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# MOUNT ST. HELENS TECHNICAL INFORMATION NETWORK

federal emergency  
management agency

Friday, June 6, 1980

BULLETIN #13 - "Research Into The Free Crystalline Silica Content  
Of Mount St. Helens Ash"

Preliminary analyses of four samples of volcanic ash taken from the ground in the Ellensburg, Yakima, and Spokane area by a team of researchers from the national Center for Disease Control (CDC) have shown a consistent, but low concentration of free crystalline silica ( $\text{SiO}_2$ ). The proportion of free silica in the ash has been about 6% of the total respirable size particles (under 10 microns) by weight. Of the free silica, about 4% is in the form of cristobalite and about 2% exists as free quartz.

(This finding represents an update of the finding reported in Technical Information Bulletin #10, "Center for Disease Control Community Based Health Surveillance Program." It should be noted that many agencies are collecting and analyzing the volcanic ash for various purposes. It is the intention of the Mount St. Helens Technical Information Group (MSHTIN) to reconcile differences in findings whenever possible. When such reconciliation is not possible, the MSHTIN will present those data it considers most accurate.)

At present, industrial hygienists from CDC's National Institute for Occupational Safety and Health (NIOSH) are collecting additional samples from both the air and the ground from a number of communities in the plume paths of the two eruptions. Present plans are to sample in the vicinity of Moses Lake, Yakima, and Spokane in the path of the first plume and Longview and Centralia in the path of the second plume.

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Two hundred and fifty sampling devices were sent with the NIOSH team.

There has been a great deal of interest in the amount of free crystalline silica present in the ash since exposure to very small, airborne particles of free silica can cause silicosis, a disease resulting in scarring of the lungs and impairment of their function.

At this time, NIOSH researchers do not believe that short term exposure to the ash by the general population poses a significant health hazard. Short term adverse health effects may be experienced by persons already suffering from respiratory illnesses or damage (e.g. bronchitis, emphysema, asthma, or heavy smoking) due to mucous membrane irritation associated with any dust. The CDC Community-Based Health Surveillance program (described in Technical Information Bulletin #10) is measuring changes in admissions to hospital emergency rooms because of respiratory problems. Those findings will be described in a subsequent Technical Information Bulletin.

NIOSH researchers are most concerned with risks faced by occupational groups such as scientists, clean-up crews, loggers, and perhaps farm-workers, who may be exposed to concentrations of dust on a long term basis. These groups, particularly if they do not wear NIOSH approved face masks, may face the risk of contracting silicosis. The approved masks are coded, "TC-21C", followed by other numbers.

Although the most common form of silicosis develops only after exposure to free silica for many years, exposure to large concentrations of free silica for a short period of time has been known to result in an acute form of the disease. In addition, silicosis, unlike other forms of pneumoconiosis, may predispose certain individuals to develop-

ment of pulmonary tuberculosis.

Therefore, prudence dictates that occupational groups working in heavy ashfall areas wear NIOSH approved face masks, as well as follow other precautions as previously outlined in Technical Information Bulletin #3, "Precautions in Handling Volcanic Ash."

The magnitude of the long term health hazard, if any, is dependent on several factors besides the percentage of free crystalline silica in the ash. These factors include size of the particles, their concentration within the air, and duration of exposure of the individual.

Particles larger than 10 microns (.00004 inches) in size are usually filtered from the body by the respiratory defense system. This system consists of the nostril hairs; mucous secretions of the nose, pharynx, and upper trachea; the fine hair-like cilia in the trachea; and the white blood cells. (Heavy smokers have less efficient respiratory defenses against any airborne particulates).

One of the first questions the NIOSH team wants to answer is how much free silica is in the air, since it may be either a higher or lower percentage than that measured in the ground samples taken to date.

Other variables which will affect the magnitude of any long-term health hazards from the ash include the future activity of the volcano, weather patterns, wind speed and direction, population densities, terrain, and possible ashfall contamination of water and sanitation systems.

Some non-technical reports have mistakenly stated that the ash contains 60% or more free silica. This misunderstanding has apparently arisen because, conventionally, chemical analyses of the ash show the

total silica content (including that which is chemically combined with other elements). However, the health hazard is only from the free crystalline silica ( $\text{SiO}_2$ ).

"The general public should not be unduly alarmed by scare stories about silicosis," says Dr. Robert Bernstein, a physician with the NIOSH team. "At this time, we don't believe silicosis poses any threat to the general population. People working in areas of heavy dust concentration, however, may be at risk and should be wearing NIOSH approved face masks. These masks are 98-99% effective in screening out harmful particles of free silica."