

June 23, 1943

Dr. U. E. Bowes
Director of Research
Owens-Illinois Glass Company
Toledo, Ohio

RE: Experiments on "Hydrous Calcium Silicate"

Dear Dr. Bowes:

In reply to your letter of June 25, I can report that samples of both Rotoclone and Sander dusts have been injected into guinea pigs to determine whether they would be tolerated and how we might best plan further experiments to determine whether they are likely to cause chronic disease of the lungs.

Chemical, Petrographic and X-ray Diffraction Analysis gave the following approximate composition for the two samples:

Rotoclone Dust

Quartz - particle size 6 to 80μ; little under 10μ.....	12%
Calcite - altered perhaps by heat	3%
Chrsotile - extremely fine	25
Hydrated Calcium Silicate	50
Glass?	10

Diatomaceous Earth	Trace
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Sander Dust

Quartz - particle size 6 to 120μ	7.5%
Calcite - altered	3.0
Fibrous Material - Coarse, matted together	
Chrysotile	25.0
Wood? Fibre	20-40
Hydrated Calcium Silicate	25-35?

Both of these materials proved difficult to reduce to a size suitable for injection purposes without crushing which our experience has demonstrated will destroy the biological activity of asbestos; one of the suspicious components. However, this was obviously over-come and suspensions of 200 mesh particles were prepared for injection. The resultant suspensions in physiological salt solution were alkaline; the rotoclone sample about pH 7.5 and the sander sample about 9. These values will be checked as soon as our potentiometer which is temporarily out of order can be repaired.

As was anticipated, the injection of materials of this degree of alkalinity caused immediate difficulties. Three of five pigs injected into the peritoneal cavity with the rotoclone sample died of peritonitis, 2 to 4 weeks later, and with the still more alkaline sander dust, four of the five died within 6 to 9 days. When the two materials were introduced directly into the lungs by a tube through the windpipe, the alkalinity of the sander dust was apparently too high to be well tolerated, 3 of the 5 animals died of acute pneumonia during the 2 week injection period (5 doses were administered during this time). The slightly lower alkalinity of the rotoclone sample apparently made it tolerable and there were no accidental deaths.

These acute reactions to relatively large quantities of the "hydrous calcium silicate" are as indicated, probably due to the pH. of the dust suspension and probably have little bearing upon the problem before us. By inhalation the quantity of fine dust entering the lungs in unit time would presumably be too small to produce a chemical pneumonia from alkalinity alone. The results to date are at least temporarily assumed to result from the highly artificial methods of testing.

The chronic effects in which we are chiefly interested will require more time for development. We are dealing with a mixture that contains free silica and asbestos as well as hydrated calcium silicate, fibre etc. Both asbestos and quartz are pulmonary irritants capable of causing progressive pulmonary fibrosis. Although our analysis revealed little quartz of a particle size capable of causing lung damage (3 μ and under), we do not know whether such particles could be produced in the manufacture or use of this product. Furthermore, it is generally assumed that the accelerated solubility of quartz in an alkaline medium increases its toxicity.

Dr. U. E. Bowes

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June 29, 1943

This we have never been able to confirm by experiment but it still may be true and further observation of your product's action should shed more light upon this question. Asbestos fibres, on the other hand, seem to lose their capacity to irritate when subjected to alkaline treatment.

We have just killed two animals that received, 1 month ago, rotoclone and sander dusts respectively by tube into the lungs. Grossly, there is plenty of tissue reaction but its nature cannot be determined until microscopic sections are available. These may give some indication of the future trend of events but it will take at least another 5 months before one knows definitely whether silicosis, asbestosis or other chronic pulmonary disease are likely to develop.

Before making further plans for assay of this material I want to see these microscopic sections which should become available within a week. There are still enough animals in the various groups alive so that we should be able to decide whether it is necessary to undertake a large scale inhalation experiment.

Very truly yours,

Leroy U. Gardner, M. D.
Director

LUG:RBE