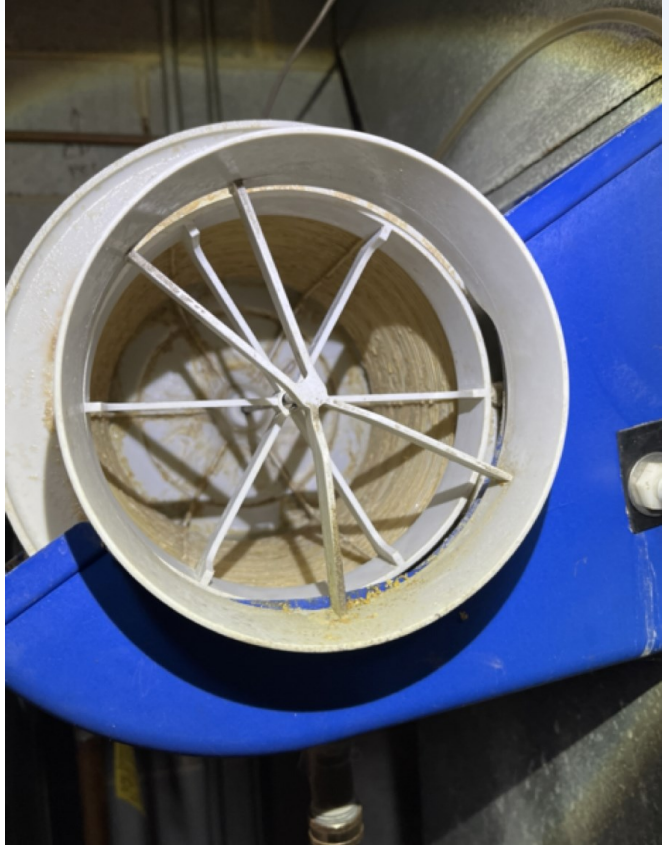


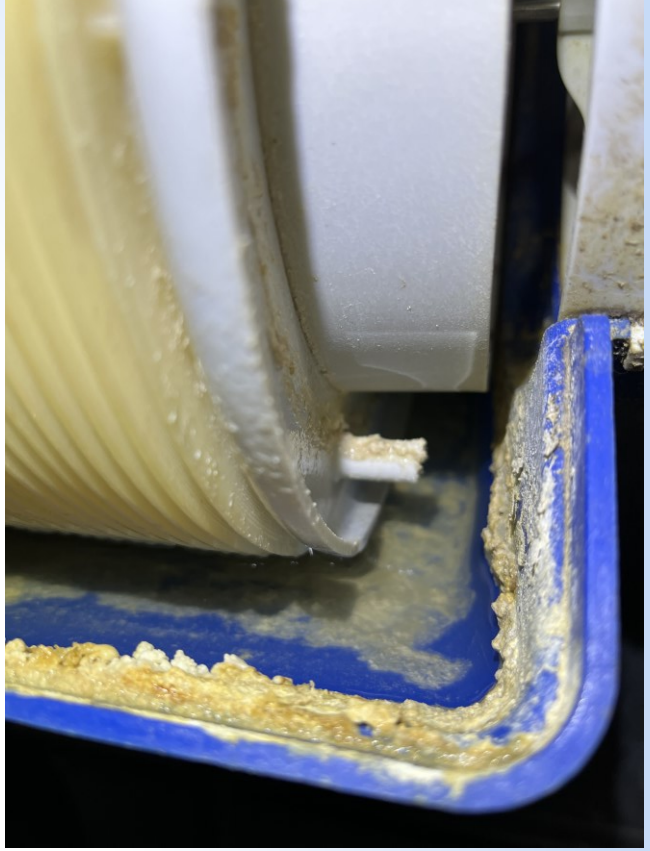

Interior porous liners

Humidifier discharge into porous liners



Maintenance required...





Reservoir type humidifiers

=

Microbial hazard!

Air Cleaning Technologies: Removal vs Additive

✓High MERV/carbon filtration

UV, Photo-catalytic oxidation (PCO) = Uncontrolled chemistry

Risks of germicidal UV:

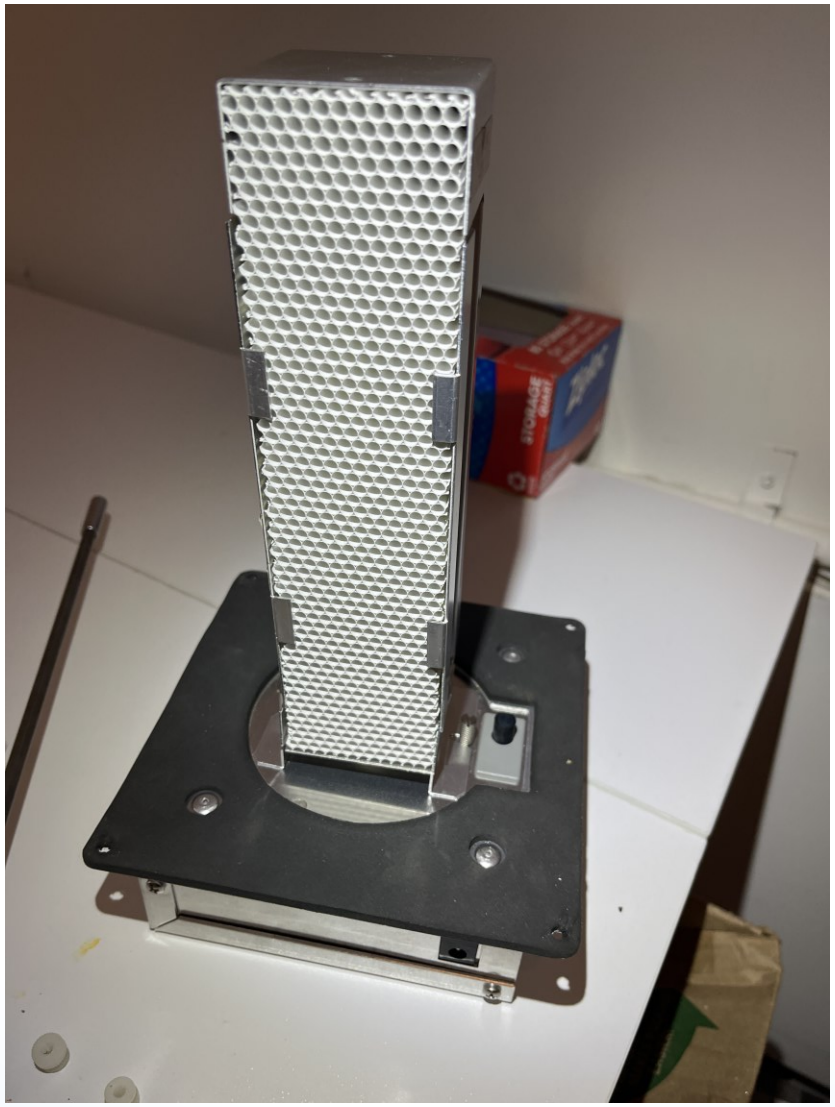
Formaldehyde, Oxygenated VOCs, Ozone, Hydroxyl radicals.

SOA (secondary organic aerosols)

Limited efficacy, insufficient dwell time. Does NOT remove contaminants.

https://www.epa.gov/sites/default/files/2018-07/documents/guide_to_air_cleaners_in_the_home_2nd_edition.pdf

UV/PCO on supply side: Ozone odor possible



UV/PCO damage to HVAC components

Ventilation and building pressurization

Exhaust-only ventilation

- Crawlspace exhaust systems
- Grow tent exhaust ventilation
- Dryer venting
- Risk of back-drafting from combustion appliances

- No outside air supply. Reliance of infiltration.

Combustion appliances

- Gas ovens release CO. Sometimes A LOT
- Many stove exhausts not vented to the outside (“forehead greasers”)
- Even if so: People do not use stove exhausts enough

- Indoor cooking has huge impact on IAQ. Particulate, moisture, VOCs. Venting is vital.

Just add water…

Contents & Uncontrolled Humidity


95.0 %RH
88.3 °F
AMBIENT
HOLD
WB DP
MIN MAX
SAVE
RECALL
FLUKE 971
TEMPERATURE HUMIDITY METER


Baxter
Dixie ULTRA
Dixie ULTRA

Dryer venting: NOT into the house!

- Moisture, Mold, and Fire Hazard

Dryer lint
&
heating oil

Dryer and bath exhaust venting

Siding, windows and gutters - oh my…

Bathrooms: The Usual Suspects

Design Matters!

- No vented crawlspaces. “Short basements” only
- No porous liners in HVAC systems
- No in-duct UV
- No porous insulation below grade

✓HVAC systems inside the conditioned space

✓Good exterior water management & air sealing

✓Outside air supply, filtration and dehumidification capacity

✓Electric/induction stoves and ovens

✓Unvented/heat-pump dryers

✓Low VOC materials

Thank you!

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