

Chronic Air Pollution Exposure and Adverse Effects on the Brain: A Review



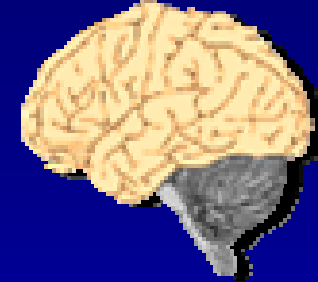
December 6, 2007

Air Resources Board



California Environmental Protection Agency

Background



- Air pollution exposure associated with premature death, hospitalizations, and other adverse health effects
- Knowledge of air pollution effects on brain is limited
- Focus of this health update is a review of findings* on the effects of air pollution exposure on the brain

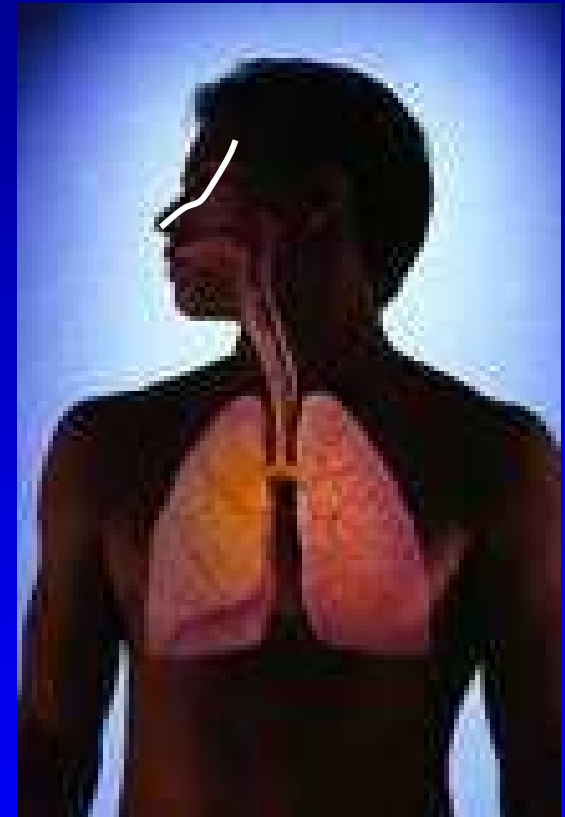
*Calderón-Garcidueñas L, Franco-Lira M, Torres-Jardón R *et al.* 2007. *Toxicologic Pathology* 35(1):154-62.



Funded by US Environmental Protection Agency, National Science Foundation, Montana Board of Research and Commercialization Technology, National Center for Research Resources (National Institutes of Health)

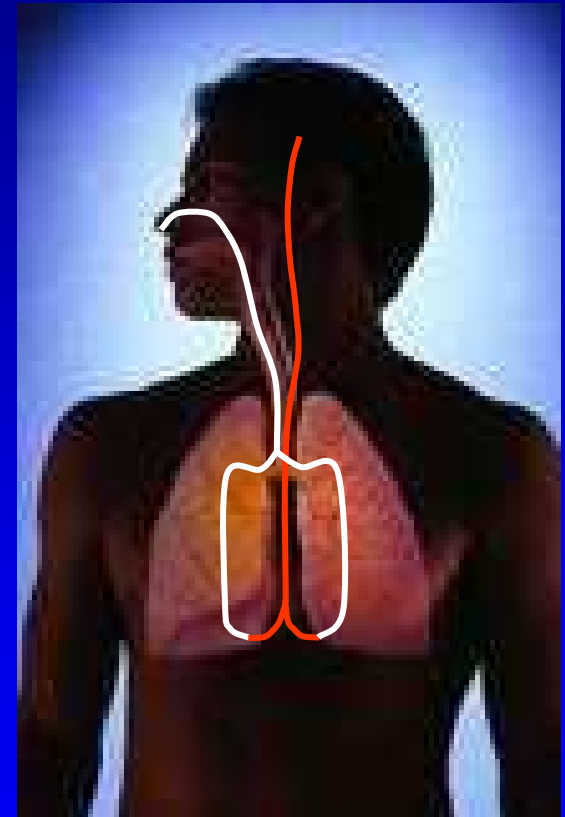
Air Pollutants' Potential Routes to the Brain

- May physically enter brain (ultrafine PM)
 - Transported along nerves in the nasal passages to brain
 - Carried from lungs to brain via bloodstream
- May affect brain indirectly (PM_{2.5} and ozone)
 - Inflammatory factors released in lungs, travel to the brain



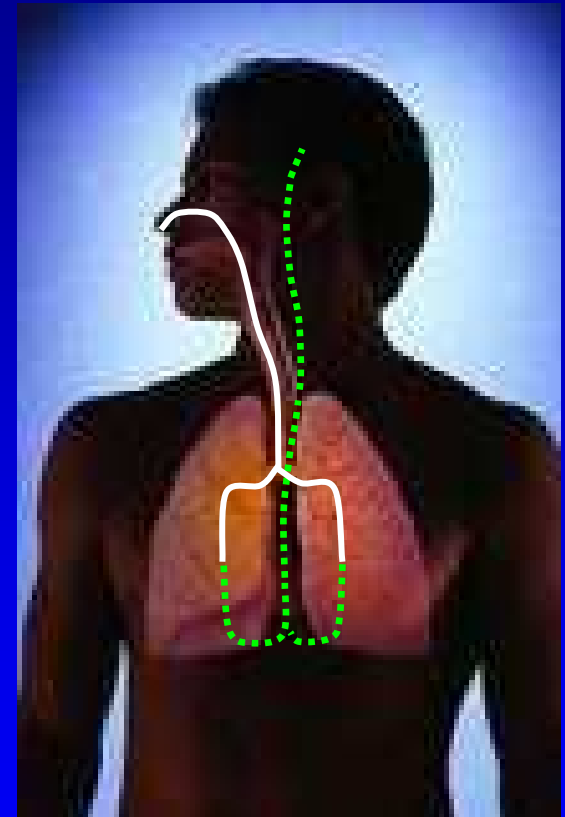
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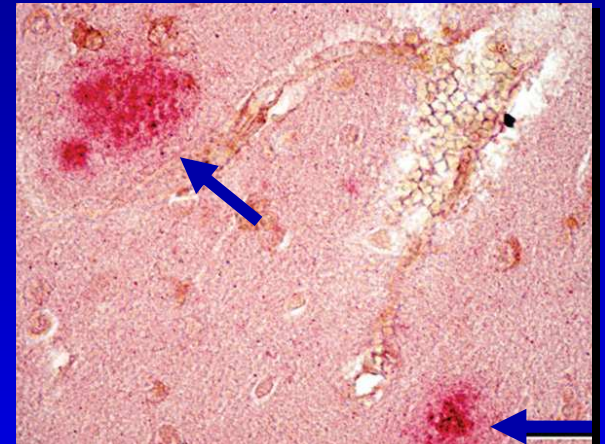
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Chronic Air Pollution Exposure Associated with Brain Inflammation and Damage

- Brains of accidental death victims (adults and children) and healthy dogs compared between high- vs. low- pollution cities
 - Higher levels of inflammatory markers
 - Abnormal protein deposits
 - These changes may precede brain abnormalities seen in Alzheimer's disease
- In mice, exposure to concentrated ambient particles may increase likelihood of developing brain inflammation*



*Campbell A, Oldham M, Becaria A, Bondy SC, Meacher D, Sioutas C, Misra C, Mendez LB, Kleinman M. 2005. *Neurotoxicology* 26(1): 133-40.



Funded by CA Air Resources Board, National Institutes of Health, Southern California Particle Center and Supersite (US EPA)

Conclusions and Implications

- Evidence for possible link between air pollution exposure and adverse effects on the brain
- Health impacts of air pollution exposure may be more far-reaching than previously thought
 - Additional research necessary
 - PM2.5 levels decreasing in California

