HEALTH EFFECTS OF SILICATE CONTRUCTION DUST

Environmental Epidemiology Program

MISSION & VISION

The Utah Department of Health's mission is to protect the public's health through preventing avoidable illness, injury, disability, and premature death; assuring access to affordable, quality health care; and promoting healthy lifestyles.

Our vision is for Utah to be a place where *all* people can enjoy the best health possible, where *all* can live and thrive in healthy and safe communities.

STRATEGIC PRIORITIES

Healthiest People – The people of Utah will be among the healthiest in the country.

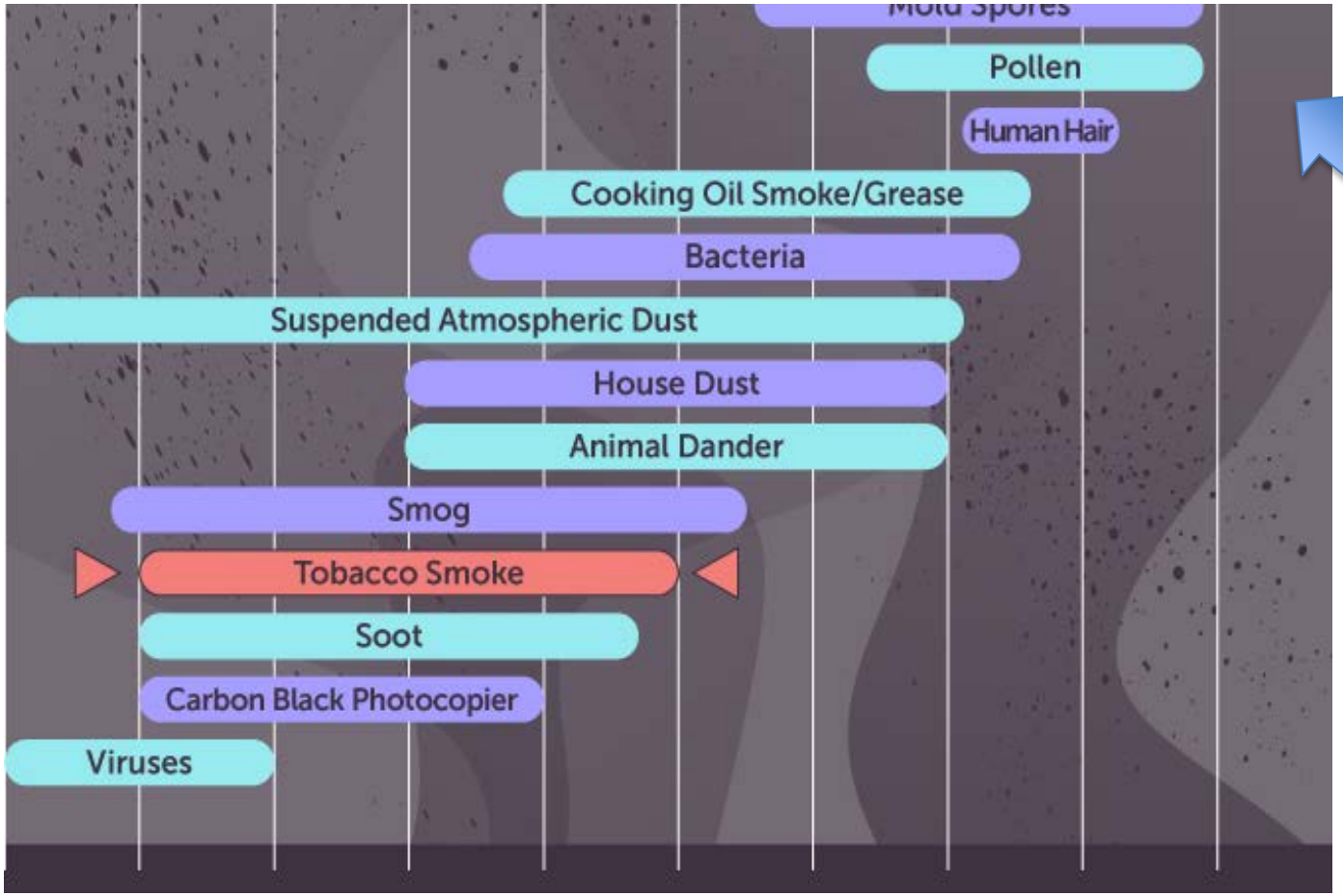
Optimize Medicaid – Utah Medicaid will be a respected innovator in employing health care delivery and payment reforms that improve the health of Medicaid members and keep expenditure growth at a sustainable level.

A Great Organization – The UDOH will be recognized as a leader in government and public health for its excellent performance. The organization will continue to grow its ability to attract, retain, and value the best professionals and public servants.

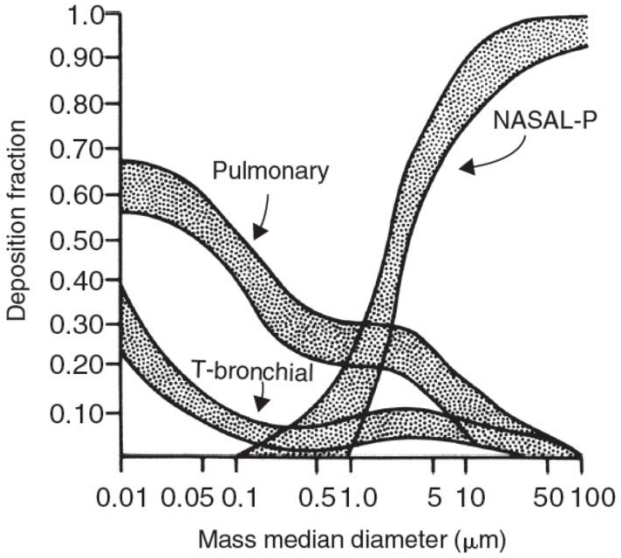
APPLETREE

- Part of EEP
- Investigates and Assess Environmental Exposures and Health Concerns
- Provides Independent Objective Health Decisions and Recommendations
- Provides Health Education focused on Exposure Prevention or Reduction

PARTICLE SIZE



PARTICLE DEPOSITION



9 - 10 μm

6 - 9 μm

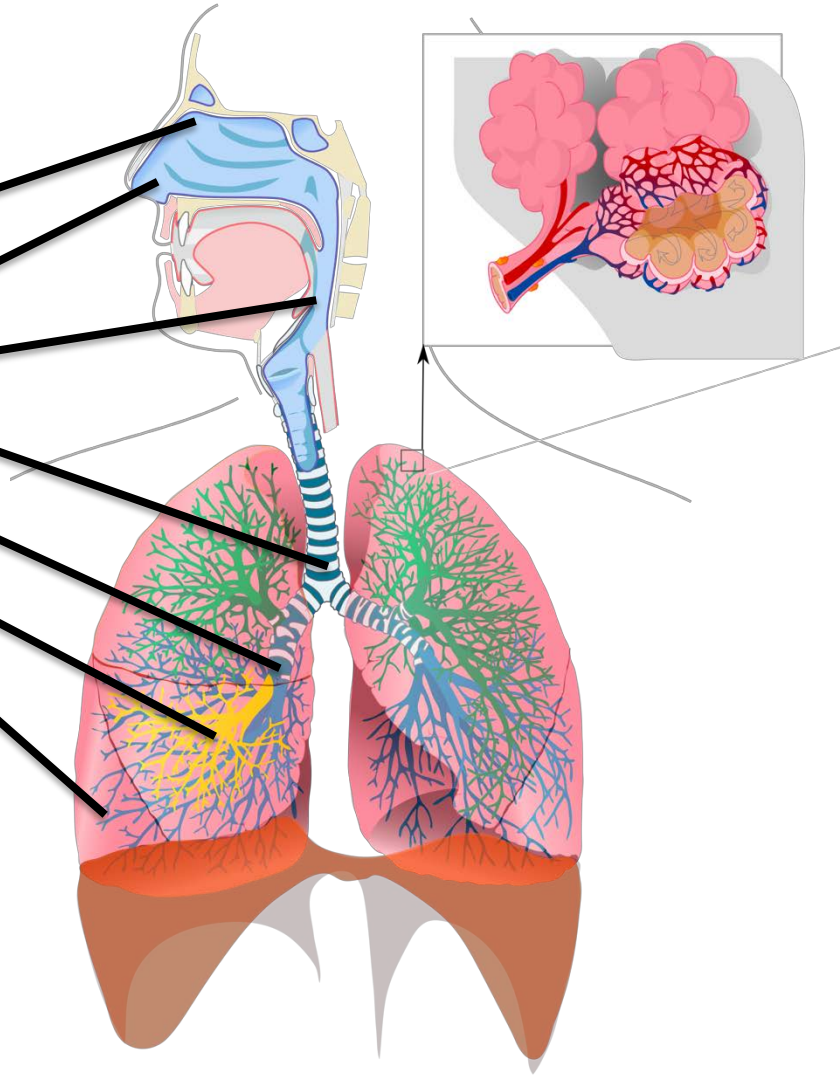
5 - 6 μm

3 - 5 μm

2 - 5 μm

1 - 2 μm

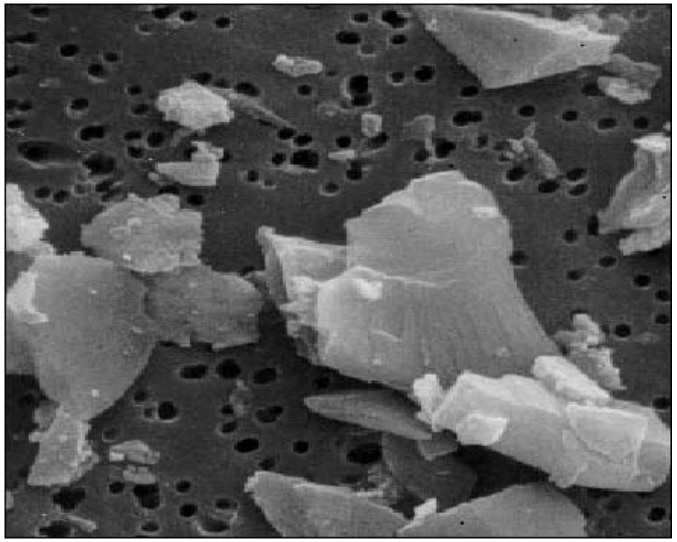
< 1 μm



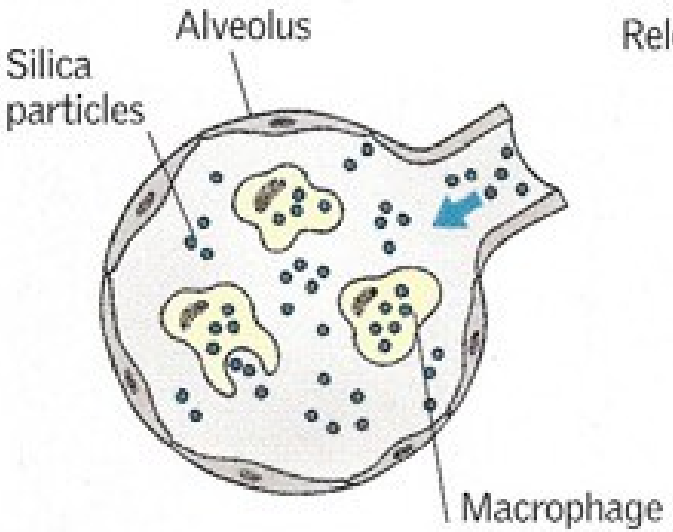
Types of Silica

- Crystalline silica
  - Very organized atomic structure
  - More toxic

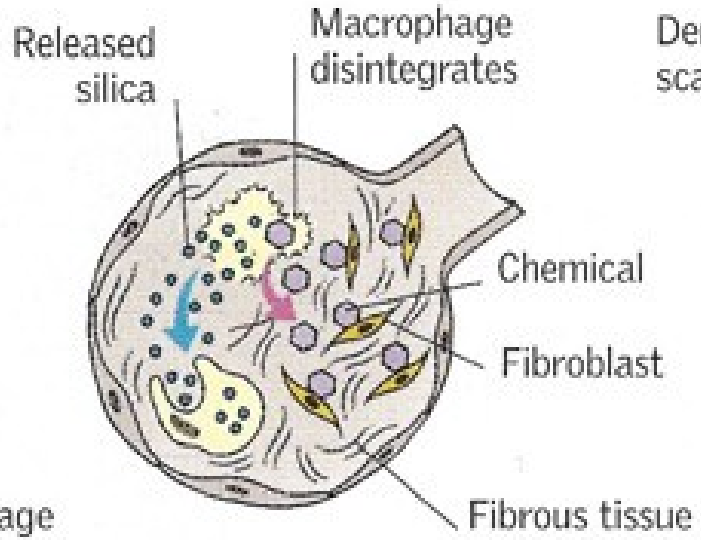
- Amorphous silica
  - More random atomic structure
  - Less toxic



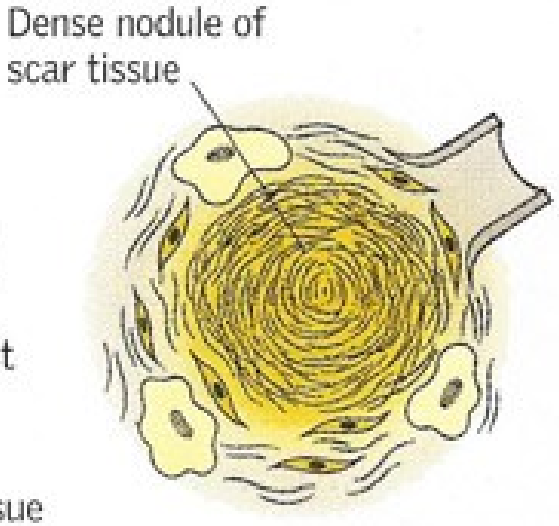
SILICOSIS (BLACK LUNG)



Silica dust inhaled



Fibrous tissue develops



Scarring of lungs

HIGH RISK

- Mining & Quarrying
- Stone Cutting & Sculpting
- Concrete & Masonry Work
- Road Construction & Excavation
- Sandblasting
- Glass and Ceramic Manufacturing

- High Exposure Concentration
- Long Exposure Duration (8+ hrs/day)
- Long Exposure Period (10-30+ yrs)

EPIDEMIOLOGY

CDC Home

Centers for Disease Control and Prevention
CDC 24/7: Saving Lives. Protecting People.™

SEARCH

A-Z Index A B C D E F G H I J K L M N O P Q R S T U V W X Y Z #

Morbidity and Mortality Weekly Report (*MMWR*)

MMWR

Silicosis Mortality Trends and New Exposures to Respirable Crystalline Silica — United States, 2001-2010

Weekly
February 13, 2015 / 64(05);117-120

Ki Moon Bang, PhD[1], Jacek M. Mazurek, MD[1], John M. Wood, MS[1], Gretchen E. White, MPH[1], Scott A. Hendricks, MS[2], Ainsley Weston, PhD[1] (Author affiliations at end of text)

Silicosis is a preventable occupational lung disease caused by the inhalation of respirable crystalline silica dust and can progress to respiratory failure and death (*1*). No effective specific treatment for silicosis is available; patients are provided supportive care, and some patients may be considered for lung transplantation. Chronic silicosis can develop or progress even after occupational exposure has ceased (*1*). The number of deaths from silicosis declined from 1,065 in 1968 to 165 in 2004 (*2*). Hazardous occupational exposures to silica dust have long been known to occur in a variety of industrial operations, including mining, quarrying, sandblasting, rock drilling, road construction, pottery making, stone masonry, and tunneling operations (*1*). Recently, hazardous silica exposures have been newly documented during hydraulic fracturing of gas and oil wells and during fabrication and installation of engineered stone countertops (*3,4*). To describe temporal trends in silicosis mortality in the United States, CDC analyzed annual multiple cause-of-death data for 2001–2010 for decedents aged ≥15 years.* During 2001–2010, a total of 1,437 decedents had silicosis coded as an underlying or contributing cause of death. The annual number of silicosis deaths declined from 164 (death rate† = 0.74 per 1 million population) in 2001 to 101 (0.39 per 1 million) in 2010 (p = 0.002). Because of new operations and tasks placing workers at risk for silicosis, efforts to limit workplace exposure to crystalline silica need to be maintained.

For this analysis, decedents for whom the *International Classification of Diseases, 10th Revision* code J62 (pneumoconiosis due to dust containing silica [silicosis]§) was assigned as either the underlying¶ or contributing cause of death were identified from 2001–2010 mortality data. Deaths of persons aged ≥15 years were analyzed. Trends in annual age-adjusted death rates per 1 million population were examined using a first-order autoregressive linear regression model. Differences in death rates were considered to be statistically significant if 95% confidence intervals did not overlap.

During 2001–2010, 1,437 decedents had silicosis coded as the underlying or contributing cause of death. Of these, 28 (1.9%) were aged 15–44 years, 1,370 (95.3%) were males, and 1,236 (86.0%) were whites (Table). The overall age-adjusted silicosis death rate for blacks (0.87 per 1 million) was significantly higher than the rate for whites (0.59) and other races (0.16). The age-adjusted silicosis death rate for males (1.39 per 1 million) was significantly higher than the rate for females. The annual number of silicosis deaths declined from 164 (0.74 per 1 million) in 2001 to 101 (0.39) in 2010 (p for trend = 0.002).

Discussion

A statistically significant decline in silicosis death rates was observed during 2001–2010. However, silicosis deaths still occurred among persons aged 15–44 years. Of 28 decedents aged 15–44 years, the youngest was aged 19 years. This would be consistent with the decedent developing acute silicosis after an extremely high exposure to respirable crystalline silica. Such findings indicate the importance of educating at-risk workers and their employers regarding the dangers of exposure to respirable crystalline silica in the workplace. The disparities by sex and by race reflect differences in the composition of the workforces in the industries and occupations placing workers at risk for exposure to crystalline silica dust.**

Approximately 2 million U.S. workers remain potentially exposed to respirable crystalline silica (*5*). Occupational exposures to dust containing crystalline silica have long been known to occur in mining, quarrying, sandblasting, pottery making, rock drilling, road construction, stone masonry, and tunneling operations (*1,5*). Despite enforceable limits†† on worker exposure to respirable crystalline silica, substantial overexposures continue to occur in the United States (*3*). Moreover, new job tasks that place workers at risk for silicosis continue to emerge.

In 2004, occupational disease surveillance programs in Michigan, New Jersey, Massachusetts, New York, and Ohio reported nine confirmed cases of silicosis among technicians who performed sandblasting in dental laboratories (*6*); in 2013, there were approximately 37,000 dental laboratory technicians in the United States.§§ In a 2012 report from Israel, a 2014 report from Spain, and a 2015 report from the United States, silicosis has been documented among workers exposed to respirable crystalline silica dust during the fabrication and installation of quartz-containing engineered stone products used primarily for kitchen and bathroom countertops (*4,7,8*). A 2013 report documented high levels of exposure to respirable crystalline silica during hydraulic fracturing of gas and oil wells (*3*). Moreover, a 2010 study reported an excess risk for silicosis in coal miners that was associated with silica as a component of coal mine dust formed during drilling, crushing, and loading of mine material (*9*). In 2013, there were approximately 204,000 oil and gas extraction industry workers and approximately 80,000 coal mining industry workers in the United States.¶¶ Finally, although not in the United States, silicosis cases have been reported in other occupational settings, including among denim sandblasters (*10*).

In 1999, the Council of State and Territorial Epidemiologists made silicosis a nationally notifiable condition.*** In addition, because current permissible exposure limits for respirable crystalline silica do not adequately protect workers, the Occupational Safety and Health Administration (OSHA) has proposed amending the current standards. One of the proposed changes is a lower permissible exposure limit (*5*).

The findings in this report are subject to at least three limitations. First, silicosis deaths were not validated by medical records or follow-up with health care providers, thus findings might be subject to misclassification. Second, no individual work history is reported on death certificates. Therefore, it was not possible to identify those industries and occupations where the decedents' exposures to crystalline silica occurred. Finally, inhalation of respirable crystalline silica can

- Black Lung History
  - Hawk's Nest Mining (1930s)
- Occupational "Permissible Exposure Limit" (PEL) = 50 $\mu g/m^3$ 8-hour (time weighted) average
- Since 1950s steady reduction:
- 2001 164 deaths 0.74/million
- 2010 101 deaths 0.39/million
- Rarely
  - Chronic lung infections
  - Chronic bronchitis
  - Lung cancer
  - Immune disfuction

Healthy Lungs

- Avoid Smoking or Using Tobacco Products
- Minimize Alcohol Consumption
- Physical Exercise or Deep Breathing Exercises
- Prevent Respiratory Infections
  - Wash hands
  - Good oral hygiene
  - Stay current on vaccinations
- Avoid Air Pollution Exposure As Much As Possible
- Get Regular Healthcare Checkups

THANK YOU!

Sam LeFevre slefevre@utah.gov
Nathan LaCross nlacross@utah.gov
Evelyn Reategui Zirena ereategui@utah.gov

801-538-6191

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