Proposed Identification of Environmental Tobacco Smoke as a Toxic Air Contaminant

Public Workshop

Cal/EPA Headquarters Building
Sierra Hearing Room
Sacramento, California

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Workshop Overview

- Introductions
- Presentations
  - ARB: Part A (exposure assessment)
  - OEHHA: Part B (health evaluation)
- Open Discussion
- Next Steps

ETS Chronology

1992: ARB/OEHHA initiates a health risk assessment on ETS

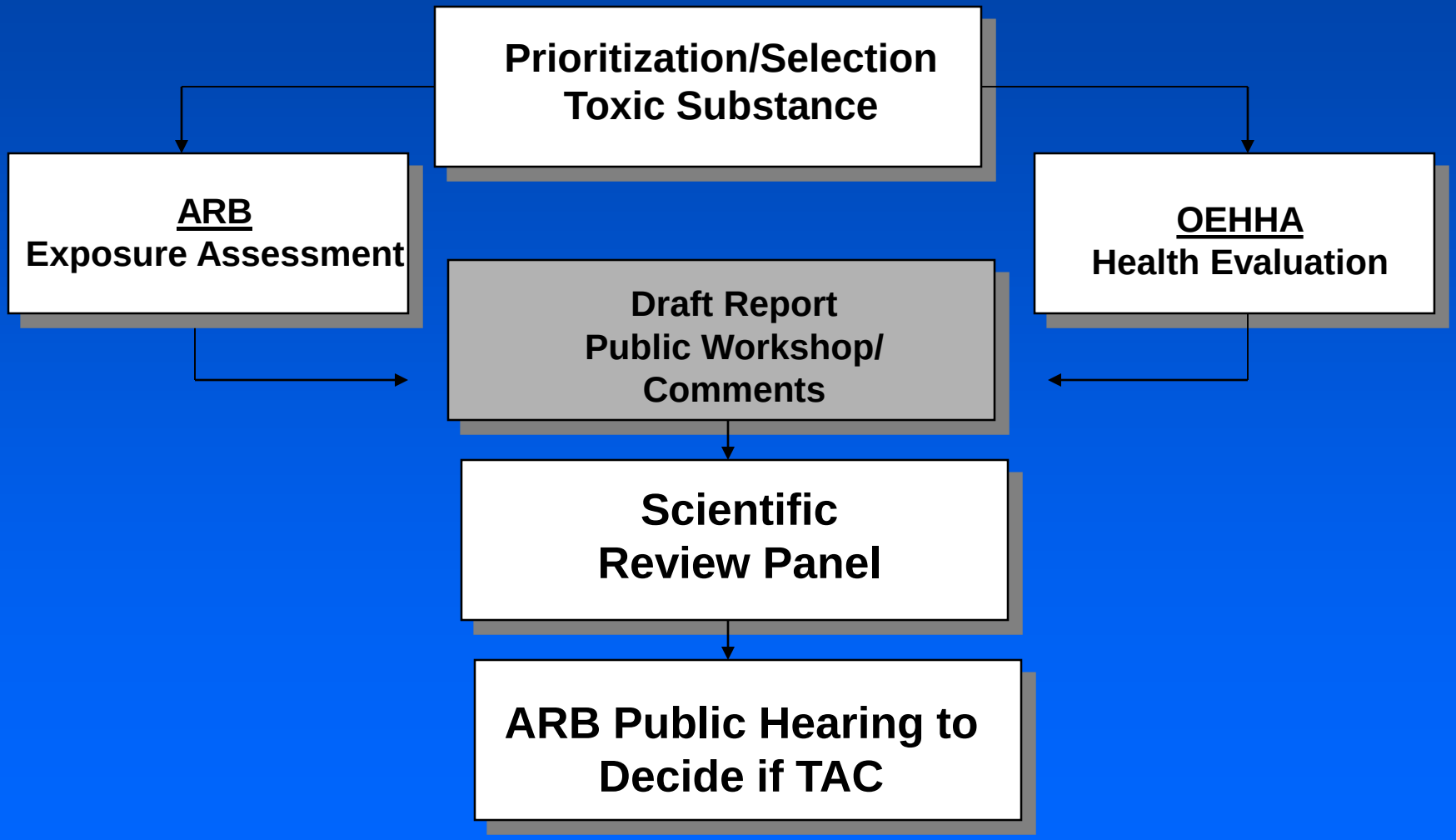
1997: SRP approved OEHHA Report on Health Effects from ETS

1999: NCI adopted OEHHA ETS Report for their Smoking and Tobacco Control Monograph series

2001: ARB entered ETS into AB 1807 identification process

2003: ARB released draft ETS ID report

TAC Identification Process



Definition of an Toxic Air Contaminant

"...an air pollutant which may cause or contribute to an increase in mortality or in serious illness, or which may pose a present or potential hazard to human health."

HSC Section 39660 et. seq.

Health & Safety Code Requirements

TAC Identification

- ARB to evaluate Californian's exposure to potential toxic air contaminants
- OEHHA to evaluate the potential health effects using the best available scientific data
- ARB to assess disproportionate exposure among infants and children *(Senate Bill 25)*
- OEHHA to assess special susceptibility among infants and children *(Senate Bill 25)*

Part A - Exposure Assessment

- Chemical & Physical Properties
- Sources & Emissions
  - prevalence
  - emissions inventory
- Exposure
  - ambient monitoring
  - indoor studies
  - total exposure (scenario-based approach)
  - biomarkers
- Atmospheric Persistence
- Conclusions

ETS Chemical & Physical Properties

- Complex mixture of thousands of gases and fine particles
- Many substances in ETS have known adverse health effects including:

  1,3-butadiene, acetaldehyde, arsenic, benzene, benzo[a]pyrene, cadmium, chromium, formaldehyde, and nicotine, carbon monoxide, RSP

ETS Source

Smoking Prevalence

- California Tobacco Survey (CTS) indicates that smoking prevalence among adults has decreased since 1990
- 2002 CTS adult smoking prevalence in California was about 16%, 2002 nationwide prevalence for adults was about 23%
- 2001 California Students Tobacco Survey measured adolescent smoking prevalence at about 16%

2002 Statewide ETS Emissions

Nicotine: 40 tons per year

RSP: 365 tons per year

CO: 1,907 tons per year

- Emissions = ER (μg/product) x N (# products sold in CA)
  - ER = emission rates; scientific literature
  - N = tobacco product distribution data from BOE
  - CTS data

ETS Exposure Assessment

- Based on measured outdoor and indoor ETS concentrations
- Presents range of individual exposures
  - varying exposure patterns among children and adults

ETS Exposure Prevalence

- Based on studies of daily exposure from late 1980s to early 1990s:

  38% of children (0-11 years)

  64% of adolescents (12-17 years)

  56% of adults (over age 18)

  may be exposed to ETS.

ARB Monitoring Study

- ***Objective*** To collect current ETS levels in ambient air using nicotine as a surrogate for ETS exposures

- ***Study Design***
  - 5 outdoor smoking areas (airport, amuse. park, office bldgs, college)
  - Background samples were taken in each study location
  - 2-> 8 Hr. samples (EQL=0.0036 $\mu g/m^3$)
  - 6-> 1 Hr. samples (EQL=0.029 $\mu g/m^3$)
  - BGI PQ-100 @ 15 LPM; XAD-4 resin
- ***Study Results***
  - 8-hour samples ranged from 0.013 to 3.1 $\mu g/m^3$
    - Avg. background $\longrightarrow$ 0.009 - 0.021 $\mu g/m^3$
  - 1-hour samples ranged from 0.016 to 4.6 $\mu g/m^3$
    - Avg. background $\longrightarrow$ <EQL - 0.17 $\mu g/m^3$

ETS Indoor Studies
Summary

Environment	Nicotine Concentration ($\mu g/m^3$)	RSP Concentration ($\mu g/m^3$)
Homes	0.5 – low 3.0 – medium 6.0 - high	300 – 5,500
Offices/Public Buildings With smoking Smoking prohibited	 2 – 8 <1	 57 – 348 <15
Vehicles With ventilation	 NA NA	 ~100 ~1,200
Public Establishments Betting Establishments Bingo Parlours	9.8 76.0	

ETS Exposure
Scenario-based Approach

Total Exposure = $\Sigma_i C_i$ x (T_i)

C_i concentration in environment i T_i Time spent in environment i

- Useful to show range of public exposures
- Based on scenario-based activity patterns and indoor/outdoor ETS concentration data to estimate exposure under different situations
- Average daily non-smoker exposures range:

Level	Scenario	Concentration, ($\mu g/m^3$)
Low	non-smoking home; brief encounters w/smokers	< 1 $\mu g/m^3$ to higher
High	indoor smoking home; w/ other ETS exposures throughout the day	about 3 $\mu g/m^3$

ETS Atmospheric Persistence

- Gaseous Component Reactions
  - *pyrolisis*
  - *pyrosynthesis*
  - *distillation*
  - *nicotine half life = 1 day*
- Particulate Component Reactions
  - *wet/dry deposition*
  - *relatively stable*
  - *persist for 5 hours*

ETS Biological Markers

- Cotinine (nicotine metabolite)
  - Strong correlations with inhaled nicotine concentrations as well as cigarette smoke exposure by questionnaire
  - Distinguishes ETS-exposed from unexposed non-smokers
  - Sensitive assays available
  - Wealth of population data available
- Hair nicotine levels emerging as longer term biomarker
- DNA and protein adducts less useful in quantifying exposure

Conclusions

- ETS is a complex mixture of several thousand gases and particles, many with known adverse health effects
- Tobacco smoke contributes 40, 365, and 1,907 tons per year of nicotine, fine particles and carbon monoxide, respectively
- Indoor ETS concentrations present significant exposures ranging from 0.5 µg/m^3 to 76 µg/m^3
- Exposure scenarios for daily activity can range in average ETS concentrations from less than 1 µg/m^3 to 3 µg/m^3
- While most of the nonsmoking public's exposure to ETS is low, in certain cases, outdoor exposures can be significant ranging up to 4.6 µg/m^3 nicotine