PUBLIC HEALTH

Traces of Aluminum Powder Prevent Dread Silicosis

Rabbits Dusted With Quartz To Which Less Than One Per Cent Aluminum Dust Was Added Show No Fibrosis

TINY traces of aluminum dust added to the already dusty, silica-filled air breathed by certain classes of miners may some day stay the rages of dread silicosis.

This is the suggestion implied in the medical report of scientists and physicians at the University of Toronto (*Canadian Medical Association Journal*, July).

Technical and financial guidance of the promising research are shared by a Canadian Nobel Prize winner and a Canadian mine owner; Sir Frederick Banting, discoverer of insulin, and J. P. Bickell, president of the McIntyre Porcupine Mines, Ltd., of Schumacher, Ont.

J. J. Denny, metallurgical engineer, and Dr. W. D. Robson, chief surgeon of the McIntyre Mine, and associate professor Dudley A. Irwin, of the department of medical research at the University of Toronto, form the three-man discovery team which has reported the following:

1. The addition of small quantities of metallic aluminum dust almost completely inhibits the solubility of silicious materials in a laboratory beaker.

2. Rabbits dusted with quartz to which less than one per cent. of metallic aluminum dust had been added showed practically no fibrosis, while control rabbits, dusted with quartz alone, showed well developed silicosis.

Reduces Solubility

Discovery 1 suggests that the addition of the aluminum reduces the ability of the silica to go easily into solution. Soluble silica has previously been recognized as a factor in the dangerous pre-silicosis phase.

Discovery 2 bears out the first finding but uses the more decisive animal experimentation criterion as a test. Results in test tubes and those on living animals sometimes fail to show comparable results as they did in this case.

Behind these two simple but striking and significant results lies a trail of theory and research that goes back to 1930 and to a report by the noted British scientist, Sir William Bragg, published in a little-known and highly-specialized German technical journal devoted to the structure of crystals.

Sir William described the probable molecular arrangement of freshly fractured quartz and a fellow Englishman, P. Heffernan, suggested that the possible cause of acute silicosis arose from the unsaturated oxygen atoms present in such freshly broken quartz. These dissatisfied oxygen atoms, as it were, might join to the lung tissues and hence bring the start of silicosis.

After crediting Bragg and Heffernan for prior work the Canadian scientists state:

"This (Heffernan's hypothesis) suggested to us that if the unsaturated oxygen atoms could be satisfied with nascent hydrogen it might diminish the toxicity of silica in tissue and change a fibrosis response into a simple foreign body reaction."

Laboratory, test tube experiments came first, but just about a year ago animal experiment was started with 13 rabbits which, for six months, lived in a world of silica dust. Seven rabbits breathed the silica with a tiny trace of powdered aluminum dust added. The other six breathed the silica dust alone.

Examine Lungs

At intervals up to six months the lungs and other organs of these animals were sent to Dr. Irwin for pathological examination in his laboratories at the University of Toronto. In the control animals, breathing the quartz dust alone, the gradual onset of silicosis with its characteristic and spreading fibrous growths in the lungs could be traced. In no case did a similar reaction show in the animals breathing the quartz dust plus the aluminum powder. Both groups of animals had large quantities of dust in their lungs, of course, but in the group breathing the quartz-aluminum mixture the lungs had reacted in simple fashion as they do when any dust is breathed. Scientists call this well-known

ONE IN FIVE MILLION

An albino bison is not merely one in a million, it is one in five million. As nearly as scientists of the U. S. Biological Survey can figure out, that is the ratio of albino to brown calves born to bison cows. Records from the days of the "Thundering Herd" tell of not more than a dozen or so ever seen by white men. The four-year-old albino bull shown in this picture lives on the National Bison Range at Moiese, Mont. The other animals in the herd guard it jealously; it is very risky to enter the corral to attempt a photograph.

condition a "foreign body" reaction and it is definitely not linked to silicosis.

A virtue of using metallic aluminum dust as a silicosis preventive, suggest the Canadian scientists, is that its specific gravity is almost exactly the same as quartz itself. Thus if aluminum dust is mixed with quartz it will stay suspended in the air an equal length of time.

"We are of the opinion," conclude the scientists, "that the aluminum reacts as in the beaker, when taken into the lung with the dangerous dusts. That is, that the rapid initial rise and concentration of the solution of the silicious material is inhibited, thereby preventing degeneration of the dust cells and the production of fibrous tissue.

"Due to the remarkable results obtained in the quartz and aluminum treated rabbits in conjunction with the beaker results, it seems reasonable to assume that metallic aluminum in small quantities administered in a similar manner will prevent other forms of pneumoconiosis, such as asbestosis, etc."

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PHYSICS

Invisible Rays Help To Solve Molecule Structure Problems

Science's Powerful Research Tool, the Spectroscope, Applied to Research on Glands, Food Color, Even Guns

INVISIBLE light and rock salt are being used to solve one of science's most puzzling problems; the structure within the molecule of the atoms of which all matter is composed, it was indicated by a report of Dr. R. B. Barnes, of the American Cyanamid Company before the Fifth International Spectroscopy Conference at the Massachusetts Institute of Technology.

Among the vital questions science may be able to answer from knowledge gained in this research are: What happens when rubber ages, how some petroleum products differ from others, what takes place when a film of paint dries and what is the effect and action of various catalysts.

In his research, Dr. Barnes employs one of science's most powerful research tools, the spectroscope. By using it to examine the invisible light found in the infra-red range of the spectrum, he can not only tell what and how many atoms of an element are present, as can be done in all ranges of the spectrum, but how these atoms are connected with each other, as well.

Shows Linkages

The investigation is expected to be particularly valuable in determining what actually occurs during chemical reactions, for the spectroscope can reveal atomic linkages both before and after the reaction. It will also enable investigators to differentiate between isomeric structures, substances composed of the same atoms but linked differently. These isomers, Dr. Barnes explained, while difficult to differentiate by chemical analyses, reveal different sets of spectral lines as proof of their individuality.

Infra-red light cannot be seen, but is measured by its heat. A delicate thermocouple transforms this heat into electricity, so that the light can be "read" from a galvanometer.

The chief feature of the spectrograph used is that the prism employed to break the light into the familiar spectrum is merely a large single crystal of rock salt. This is used in place of the ordinary glass or quartz prism because of its superior ability to transmit infra-red rays.

Ordinarily Tedious

Infra-red spectrum research is difficult and tedious because of the delicate and specialized technique and equipment required. To make one complete measurement of a given compound, for example, often requires that the experimenter sit in one position for from five to seven hours. The most recent instrument constructed by Dr. Barnes is completely automatic, however, and has cut this time to less than an hour. An idea of the sensitivity of the experiments can be gained from the fact that temperature changes as small as one ten-millionth of a degree Centigrade must be measured.

Other new roles played by the spectroscope were described. The discovery of red color pigments that make hams turn red when cured, improved methods of detecting impurities in cast iron, vital information that should yield better rayons and applications that are telling scientists new facts about gland secretions are among the diversified uses of the spectroscope described by scientists on the program.

Study Glands

Dr. G. O. Langstroth, of McGill University, outlined his spectroscopic methods of analyzing the secretion of glands in the body under varying kinds of stimulation: how the ability of the spectroscope to study small samples of saliva, for example, has enabled him to find that in the cat a different type of protein material is liberated when the salivary glands are excited by adrenalin than when stimulated by the chorda tympani nerve, the small nerve at the base of the brain.

This discovery, said the McGill scientist, was followed up chemically by the use of large quantities of the secretion and found to be correct. The studies have enabled the scientist to formulate a mathematical theory of secretion that gives a fairly comprehensive picture of certain glandular functions and permits calculation of many features not observable in a critical experiment.

What Makes Ham Red?

Another biological application of the spectroscope, described by Dr. W. M. Urbain of the chemical laboratory of Swift & Company, is to learn more about the color changes occurring in the curing of meats. Why, for example, fried steak or a roast of beef will turn brown while ham, corned beef and frankfurters remain red, or pink, on cooking.

The color of food, he emphasized, is important economically for there is a psychological appeal to good looking meat that makes customers want to buy it. Meat packers now add constituents to the curing stage which determine the final color of the meat. But the process is not too well known chemically.

The spectroscope, said Dr. Urbain, is now helping scientists to find out what happens when a ham or other product is cured. Already several complex, natural pigments have been isolated and some of their properties determined.

By a more accurate spectroscopic analysis of the caustic liquors that go into its manufacture, better rayon should be