

PUBLIC HEALTH

# Aluminum Dust Inhalations Preventive of Silicosis

## Powder Forms a Colloid in Body Fluids Which Seals The Surfaces of Quartz Particles to Prevent Solution

**P**OSSIBILITY that aluminum dust inhalations may serve both as preventive and remedy in silicosis appears in the report of J. J. Denny, metallurgical engineer, Dr. W. D. Robson, chief surgeon of the McIntyre Porcupine Mine, Schumacher, Ont., and Dr. D. A. Irwin, of the University of Toronto. (*Canadian Medical Association Journal*, March)

Silicosis is the lung disease resulting from inhalation of silica or quartz dust. The silicosis-preventive action of aluminum dust inhalations was first suggested in research on rabbits reported by the Canadian investigators to the Academy of Medicine, Toronto, two years ago. In this latest report the scientists further substantiate their findings of two years ago, explain the manner in which aluminum powder prevents quartz dust from damaging the lungs, and show that some quartz dust already inhaled may be gradually removed from the lungs under treatment with aluminum powder.

### Prevents Poisoning

The development of the fibrosis of the tissues in the lungs, which is characteristic of silicosis and is produced by the inhalation of extremely fine quartz dust, is known to be due to the poisoning of the phagocytic (scavenger) tissue cells by the silica dust which they engulf. Because they are poisoned and killed, they are unable to eliminate this dust through the usual channels by which inert dusts are eliminated. The present experiments show that the action of the aluminum is to prevent the silica from poisoning and killing the lung phagocytes, and thus allow them to carry away the silica just as they would an inert dust.

It seems that the fine aluminum powder is gradually dissolved by the body fluids in the form of a colloidal or jelly-like aluminum hydroxide, which is then adsorbed and firmly held upon the surfaces of the quartz particles, and seals these surfaces so firmly that the quartz can no longer go into solution and poison the body tissues. Since the aluminum and its hydroxide are themselves harmless and non-irritating, the result is that the quartz particles are also rendered

harmless, and therefore placed in the way of being eliminated by natural processes.

The presence of this thin layer of material on the surface of the quartz was demonstrated by the Canadian investigators by staining it with dye, and then its identity as aluminum hydrate was demonstrated by Dr. Germer and Mr. Storke, of the Bell Telephone Laboratories in New York, using one of the most modern and sensitive processes known to physics—electron diffraction. Both chemical and physiological tests indicate that the protecting action of the aluminum hydroxide on the quartz dust is substantially permanent, and that the only thing necessary to make the quartz dust harmless in the body is to bring it in contact with enough of the colloidal aluminum hydroxide so that it can coat itself with this film. For this purpose, the aluminum dust must be in close contact with the quartz dust: experiments showed that when the quartz dust was inhaled by the rabbits it did no good to give them aluminum with their food or to inject it into their veins, but that they must inhale the aluminum dust so that it could be deposited with the quartz dust in the lungs. The fact that certain "antidotal" rocks are able, when present in the dust of certain mines, largely to prevent the development of silicosis, is ascribed by the Canadian scientists to the fact that these rocks contain small amounts of soluble aluminum salts which produce aluminum hydroxide in the lungs.

### Can Take It Later

Experiments showed that it was not necessary that the aluminum dust should be inhaled at the same time as the quartz dust. Rabbits that inhaled aluminum dust for 40 minutes each morning were completely protected, although they inhaled quartz for the next 12 hours. The only condition seems to be that the amount of aluminum dust deposited in the lungs should be at least about one per cent. of the weight of the quartz dust, and that this aluminum dust should be distributed fairly uniformly with the quartz dust, so that it can get at it and act upon it.



### RADIAL ICICLES

*They formed on the hub caps of a car driven along a slushy road, with the air above it hovering just under freezing point. The whirling of the wheel furnished centrifugal force to substitute for gravity, so that the icicles formed pointing away from the hub center instead of hanging straight down. The heavy "V" pattern follows a trademark. This unique picture was snapped in Ithaca, N. Y., by Dr. Harley Howe, professor of physics at Cornell University.*

Perhaps the most interesting experiments, from the standpoint of the treatment of silicosis, were those which indicated that if rabbits which had already developed silicosis and whose lungs contained considerable quartz dust were allowed to inhale a little aluminum dust each day, the quartz dust was not only rendered inactive but was steadily removed by the lung phagocytes, so that it was carried out of the body, and the further progress of the disease might be expected to be prevented. One of the most characteristic and serious things about silicosis has been the fact that when the quartz dust has once been deposited in the lungs the irritating and poisoning action continues for years, and the patient gradually gets worse. These experiments give hope that by the inhalation of aluminum much of this quartz dust may be removed, and the progress of the disease retarded or even stopped.

*Science News Letter, March 18, 1939*

A Swedish archaeologist has dated a Swedish fortress as having been built in the fifth century, by comparing timber in the building with tree-ring records from America's sequoia trees.