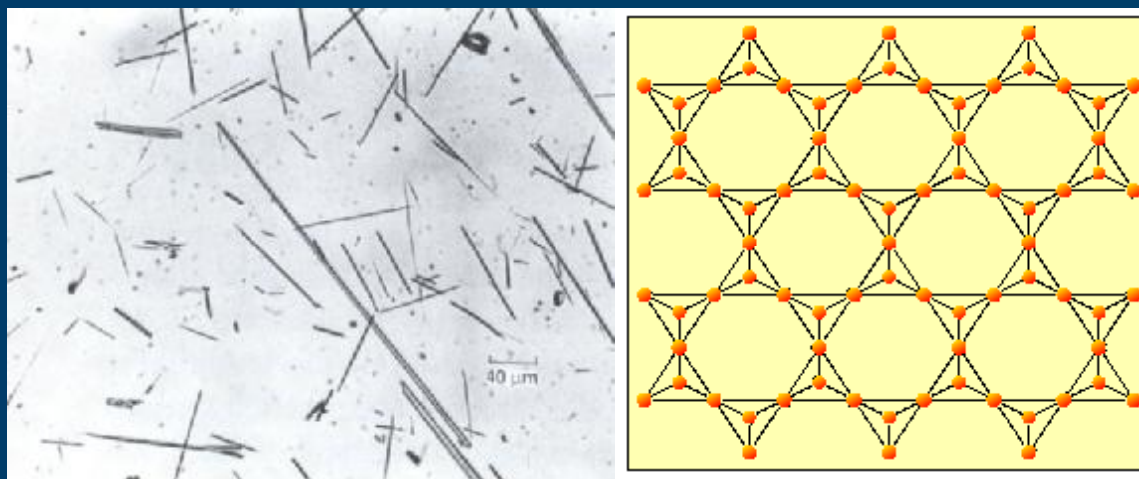


Review of NIOSH Research Roadmap on Asbestos and Other Elongated Mineral Particles

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NIOSH Roadmap:

- Ø EPA Human Health Risk Assessment
- Ø Hazard Identification of EMPs
- Ø Quantitative Risk Assessment
- Ø Analytical Methods Development
- Ø Summary

Human Health Risk Assessment

Site Specific

Exposure
Measurement

Toxicity values

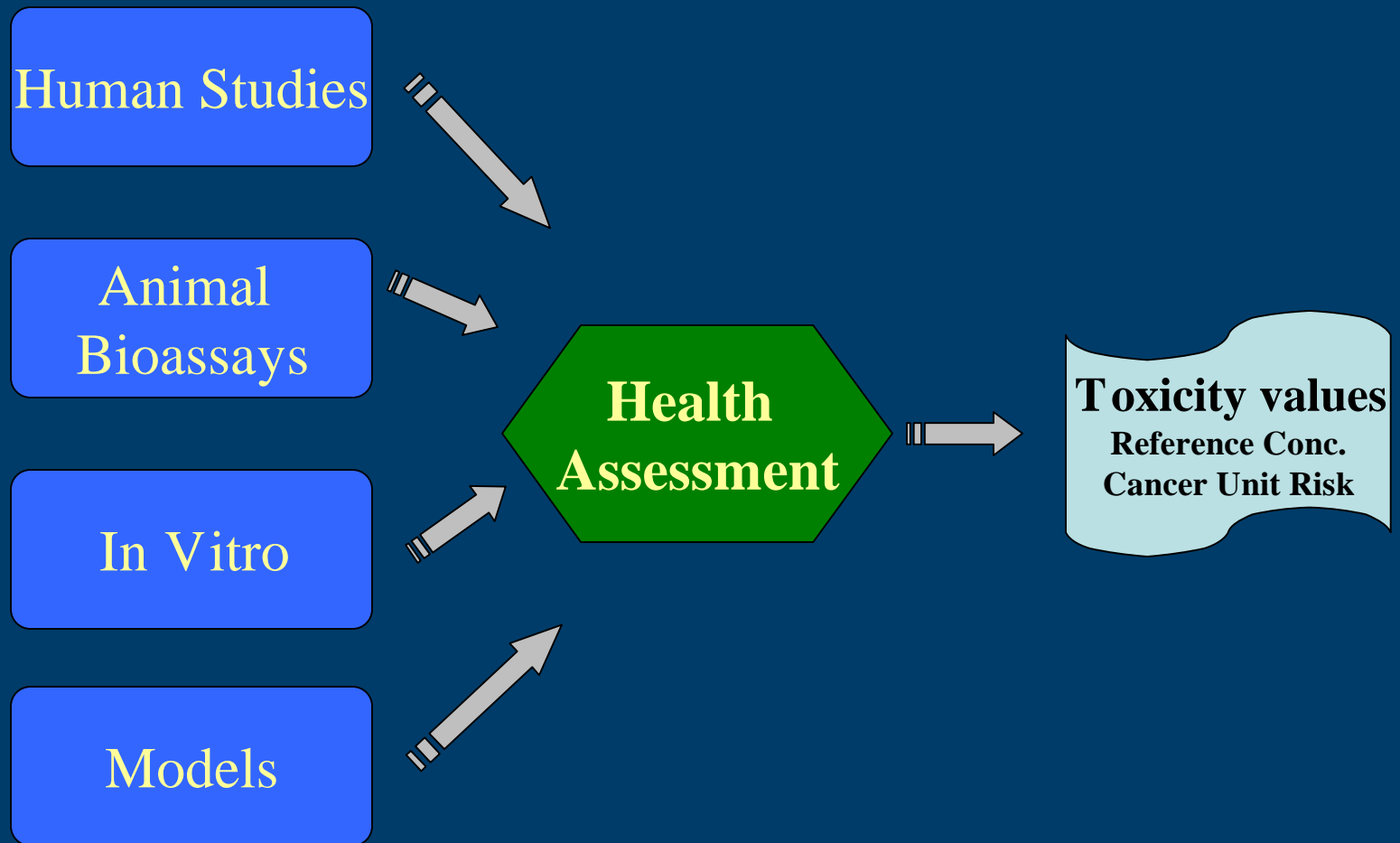
Agent Specific

Risk
Calculations

Characterization
Hazard Index.
Estimated Cancer Risk

Risk Assessment

Agent Specific Health Assessment



Health Assessment

Human Studies

Ø Hazard Identification

- Qualitative
- Noncancer endpoints
- Cancer

Animal
Bioassays

Ø Exposure Response Relationship

- Quantitative – estimate human health risk
- Reference Concentration (RfC)
- Inhalation unit risk or Cancer Slope factor

In Vitro

Models

Hazard Identification

Noncancer Health Effects

- Ø Interstitial pulmonary fibrosis (Asbestosis)
- Ø Pleural fibrosis
(Plaques, diffused or circumscribed fibrosis)
- Ø Plural effusions (benign)
- Ø Obstruction of Pulmonary airflow
- Ø Collapse of the lung (Rounded atelectasis)
- Ø Other ?
 - Autoimmune (?)
 - Cardiovascular (?)

Animal Studies: Potential to inform hazard identification for noncancer endpoints

- Ø Assess toxic potential of EMPs
- Ø Determinants of toxicity
- Ø Document the progression of disease under controlled conditions
- Ø Explore dosimetrics
- Ø Episodic versus peak exposures
- Ø Life-stage susceptibility
- Ø Explore plausibility of non-respiratory effects
 - Ø Autoimmune
 - Ø Cardiovascular
 - Ø Other ?

Animal studies

- Ø Biopersistence
- Ø Translocation/Clearance
- Ø Fiber splitting
- Ø Changes in surface chemistry
- Ø Timelines of biological activity
- Ø Sequestering of fibers

Hazard Identification

Cancer

- ∅ Lung Cancer
- ∅ Laryngeal Cancer
- ∅ Mesothelioma
 - Pleural
 - Peritoneal
 - other sites ?
- ∅ Gastrointestinal cancers
(Esophageal, gastric, intestinal, colon, rectal)
- ∅ Other Malignancies
 - Kidney
 - Lymphomas
 - Pancreatic
 - Liver/bile duct

Key Questions for Quantitative Risk Assessment

Ø Exposure Metrics (external)

- Fiber concentration (current)
(Surrogate measure of a subset of material)
- Cumulative, residence time weighted?
- Surface area
- Mass

Ø Dosimetric (Internal)

- Lung burden
- residence time
- Units
 - Surface area, mass, fiber count?
 - On a tissue weight or surface area basis?

Ø Less-than Lifetime Risk

Ø Episodic versus continuous exposure

Ø Short-term high intensity, shorter latency?

Quantitative Assessment

ØEPA: Human data, **where adequate**, for exposure response relationship (US EPA 2005)

ØEPA Science Advisory Board, 2008

ØOngoing work to improve epidemiological support for human health risk assessment

- ✓South Carolina Textile Cohort (Chrysotile)

- ✓Libby Worker Cohort (Libby amphibole asbestos)

- ✓Tyler Texas Pipe Insulation Plant (Amosite)

Opportunities for Research to Support Human Health Assessment

Ø Mortality Updates of established cohorts (2006, NDI)
(40+ years of follow-up since PCM exposure data are available)

Ø Reanalysis of archived filters

- Inform bivariate fiber size distribution
- Fiber mineralogy and morphology

Ø Identify existing cohorts with available noncancer data

Ø Case Control Studies

Recent and Current Progress on Existing Cohorts

ØNIOSH – Reanalysis of the textile worker cohort (SC)

ØNIOSH – Update of the Libby, MT worker cohort

ØDuke Univ. – Dr. Dement

- Chrysotile plants (N.C.)
- Reanalysis of archived filters
- Mortality update

ØUniv. of Cincinnati -- Marysville, OH cohort

- Libby Amphibole
- Noncancer health effects (Pleural plaques)

Other Possible Sources of Epidemiologic Data

Ø Access International Publications

- China (Chrysotile and crocidolite)
- Russia (Chrysotile)

Ø Non-commercial EMP Epidemiological studies

- Characterize EMPs in areas with documented health effects
- Exposure characterization (EPA work with Erionite in Turkey)

Ø Collaborate with researchers to reanalyze existing data

- Various exposure metrics
- Individual level data Vs. categorical data
- Reanalysis of archived filters (Providing a TEM metric)

Ø Collect new data in active facilities

- New exposure measurements (TEM)
- Noncancer endpoints
- Biomarkers of exposure

Potential Worker Cohorts in China

Ø Meta-analysis of workers exposed to only chrysotile. (Li et al., 2004)

Ø Literature search

- 203 cohort studies identified
- 26 chrysotile only cohorts met criteria

Ø 10 Chinese cohorts identified

- Publication years (1991 – 2003)
- Six in Chinese literature
- Cohort size ranges from 370 - 9950

Recent Publications on Chinese Cohorts

- ØA 41-year cohort study on cancer mortality among female workers with manual spinning of chrysotile asbestos, Sun et al., 2003
(*Chinese*)
- ØA prospective cohort study of on malignant tumors mortality among workers exposed to asbestos, Zhang et al., 1997.
(*Chinese*)
- ØChrysotile and lung Cancer 27 year follow up study, Wang et al., 2001.
- ØStudy on incidence of malignant tumor in workers of Shanghai asbestos products factory in 40 years, Wang et al., 2000.
- ØPulmonary function in Long-term asbestos workers in China, Wang et al., 2001.

Main Messages

- Ø Current EPA risk assessment activities would be improved with improved epidemiologic data**
- Ø EPA is interested in pursuing new and updated information**
- Ø These efforts would benefit from collaboration across Federal Agencies, as well as Internationally**

Recommendation for Analytical Methods Development

- Ø Methods development for asbestos and EMP content
(e.g. soil, rock or commercial material)
- Ø Fiber release potential for various materials
- Ø Fiber properties – beyond Asbestiform
 - § Dimension
 - § Morphology
 - § Crystalline structure
 - § Mineral content
- Ø Various Metrics – beyond fiber count

Summary

Ø Hazard Identification

Ø Laboratory research can inform additional aspects of public health interest

Ø Greater focus on Human Epidemiological data – both for cancer and noncancer health effects

Ø Analytical Methods Development