Coal Dust from Coal Trains Increases Mortality

Presentation for Contra Costa Hazardous Materials Commission

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Outline of Presentation

• Health Emergency - Rapid rise in coal exports through Richmond and coal trains spewing toxic dust in Contra Costa County

• Coal dust blows from coal trains

• Health hazards of coal dust

• Mitigation procedures do not work
## Port of Richmond Exports of Coal & Petcoke

<table>
<thead>
<tr>
<th>Year</th>
<th>Coal Metric Tons (000)</th>
<th>Petcoke Metric Tons (000)</th>
<th>Total Metric Tons (000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>176</td>
<td>322</td>
<td>498</td>
</tr>
<tr>
<td>2014</td>
<td>540</td>
<td>335</td>
<td>875</td>
</tr>
<tr>
<td>2015</td>
<td>453</td>
<td>580</td>
<td>1033</td>
</tr>
<tr>
<td>2016</td>
<td>130</td>
<td>906</td>
<td>1036</td>
</tr>
<tr>
<td>2017</td>
<td>1076</td>
<td>640</td>
<td>1716</td>
</tr>
</tbody>
</table>

Source: US Census International Trade
Video of train spewing coal dust
Levin Richmond Terminal
Coal/Pet coke Piles
Train Loaded with Coal approaches Levin-Richmond Terminal, Richmond, CA 7/23/2015

Accessed April 16, 2018
What is PM$_{2.5}$?

- **PM$_{2.5}$**: Combustion particles, organic compounds, metals, etc. less than 2.5 microns in diameter.
- **PM$_{10}$**: Dust, pollen, mold, etc. less than 10 microns in diameter.
- **Human Hair**: 50-70 microns in diameter.
- **Fine Beach Sand**: 90 microns in diameter.

**Image courtesy of the U.S. EPA**

**Groups sensitive to PM$_{2.5}$**
- **Respiratory system**: The soluble part of PM$_{2.5}$ directly enters the bloodstream and the insoluble part accumulates at the alveoli of the lungs, causing inflammation.
- **Cardiovascular system**: PM$_{2.5}$ causes cardiotoxicity and also causes severe irritation to the autonomic nervous system, which regulates the activity of the heart muscle.
- **Blood system**: PM$_{2.5}$ cause blood toxicity, blood coagulation abnormalities and can trigger heart disease.
- **Reproductive system**: PM$_{2.5}$ are attached to various types of pollutants such as heavy metal and PAHs, causing placental blood toxicity that leads to direct harm to fetuses, intrauterine growth retardation and low birth weight of babies, especially when PM$_{2.5}$ exposure happens in the first month of pregnancy.

**People with heart or respiratory diseases, the elderly, pregnant women and children.**
Where Particulate Matter deposits

Upper respiratory tract
- Nasopharynx
- Oropharynx
- Larynx

Lower respiratory tract
- Trachea
- Bronchi/bronchioles
- Alveoli

PM (Particulate Matter)
- Coarse PM (PM 2.5-10 μm)
- Fine PM (PM 2.5 μm)
- Ultrafine PM (PM <0.1 μm)
Life expectancy versus PM2.5 in the Harvard Six City Study

Source: Schwartz J. 2011. Life Expectancy adjusted for age, sex, cigarette smoking. Occupation, education. obesity, and chronic disease
Summary estimates (95% confidence intervals) for all-cause and cause-specific mortality

Morbidity from Elevated PM2.5

- Diabetes Type 2
- Low Birth Weight
- Alzheimer’s Disease
- Asthma and COPD
  - Exacerbations – ER visits & Hospitalizations
  - New-onset
- Lung Cancer
- Respiratory infections (pneumonia)
- Stroke
- Congestive heart failure

Highest Risk
- Elderly
- Babies & Children
- Pregnant women
- Poor
- Stressed
- Other illnesses
Health hazards of coal dust

- Communities near coal terminals have demonstrated worse health problems
  - Virginia community near large coal terminal rates of asthma 2X city and state average
  - England community near coal exporting handling <2MMTPA high levels of asthma
Waterways and Coal Rail lines

- Wildcat Creek
- San Pablo Creek
- Garrity Creek
- Pinole Creek
- Refugio Creek
Derailment

• Between July 2012 -2013, at least 40 coal trains in the US derailed, causing four victims to lose their lives, large amounts of coal to spill, major delay to other rail users and significant repair costs
• How coal dust destabilizes train tracks by filling in spaces between ballast

Clean Ballast  Partially Fouled Ballast  Heavily Fouled Ballast

Source: Z Chafe 2016
Derailment from Fouled Ballast

Figure 18: Pictures posted on BNSF website showing effect of coal dust on train ballast. Note that the coal dust is not always visible at the surface of the ballast, as it accumulates between the aggregate (rocks).

Source: Z Chafe 2016
Current dust mitigation procedures not effective

- No covers for coal cars commercially available
  - Coal dust EXPLOSIVE (ignites at 260-265 degrees F)

- Surfactants sprayed on open coal cars do not completely mitigate coal dust
  - Surfactants degrade over time and distance from mines
  - are not currently required
  - BNSF acknowledges that even if application is required, “there can be significant variation in the quality and consistency of the physical application of topical treatments at the mines”
  - Surfactants may have potential health threats and safety
Richmond Community Action

• 2015 – Resolution by Richmond City Council opposing the transport of Coal and Petcoke along California waterways and through Richmond and other densely populated area

• 2017 – No Coal in Richmond coalition:
  • Sierra Club, Communities for a Better Environment, Sunflower Alliance, 350.org, Asian-Pacific Environmental Network

JOIN US at our community meetings every second Wednesday of the month @ 7pm located at 2540 Macdonald Ave, Richmond, CA 94801
Chronic cough
Coal dust in yard and on doors and houses

Parchester Village and Marina Bay residents
How can the Commission decrease air (and water) pollution from coal dust from open coal cars and storing coal and pet coke in open piles at the Terminal?
Summary estimates (95% confidence intervals) for all-cause and cause-specific mortality.


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Odds Ratio for Cardiovascular Disease and Respiratory Mortality

For every 10 microg/m³ Increase in Long Term PM<2.5 Exposure

PM$_{2.5}$ Exposure Type:  
All mortality cases long-term PM$_{2.5}$ 1.6 (1.5–1.8)  
All mortality cases local PM$_{2.5}$ 1.4 (1.3–1.5)  
Urban areas 1.7 (1.5–1.9)  
Rural areas 1.3 (1.1–1.6)  
High education 1.4 (1.2–1.6)  
Low education 1.9 (1.60–2.1)

Source: Kloog et al. 2013
Coal dust harmful to fish and wildlife

- Coal trains move along the Sacramento River, Sacramento – San Joaquin Delta, Richmond Riviera, and Santa Fe Channel