Casey Middle School Recommendations

Mike Van Dyke, Ph.D., CIH
Branch Chief
Environmental Epidemiology, Occupational Health, and Toxicology

COLORADO Department of Public Health & Environment
Scope of Recommendations

• Technical recommendations and scientific opinion
• Requested by BVSD Board of Education
• Working in support of Boulder County Public Health
• CDPHE does not have specific regulatory authority for indoor air quality in schools
Env Epidemiology, Occ Health, and Toxicology

Mission

• Monitor, assess and prevent disease, illness and injury related to environmental, occupational, and toxic exposures.
  – Surveillance
  – Toxicologic and Epidemiologic investigations
  – Scientific evaluation of health risks
  – Health education and risk communication
  – Support evidence-based decision-making in collaboration with communities and partners
Data CDPHE Has Reviewed

• 2014 monitoring reports from Quest
• Visual inspection of the building
• Urine thiosulfate results provided by a parent
• Most public documents on BVSD and fixcaseynow.org sites
• Reports from Indoor Air Diagnostics
• Limited teacher health survey
• There are likely many data sources that CDPHE has NOT reviewed
Outline

• Background Information
• Indoor Air Quality Goals
• Recommendations
What is hydrogen sulfide?

- Colorless gas with odor of rotten eggs
- Produced by bacterial breakdown of organic matter
- Produced by processes in the human body
- Can be found in sewer gas
Hydrogen Sulfide Odor Detection

• Highly variable

• 26 studies:
  – Average odor threshold ranged from 0.07 ppb to 1,400 ppb
  – Average from 26 studies was 8 ppb
    • Point where 50% of individuals can detect the odor
Long Term Hydrogen Sulfide Concentrations

• EPA Inhalation Reference Concentration (RfC = 1.4 ppb)
  – An estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure of a chemical to the human population through inhalation (including sensitive subpopulations), that is likely to be without appreciable risk of deleterious effects during a lifetime.
  – Established in 2003
EPA RfC Key Points

• Based on the most sensitive toxic endpoint
  – For H₂S: nasal lesions in rats
• Uncertainty factors applied
  – 300 in the case of H₂S
• Used for human health risk assessment
• When applied, exposure duration taken into account
  – For an 8-hour exposure, 5.9 ppb
Short-Term Hydrogen Sulfide Concentrations

• California EPA Acute (1 hour) Reference Exposure Level (REL=30 ppb)
  – The concentration level at or below which no adverse health effects are anticipated for a 1-hour exposure duration.
  – RELs are designed to protect the most sensitive individuals in the population by the inclusion of margins of safety.
  – Exceeding the REL does not automatically indicate an adverse health impact.
Cal EPA 1-Hour REL Key Points

• Based on the most sensitive toxic endpoint
  – For H₂S: headache, nausea, physiological responses to odor

• Uncertainty factors applied
  – 1 in the case of H₂S (based on controlled human study)

• When applied, exposure duration taken into account
  – Only applied to 1 hour average concentrations
Comparison Numbers for Hydrogen Sulfide

• Odor threshold
  – 8 ppb
• 8-Hour average concentrations (during occupied time)
  – 5.9 ppb
• 1-Hour average concentrations
  – 30 ppb
Measuring Hydrogen Sulfide

• Difficult to measure ppb levels
• Direct reading meter
  – Can give minute-by-minute averages
• Range: 0 to 50 ppb
• Sensitivity: ± 3 ppb
• Industry standard instrument
• Long track record of use
Acceptable Indoor Air Quality

- American Society of Heating Refrigeration and Air conditioning Engineers, inc. (ASHRAE) defines *Acceptable Indoor Air Quality* as air in which there are not known contaminants at harmful concentrations and with which a substantial majority (80% or more) of the people exposed do not express dissatisfaction.

- ASHRAE defines the necessary amount of “fresh” air that should be delivered to an occupied space such as a classroom to maintain acceptable indoor air quality.
CDPHE Recommendations
Casey Indoor Air Quality Goals

• No “unusual” sources of hydrogen sulfide (or other harmful chemical contaminants)
• Sufficient “fresh” air delivered to occupied classrooms and other spaces
• Hydrogen sulfide concentrations at “normal” indoor levels
  – As close to outdoor air levels as possible
• Progress monitored with objective measurements and staff surveys
Survey ALL staff using a questionnaire addressing health symptoms possibly related to hydrogen sulfide exposure AND other indoor exposures

All individual survey responses will remain confidential

Four time points: April, Late-May, October, and January

Use the data to:
- Classify types of symptoms
- Identify potential causative exposures
- Determine timing and location of air quality issues
- Monitor changes over time

Survey and analysis performed by CDPHE
CDPHE Recommendations
Hydrogen Sulfide Air Monitoring

• Start with outdoor monitoring to determine target concentrations
• Indoor monitoring in five locations and five different time periods (different seasons)
  – Include areas with concerns and those without in addition to outdoor locations
  – Monitor for 5 consecutive 24 hour periods at each time period
  – Use a direct reading instrument to maximize the usefulness of the data
• Revise the monitoring plan based on survey results and review of each set of air monitoring data
• CDPHE will review the monitoring data
CDPHE Recommendations

Fresh Air Ventilation Rate Monitoring

• Measure the volume of fresh air delivered to occupied spaces
• Measured at the same frequency as hydrogen sulfide
• Measured using state-of-the-art methods
• Revise the monitoring plan based on survey results and review of each set of air monitoring data
• CDPHE will review the monitoring data
Thank You