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Children's Exposure to Diesel Engine Exhaust: Important Facts For Consideration

How Bad is Diesel Exhaust?

- Diesel exhaust is a sooty cocktail containing 40 different chemicals classified as “Toxic Air Contaminants” by the State of California¹ and “hazardous air pollutants” by the US EPA under the Clean Air Act.²
- The state of California identified diesel engine exhaust as a known carcinogen in 1990³ and the US EPA designates diesel exhaust a likely human carcinogen.⁴
- Diesel exhaust has been associated with premature mortality, increased risk of lung cancer among truck drivers, immunological reactions including inflammation of the airways, airway constriction, asthma, chronic bronchitis, reductions in pulmonary function, chronic cough, phlegm, chest tightness, wheezing and

¹ California Air Resources Board (CARB, 1999) Toxic Air Contaminant List , December 1999, <http://www.arb.ca.gov/toxics/catable.htm>

² Wargo, J. (2002), “Children’s Exposure to Diesel Exhaust on School Buses,” p.10.

³ State of California Office of Environmental Health Hazard Assessment Safe Drinking Water and Toxic Enforcement Act of 1986, “Chemicals Known to the State to Cause Cancer or Reproductive Toxicity,” February 3, 2006, p. 6. http://www.oehha.ca.gov/prop65/prop65_list/files/P65single20306.pdf

⁴<http://www.epa.gov/cleanschoolbus/>

increased susceptibility to infections.⁵

- Diesel exhaust has been demonstrated in more than 30 human epidemiological studies to increase cancer risk.⁶
- California's South Air Coast Air Quality Management District recently estimated that 90% of the cancer risk from air pollutants in the area and 70% state-wide is associated with diesel emissions. Two national associations of air pollution regulators have estimated, based on lifetime risk, that diesel exhaust is responsible for 125,000 excess cancer cases in the United States each year.⁷

Who is at Risk?

- People with existing heart or lung disease, asthma or other respiratory problems are most sensitive to the health effects of fine particles from diesel exhaust.
- Due to a child's developing body and lungs, narrower airways, faster metabolism, and faster breathing rate than adults, children riding our buses are the most susceptible population to the hazards of diesel exhaust.⁸

Are California School Children Exposed?

- In California roughly one million children ride to school every day on diesel powered buses. Students spend an hour and a half each weekday in a school bus, which means that the average child riding the bus to and from school can be exposed to 270 hours of elevated levels of diesel exhaust per year.⁹
- Studies by the California Air Resources Board and others have established that

⁵ Wargo 2002, p. 23.

⁶ California Air Resources Review Board, Findings of the Scientific Review Panel on "The Report on Diesel Exhaust" as adopted at the Panel's April 22, 1998, Meeting, p.4. <http://www.arb.ca.gov/toxics/dieseltac/de-fnds.pdf>

⁷ State and Territorial Air Pollution Program Administrators and the Association of local Air Pollution Control Officials, "Cancer Risk from Diesel Particulate: National and Metropolitan Area Estimates for the United States," March 15, 2000, p. 2. <http://www.4cleanair.org/comments/Cancerriskreport.PDF>

⁸ US EPA Clean School Bus USA Program, <http://www.epa.gov/cleanschoolbus/humanhealth.htm>

⁹ US EPA Clean School Bus USA Program, <http://www.epa.gov/cleanschoolbus/> and US Department of Education, http://nces.ed.gov/surveys/pss/tables/table_15.asp

much of a bus' own diesel exhaust enters the cabin from cracks in the exhaust train and through windows and doors. This phenomenon, called "self-pollution," is responsible for a significant portion of the diesel exhaust kids breathe inside the bus cabin.^{10,11}

- In California, the average school bus is 11 years old and emits nearly two times more pollution per mile than a big rig truck.¹² In 2002, California had more dirty diesel school buses than any other state in the country.¹³
- Since 2003, both the Los Angeles and San Francisco Unified School Districts have taken initiative to modernize their school bus fleets. While modernizing school bus fleets with newer diesel buses is an improvement, it does not eliminate the problem.¹⁴ Roughly 50% of the state's school buses are more than 10 years old and only 11% are currently outfitted with particulate traps.¹⁵ California school children continue to be exposed to diesel exhaust and many smaller school districts throughout the state have yet to act.

How much diesel exhaust are kids breathing?

- A recent study recently found that children riding on diesel fueled school buses in the Los Angeles area inhale roughly one million times more school bus exhaust (by mass) than non-riders in the general population.¹⁶

Closing the bus' windows simply makes the situation worse. One study

¹⁰California Air Resources Board (CARB, 2003) Final Report "Characterizing the Range of Children's Pollutant Exposure During School Bus Commutes," p. 166.

http://www.eere.energy.gov/afdc/apps/toolkit/pdfs/carb_bus_emission.pdf

¹¹ Marshall, J., Behrentz, E. (2005) "Vehicle Self-Pollution Intake Fraction: Children's Exposure to School Bus Emissions," *Environmental Science & Technology* 39 (8): 2559.

¹² Union of Concerned Scientists (UCS, 2006), School Bus Report Card p 37.

http://www.ucsusa.org/clean_vehicles/big_rig_cleanup/clean-school-bus-pollution.html

¹³ Union of Concerned Scientists, (UCS, 2002) Pollution Report Card: Grading America's School Bus Fleets, p. 17

http://www.ucsusa.org/clean_vehicles/big_rig_cleanup/pollution-report-card.html

¹⁴ MEMO, April 25, 2006, (Tom Plenys, LAUSD to Tim Carmichael, Coalition for Clean Air) Re: LAUSD Contracted Bus Fleet.

¹⁵ UCS 2006, p. 37.

¹⁶ Marshall, J., Behrentz, E., 2005, p.2559.

conducted by the California Air Resources Board found that concentrations of diesel vehicle-related pollutants are significantly higher on board diesel school buses when the windows are closed due to the intrusion of the bus' own exhaust.¹⁷

What effect does diesel exhaust have on children?

- Diesel exhaust contains significant levels of small particles, known as fine particulate matter (PM 2.5). Fine particles are so small that several thousand of them could fit on the period at the end of this sentence. Fine particles pose a significant health risk because they can pass through the nose and throat and lodge themselves in the lungs. These fine particles can cause lung damage and premature death. They can also aggravate conditions such as asthma and bronchitis.¹⁸
- Nearly 94% of diesel particles are less than 2.5 micrometers. These smaller particles are able to penetrate children's narrower airways reaching deeply into the lung, where they are more likely to be retained. Pound for pound children breathe nearly 50% more air than is inhaled by adults.¹⁹
- Children on school buses are exposed at times to levels of fine particulate matter (PM 2.5) that are five to fifteen times higher than background levels.²⁰
- Under federal law, the emissions children are exposed to by riding in schools buses, translate into *significant* risk of cancer to children. In fact, these exposures pose as much as 23 to 46 times the cancer risk level considered significant under federal law.²¹

¹⁷ CARB, 2003, p. 166. http://www.eere.energy.gov/afdc/apps/toolkit/pdfs/carb_bus_emission.pdf

¹⁸ US EPA Clean School Bus USA Program, <http://www.epa.gov/cleanschoolbus/humanhealth.htm>

¹⁹ Wargo, 2002, p.10.

²⁰ Wargo, 2002, p.10.

²¹ Natural Resources Defense Council and the Coalition for Clean Air (2001) "No Breathing in the Aisles: Diesel Exhaust Inside School Buses," p.1 <http://www.nrdc.org/air/transportation/schoolbus/schoolbus.pdf>

- While children make up 25% of the population, they represent about 40% of the asthma cases. Research indicates that diesel exhaust may increase the frequency and severity of asthma attacks and may lead to inflammation of the airways that can cause or worsen asthma.²²

Cleaner Technologies Exist and Need to be Implemented

- Federal, state and local governments have set aside funds earmarked exclusively to help public and private school fleet operators cover the incremental costs of purchasing cleaner alternatives. These funding sources are still relatively limited, however, and parents, educators, and school administrators across the country need to pressure their elected officials to make replacement of old, dirty diesel school buses a top budgetary priority.

Additional References

Several agencies, universities and environmental health groups have looked at this problem and have found diesel emissions pose a health threat to children riding school buses.

Union of Concerned Scientists:

http://www.ucsusa.org/clean_vehicles/big_rig_cleanup/pollution-report-card.html

http://www.ucsusa.org/clean_vehicles/big_rig_cleanup/clean-school-bus-pollution.html

National Resource Defense Council:

<http://www.nrdc.org/air/transportation/schoolbus/sbusinx.asp>

California Air Resources Board:

<http://cleanenergy.org/pdf/CARB%20Report.pdf>

²² Natural Resources Defense Council and Coalition for Clean Air, 2001, p. 16.

Environment and Human Health, Inc.:

<http://www.ehhi.org/diesel/>

Clean Air Task Force:

<http://www.catf.us/publications/view/82>