



**SWCPEH**

Southwest Center for Pediatric Environmental Health

# Seminar 5: Improving the IEQ in Public School Classrooms

## Schools as Pediatric Environments

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# Disclaimer

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# Program Learning Objectives

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- Document the relationships between healthy school buildings and healthy students by describing the building conditions that result in poor human health outcomes.
- Illustrate the design, operation and maintenance systems and practices used in a school building that provide and promote a healthy indoor environment for the building occupants.
- Present techniques and procedures for monitoring and measuring the indoor environment to quantify the environmental conditions that support healthy outcomes for the building occupants.
- Provide the financial and medical benefits of a healthy school classroom to support the efforts of school designers and school administrators to build healthy school buildings and maintain healthy building systems.

# Learning Objectives, Cont.

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- Explain the results of research projects and actual classroom experiences that substantiate the direct correlation between good IEQ conditions and student performance and health outcomes.
- Show how a school environmental health program can achieve substantial benefits to a school's educational goals and programs.

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# My Agenda

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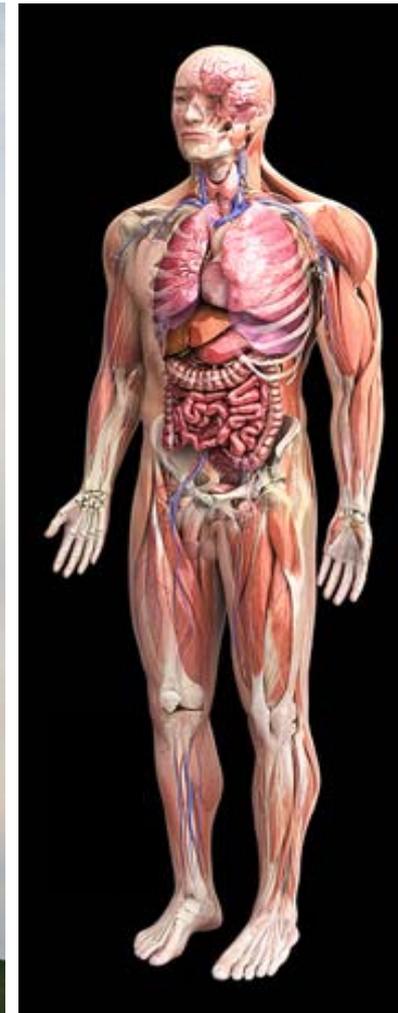
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- The basics
  - Introduction to environmental health
  - Substances in schools that impact health
  - Special susceptible populations
  - Why is this important in schools?
- Case studies
  - Carbon monoxide in a school
  - Mold and the asthmatic
  - Improper air intake location
  - Wrong biocide in HVAC drip pans

# Anatomies: buildings versus humans

- Building envelope
- HVAC system
- Plumbing
- Furnishings / clutter
- Occupants / activities
- Cleaning and maintenance
- Microbial communities
- Health / well being
- Remediation



Courtesy of Richard Corsi, Univ Texas, Austin

# Environmental health and schools

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- Goals: Provide a safe learning environment for our children
- How do children become exposed to toxic substances?
  - Inhalation (most common)
  - Ingestion (from dust on surfaces)
  - Through the skin (direct contact)
- Free resource: SWCPEH, one of many PEHSU's in US. See [www.pehsu.net](http://www.pehsu.net)

# **What substances in schools impact children's health?**

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- Indoor air from outside
- Moisture, mold, bacteria from inadequate ventilation
- Building related materials (lead, glue, asbestos) cleaning agents (waxes, pesticides) and lab related (chemicals, animals, formaldehyde)

# Some examples



Source: Google images

# Pollutant sources?

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- Occupant-generated
  - Hygiene related
- Activity-generated
  - Classroom, labs, cafeteria, other rooms, HVAC
- Infiltration from outdoor air
  - Carbon monoxide from idling school buses
  - Air pollutants from traffic, other sources

# Special susceptibilities

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- Young children with developing immune systems
- Asthmatics and exposure to asthma triggers in schools
- Students/faculty with allergies
  - Cat dander, dusts, odor masking chemicals, fragrances
- Older faculty and staff with declining immune and respiratory systems

# Why is environment important?

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- Where do kids spend most of their active time?
- Direct link between IEQ, student performance, and average daily attendance (impacts performance and revenue)
- Turnover of faculty and staff

# Does this look like a good learning environment?



Clearview Elementary School

From Greening America's Schools, Costs and Benefits, a Capital E Report, 2006

# Case study

## Carbon monoxide in school

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- Headaches reported in students and faculty at about 2:30 pm
- Many students referred to the ER
  - Carboxyhemoglobin in blood elevated indicating exposure to carbon monoxide
- School closed while investigation of source conducted.
  - Loss of funding for average daily attendance

# Case continued

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- Where did carbon monoxide come from?
  - HVAC system? Not likely at specific time
  - Culprit: Air intakes for school located near traffic circle where busses and parents pick up kids after school
- Short term solution: prohibit idling of buses and vehicles in the traffic circle.
- Long term solution: Move air intake or traffic circle

# CO leak at Atlanta school sickens nearly 50 people

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Nearly 50 students and teachers were hospitalized in Atlanta on Monday after becoming ill due to a **carbon monoxide leak at an elementary school**, officials said.

The 43 students and six teachers from Finch Elementary School were all "conscious and alert" when they were taken to the hospitals, Atlanta Fire Department spokeswoman Marian McDaniel said.

Officials determined a **faulty furnace at the 3-year-old** school to be the source of the leak, McDaniel said. Carbon monoxide levels inside the school were "the highest we've ever seen," she said.

**The school doesn't have carbon monoxide detectors, and none are required by Georgia law, McDaniel said.**

**Date:** 04-Dec-12 <http://planetark.org/wen/67301>

# Case study: Dirty air in a middle school

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- 13 y/o student had headache, eye irritation, congestion, and shortness of breath at school. Occasional throat tightness and rashes.
- Symptoms occurred only at school - not at home, at the mall, on weekends, or on vacations.
- Student sent home for 6 weeks with the school paying for a daily home tutor.

# Dirty air case

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- Other students and teachers had similar complaints; principal missed school for 2 weeks for unknown illness, possibly related to air at school
- Allergy work-up and symptomatic meds for 13 y/o index patient- not helpful

# What happened?

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- HVAC engineering firm discovered fresh air intake shutters on the roof near the air exhaust vents for school
- Patient transferred to a new school and returned to baseline functional status
- Indoor air investigation at school: re-engineering, movement of the air intake

# Have you seen this before?



Source: personal photo of hospital loading dock

# Case: Mold in a school gym

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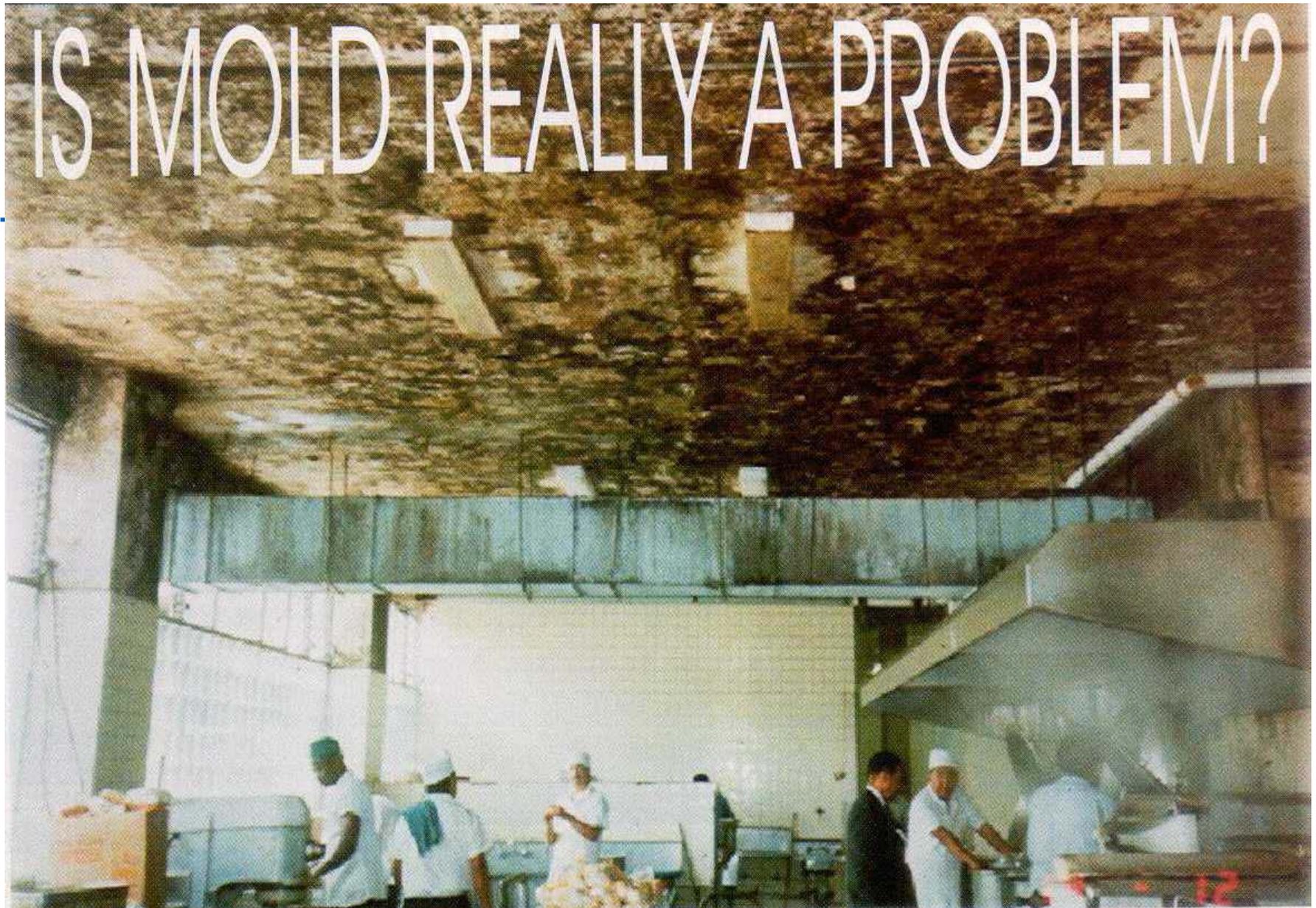
- 6 y/o asthmatic boy with inhalant allergy to molds became symptomatic when exercising in the school gym, despite maximum medical management of asthma
- Environmental investigation revealed “high” levels of mold in the gym
- Source: water seepage through a wall cut into a hill w/o adequate drainage

# School mold

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- Some issues with school on dismissal of student from gym.
- Other students with same problem?
- Short term solution: Dismiss the student from gym but not PE outside the gym
- Long term solution: evacuate soil next to gym wall and install drainage.



IS MOLD REALLY A PROBLEM?

Source: Mold remediation company advertizing

# Case: HVAC issues

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- History
  - Catholic school, 610 students, aged 5-15, 50 teachers
  - In last 2 weeks, 45 students, 15 teachers saw school nurse
- Symptoms
  - Cough, tearing, scratchy throat worse at school
  - Immediately resolves on leaving school

# Environmental history

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- School principal found Aquachem, a chlorine product for pools liberating hypochlorite, had been placed in moldy drip pans of the school's HVAC
- A one-time treatment - residual tablets removed after about 10 days
- Day 14: Principal contacted poison center

# Drip or drain pan

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# Action taken

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- School evacuated
- Environmental investigation 2- days later showed
  - Molds high, other chemicals below regulatory limits, no chlorine
- School opened in two weeks, no further problems

# Questions?

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