

FILE NAME: Raybestos-Manhattan (RBM)

DATE: 1937-1948

DOC#: RBM094

DOCUMENT DESCRIPTION: Interim Report on Experimental
Asbestosis at the Saranac Lab with Relevant Correspondence

11-10-48
April 26, 1948

Mr. Ernest Mushleck,
President,
Kearney & Mattison Company,
Ambler, Penna.

Dear Mr. Mushleck:

You and Mr. Rohrbach are the only members of the group with whom I have communicated concerning the impending report upon Dr. Gardner's experiments. You will be interested to know that Mr. Rohrbach likewise favors a review of the report by a small committee prior to its being released to the entire group.

I am in agreement with you and Mr. Rohrbach, but I am not entirely clear as to how the matter should be handled mechanically. Since it was the asbestos textile manufacturers who underwrote the experiments, perhaps it might be appropriate for the president of the Textile Manufacturers Association to appoint a small committee.

Sincerely yours,

Vandiver From,
Secretary.

VB:y

cc Mr. J. F. D. Rohrbach ✓
Raybestos-Manhattan, Inc.
Bridgeport,
Connecticut.

RM 154-19-77 Qpk

copy for * Mr. Vanliver Brown, Secretary
John-Manville Corporation
copy for Mr. O.H. Gilley,
U.S. Asbestos Division - Manheim, Pa.

Room 1606,
120 Broadway,
New York

January 19, 1944.

Leroy U. Gardner, M.D. Director,
The Gerardo Laboratory
for the Study of Tuberculosis
of the Edward L. Trudeau Foundation,
Saranac Lake, New York.

Dear Doctor Gardner,

Replying to your letter of January 12th asking to be permitted to make a survey of the films of Manheim employees, would advise that Doctor Loran has these films in his possession and it would be satisfactory for you to examine them and systematically record any changes or other information that you wish to obtain.

There are also some films at Manheim that have been taken of prospective employees who have worked in other industries that may have dust hazard and these are in possession of the Office at Manheim, Pa. and if you want to look at some of these, will you please contact:-

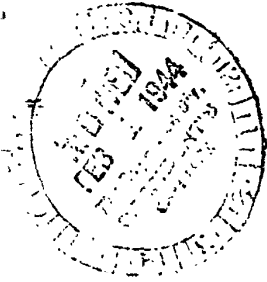
Mr. O.H. Gilley, Assistant General Manager,
United States Asbestos Division
of Raybestos-Manha Co., Inc.,
Manheim, Pennsylvania.

and he will be very glad to show them to you.

Of course it is understood that our name will not be mentioned in any way in the examination or in your report of the films. For a matter of your records and the Metropolitan Insurance Company it is alright, but I mean general publication.

Yours very truly,

3. Simpson,
President
RAYBESTON-MANHEIM CO., INC.



THE SARANAC LABORATORY
FOR THE STUDY OF TUBERCULOSIS
OF THE EDWARD L. TRUDEAU FOUNDATION
SARANAC LAKE, N.Y.

January 31, 1944

Mr. Sumner Simpson, President
Raybestos-Manhattan, Inc
Room 1623
120 Broadway, New York

Dear Mr. Simpson:

I appreciate very much your letter of the 10th which awaited me on my return from a recent trip. I am grateful to you for your offer to co-operate in the matter of reviewing films of your employees. I expect to see Dr. Lanza on Monday and will ask him to give me access to those films in his possession.

I do not believe that it would be profitable for us to review the pre-employment films that are at Mannheim as we are particularly concerned now with the evolution of asbestosis.

I shall, of course, refrain from mentioning the names of any particular employer in publication but simply acknowledge my indebtedness to a group of companies who have made such a study possible.

With best wishes,

Sincerely yours,

Leroy U. Gardner, M. D.
Director

LUG:RH

RM 171-8
4 29 27 62

✓

THE SARANAC LABORATORY
OF THE EDWARD L. TRUDEAU FOUNDATION
SARANAC LAKE, N. Y.

Leroy U. Gardner, M. D.
Director

July 26, 1946

Mr. Ernest Muehleck, President
Keasbey and Mattison Company
Ambler, Penna.

Dear Mr. Muehleck:

Your letter of July 23 is at hand to disturb an already guilty conscience. I by no means have forgotten my obligation to prepare the report of our studies for your industry. Every time I see a case of asbestosis or have occasion to examine tissue from a few of the animals that are still being sacrificed after injection with asbestos dust, I realize that I have not fulfilled my part of the bargain. My intentions are the very best, but it has not yet been possible for me to do any writing on the subject.

I am besieged by an influx of European visitors who are arriving here to find out what has been done during the war. Official delegations are coming from everywhere to consult us on aluminum therapy in silicosis and various other industrial disease problems.

It looks now as if I will not be able to take any vacation, as I had hoped to do as soon as the war was over. Therefore, I see little chance of my devoting the necessary two months to the preparation of your report until the winter."

I trust you will forgive me and realize that I very much want to do this, but simply have not yet been able to fulfill my intentions.

Sincerely yours,

LUG

LUG:LB
CC: Mr. Vandiver Brown

R M 1498-22



JOHNS-MANVILLE CORPORATION

TWENTY-TWO EAST FORTIETH STREET
NEW YORK 10, N.Y.

EXECUTIVE OFFICES

April 19, 1948

Mr. J. F. D. Rohrbach,
President,
Raybestos-Manhattan, Inc.,
Bridgeport, Conn.

APR 20 1948

Dear Mr. Rohrbach:

✓ By an interesting coincidence I received your letter of April 15th on the same day that I received advice from Saranac Laboratory that a report on Dr. Gardner's asbestos dust experiments would be submitted within approximately one month.

You and Mr. Simpson will recall that our contract with Saranac provided that the results of Dr. Gardner's experiments would not be published unless approved in advance by the asbestos textile group which financed the experiments. I shall be interested in yours and Mr. Simpson's ideas as to how we should proceed after the report has been received. Should we convene a meeting with representatives of the entire group or should a small committee be appointed to review and make recommendations? The latter would probably be preferable as it is my recollection they were approximately ten contributing companies.

As you are probably aware, Dr. Lanza became a Trustee of the Trudeau Foundation following Dr. Gardner's death and he was instrumental in securing the services of Dr. Kenneth Lynch, of Charleston, South Carolina, for the purpose of reviewing Dr. Gardner's experimental data and notes and preparing the forthcoming report thereon.

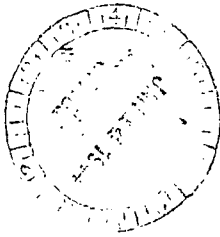
Please convey my regards to Mr. Simpson.

Sincerely yours,

Vandiver Brown
Vandiver Brown,
Secretary.

VB:y

RM 157-PA- Jek
4-29-77



THE SARANAC LABORATORY
FOR THE STUDY OF TUBERCULOSIS
OF THE EDWARD L. TRUDEAU FOUNDATION
SARANAC LAKE, N.Y.

January 12, 1944

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Mr. Sumner Simpson
Rebestos-Manhattan Company
Bridgeport, Connecticut

Dear Mr. Simpson:

I am getting material together for our monograph on asbestosis. Among other things we would like to include a section dealing with appearances in human subjects. Moore has reported a comprehensive survey of serial films over a period of years on the same individual.

I have written Vandiver Brown asking permission to review the films of his employee at Manville and I am wondering whether you would permit me to review those of your group at Manville. I would hope to be able to get at such a study the latter part of February. I won't be able to do so before because I am scheduled to leave for the tomorrow.

It is, of course, our purpose to describe the evolution of the X-ray shadow pattern with no reference to individuals would be made. We have been seeing films with Dr. Lanza and Dr. Moore. I have made no attempt to systematically record successive changes for the purpose of description.

I hope that it may be possible for you to grant us this favor.

With very best wishes,

Cordially yours,

Leroy U. Gardner

Leroy U. Gardner,
Director

LUG:RH

✓
Bridgeport, Conn.
April 15, 1948

Mr. Vandiver Brown, Secretary
Johns-Manville Corporation
22 East 40th Street
New York 16, New York

My dear Mr. Brown:

Mr. Simpson and I have discussed the work Dr. Gardner did at the Saranac Laboratory and have reached the conclusion that the industry could not possibly get a report on the work that was done under Dr. Gardner's direction for a long term of years.

Do you consider this matter closed or do you think there is any chance of getting some report through other staff members of the Saranac Laboratory?

Very truly yours,

JFDR:G

President

DM 107-247

✓
Bridgeport, Conn.
Sept. 27, 1937

Mr. Vandiver Brown, General Attorney
Johns-Manville Corporation
22 East 40th St.
New York City

My dear Mr. Brown:

I am enclosing copy of a letter received from Dr. Chas. E. Hyde, who is the physician for the DuPont's Fairfield factory. I am also sending a copy of the letter to Dr. Gardner.

I saw Dr. Gardner this summer at Lake Placid, and he stated he was very much interested in the results he had obtained, but, of course, it was too early to tell anything definite, but he does think the outlook is somewhat promising.

He made one remark when I asked him to obtain more information and advise you, and that was that the Harvard College Laboratory had sent him an asbestos sample which upon injection caused immediate death of the animals. This was a little bit strange. He did not know exactly where this sample came from, and I asked him to endeavor to find out. I expect in a few weeks, we may have some information as to this sample, and as soon as received, I will advise you promptly.

Very truly yours,

SS:G

Enclosure

President

R. M. 272-22

JOHNS-MANVILLE CORPORATION

TWENTY-TWO EAST FORTIETH STREET

NEW YORK, N.Y.

EXECUTIVE OFFICES

September 29, 1937.

Mr. S. Simpson,
President,
Raybestos-Manhattan, Inc.,
Bridgeport, Connecticut.

Dear Mr. Simpson:

I wish to acknowledge receipt of your interesting letter of September 27th.

I have heard nothing from Dr. Gardner concerning his experience with the asbestos sample sent him by the Harvard College Laboratory which, upon injection, caused immediate death of the experimental animals. I agree with you that this sounds strange. The sample in question must have come from Russia, which I am sure you will agree exports poison in a variety of forms. Anyhow, I trust it wasn't from Canada.

In regard to the copy of your letter from Dr. Hyde, referring to the work being done by certain people with aluminum dust as a counter-agent to free silica, I believe you will be interested in knowing that these experiments were conducted by two Canadian doctors and a metallurgical engineer. A preliminary report on the subject was presented before the Academy of Medicine at Toronto on June 15, 1937 and printed in the Canadian Medical Association Journal. If you or anyone in your company is interested, you can obtain a reprint of this report from Air Hygiene Foundation. In fact, I am surprised you have not already received one, since obviously news of this character must be welcome to the eminent industrial sponsors of Mellon Institute.

With kindest personal regards, I am

Sincerely yours,

Vandiver Brown
Vandiver Brown,
General Attorney.

VB:y

R-M 321 PL N.k

C O P Y

✓
Charleston, S.C. May 6, 1938

Mr. Julian Mitchell
Charleston, S. C.

Dear Mr. Mitchell:

I am very glad indeed to have the opportunity of examining Dr. Gardner's report on recent investigations of the effect of fine asbestos dust as compared with longer fiber dust. As he says, if the hypothesis constructed on the basis of this experimentation proves tenable, our previous idea that the finer the dust the more harmful will have to be revamped.

It all goes to show that the only thing that can yet be positively stated is that in the human sufficient exposure to asbestos dust will cause asbestosis, but what constitutes sufficient exposure still remains subject to lack of complete knowledge.

It might be well as a forward-looking program for the asbestos factory to begin to think more about precautionary measures in departments where the dust is coarser, although even apparently less in amount.

As Dr. Gardner says, there are things about asbestosis which have not been satisfactorily explained as yet. One that remains with me and my local material is, why the advanced old cases show so much evidence of pure silicosis. I have not been able to get any evidence that any of the asbestos used here may have had free silica in it, but, unless asbestosis under some conditions shows the feature of silicosis, it must have had.

I think that this question, that is whether local cases have not been exposed to free silica in addition to silicate, is very important for the local industry to clear.

I do not think that Dr. Gardner's experiments have any practical bearing on whether there is such a thing as asbestosis. Mr. Jeffords suggested to me that conclusion, out of the extract from Dr. A. J. Ireland in the South African Mining and Engineering Journal of Jan. 15, 1938. All I can conclude from this extract is that apparently under the conditions existing there, the exposure is insufficient. Whatever those conditions may be it might be well to ascertain, if possible.

Neither do I follow fully the suggestion in Mr. Vandiver Brown's letter of April 28, 1938, that Gardner's experiments would negative the claim that the fibrosis is of a progressive character. If the material is long enduring the fibrosis might keep up even though the influence is only mechanical.

I get stimulation from the South African report to again remind that no one can know what the hazard here is until the same sort of examination of workers is done here.

I shall be glad to talk these matters over with you at any convenient time.

Sincerely yours

R M. 20513
77/21

Handwritten: J. L. G. J.

THE SARANAC LABORATORY FOR THE STUDY OF TUBERCULOSIS
OF
THE EDWARD L. TRUDEAU FOUNDATION

Handwritten checkmark

POST OFFICE BOX 551
7 CHURCH STREET
SARANAC LAKE, N.Y.

May 19, 1938

Mr. S. Simpson
Raybestos-Manhattan, Inc.
Bridgeport, Conn.

MAY 23 1938

Dear Mr. Simpson:

Thank you for allowing me to see the copy of Dr. Lynch's comments on my report.

I have also been curious about his cases of asbestosis. He has sent me sections from some of them which I have felt indicated a silicotic rather than an asbestotic type of fibrosis. I have always been suspicious that the men whom he has autopsied may have had some previous or coincident exposure to free silica, producing a nodular rather than a diffuse type of fibrosis.

I am of course sorry that he feels that our experiments have no practical bearing on whether there is such a thing as asbestosis. This is a matter of opinion and I trust that others may find the information which we shall furnish to be of more use.

Dr. Lynch comments on the findings as to the lack of progression. He fails to bear in mind that after a fibre becomes coated to produce an asbestosis body, the mechanical irritation is minimized. This might very well explain the failure of continued irritation.

I am well acquainted ^{with the fact} that Dr. Lynch has some very positive ideas but feel that I am justified in differing from him from time to time.

Sincerely yours,

Handwritten signature: Leroy U. Gardner
Leroy U. Gardner, M.D.
Director

LUG:CC

✓
Bridgeport, Conn.
May 17, 1928

Dr. Leroy U. Gardner, Director
The Saranac Laboratory for the Study
of Tuberculosis
7 Church Street
Saranac Lake, N. Y.

My dear Dr. Gardner:

Enclosed find copy of a letter
from Dr. Kenneth M. Lynch, who is the doctor
in charge of our spinning plant at North
Charleston, S. C.

I think as a matter of informa-
tion I should pass this on to you.

If there are any questions you
would like to ask Dr. Lynch, would suggest
that you correspond with him direct.

Very truly yours,

ES:G

Enclosure

President

Copy to Katherine Brown

R. M. 2.11.28 Pl. Jk

Bridgeport, Conn.
May 17, 1938

Mr. Julian Mitchell
Mitchell & Horlbeck
Charleston, S. C.

My dear Julian:

I have yours of May 14, and am sending a copy of Dr. Lynch's letter to Dr. Gardner, and also a copy to Vandiver Brown, of Johns-Manville, so they will have a complete file of the asbestos dust question.

Very truly yours,

SS:G

2-11-38

JOHNS-MANVILLE CORPORATION

TWENTY-TWO EAST FORTIETH STREET

NEW YORK, N. Y.

EXECUTIVE OFFICES

May 18, 1938.

Mr. Sumner Simpson,
President,
Raybestos-Manhattan, Inc.,
Bridgeport, Connecticut.

Dear Mr. Simpson:

Thank you for yours of the 17th and for the attached copy of a letter from your Charleston doctor commenting upon Dr. Gardner's second progress report.

It seems to me Dr. Lynch has made a very thoughtful analysis of Dr. Gardner's report. However, it all comes down to this: We cannot draw any conclusions upon the basis of the experiments to date other than that any conclusions would be premature and, in spite of Dr. Gardner's references to the apparent trend of the results thus far developed, it is quite evident he feels the same way.

Very truly yours,

Vandiver Brown
Vandiver Brown,
General Attorney.

VB:y

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21/38

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R-711 210-18

Dust - Dr. Lynch

✓

Bridgeport, Conn.
May 23, 1938

Dr. Leroy U. Gardner, Director
The Saranac Laboratory for the Study of
Tuberculosis
7 Church Street
Saranac Lake, N. Y.

My dear Dr. Gardner:

CONFIDENTIAL

Very glad to get your letter of
May 19, in reference to Dr. Lynch.

I want to say I am pinning my
faith to you, and am quite positive it will
not be very long before you convince Dr.
Lynch that your findings, whatever they may
be, are correct.

I don't think Dr. Lynch had any
particular experience, other than general
medical practice, with dust problems until he
became connected with our North Charleston
plant, and he seemed to be about the only one
in that vicinity that was willing to learn
something about our dust problems. While he
has some positive ideas, I believe that he
will be subject to your proof, for I under-
stand he has a great deal of confidence in
Dr. Lanza and yourself.

Very truly yours,

SS:G

R-M 209 dd
5-12-71

Just

December 18, 1939.

Dr. Leroy U. Gardner,
The Saranac Laboratory,
Saranac Lake, New York.

Dear Dr. Gardner:

I have received yours of December 14th and the very interesting "Interim Report on Experimental Asbestosis" which was enclosed therewith.

As usual, I plan to distribute copies of your report to the various members of the group which has been sponsoring these experiments - ten in number. For this purpose I will require four (4) additional sets of the illustrations and I will appreciate your furnishing them at your earliest convenience.

The matter of financial support for another year of experimentation will have to be considered by the group and for that reason I cannot, of course, give you any definite advice at this time.

With very best regards, I am

Sincerely yours,

VB:y

Vandiver Brown,
General Attorney.

Cc Mr. Sumner Simpson,
Raybestos-Manhattan Inc.,
Bridgeport, Conn.

4-29-77 *pk*

RM 195 *sd*

NEW YORK, N. Y.

December 26, 1939.

Re: Asbestos Dust Experiments -
Dr. Leroy U. Gardner

Enclosed is a photostatic copy of an "Interim Report" submitted by Dr. Leroy U. Gardner in connection with the asbestos dust experiments he has been conducting during the past three years with the assistance of your company.

You will note Dr. Gardner's statement at the conclusion of the report that the experiments are not yet complete and that an additional sum of \$5,000 will be required to finish them. Dr. Gardner, in his letter transmitting the report, says "I sincerely trust that the companies who have sponsored this work may feel disposed to help us to finish it."

May I have, as soon as possible, an expression of your company's position as regards the continuance of these experiments and its willingness to share in the expense thereof for an additional year?

Sincerely,

Vandiver Brown,
General Attorney.

VB:y

Hammond
Charleston
SS

Interim Report on Experimental Asbestosis
at the Saranac Laboratory

Hammond
Charleston

The original purpose of these experiments was to reproduce in animals an advanced stage of asbestosis whose progress could be followed anatomically and in x-ray films. There were two major objectives - one, to establish a better correlation between the various shadows seen in x-rays and the pathological changes in the lungs, and the other to determine in how far associated infection was responsible for the severer manifestations of the disease.

Upon the basis of previous experience with pure free silica, it was thought that the reaction to inhaled asbestos would develop most rapidly if the inhaled fibres were exceedingly fine. Accordingly Canadian chrysotile was ground in a steel ball mill until practically all of the material was reduced to 2 microns or less in maximum diameter.

This ground fibre was placed in a hopper and churned to liberate dust in the atmosphere of an 8x8x8 foot animal room. It has not been previously reported to the sponsors of the experiments and in fact the writer was until recently unaware that one volume of unground fibre was being added to every three volumes of the very fine asbestos to facilitate agitation of the material in the hopper. Thus there has been a limited amount of long fibre asbestos liberated in the atmosphere; however the quantity is comparatively small as the paddle, moving freely in the hopper, does not fracture much of the coarse fibre. The average concentration of fine asbestos dust inside the animal cages ranged about the wall of this room has been 145 million particles per cubic foot of air. (It should be noted that this figure is 29 times that set by the U.S. Public Health Service as the maximal permissible concentration of asbestos dust in industry).

Exposed to this concentration for 3 hours a day, 6 days a week were 80 guinea pigs, 8 rabbits, 20 white rats and 17 cats. Beginning with the fifth month of the exposure, sample guinea pigs were sacrificed at intervals. The last group was killed on Sept. 25, 1939, thirty months after starting the exposure. As shown in figure 1, there is barely enough change in a thin microscopic section to be visible on magnification of 2 or 3 diameters. Still higher magnifications (not reproduced here) reveal that the reaction is not fibrous in character, but more of the nature of a chronic inflammation.

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Figures 2A and 3A show the less advanced changes after exposures of 12 and 20 months respectively. Figure 2B demonstrates for comparison the very much greater reaction obtained after a 12 months asbestos exposure in a previously reported experiment. In that instance the average atmospheric dust concentration was only about one-third that in the present experiment, but the fibre was longer in that case.

This experience seemed to demonstrate that, contrary to the behavior of quartz, asbestos dust would not become more irritating as the size of the particles decreased.

This conclusion could not be maintained, however, until it was proved that the particular lot of asbestos was capable of producing fibrosis in the lungs of guinea pigs. The only way to be certain of this point was to try another inhalation experiment as previous experience had shown that injection tests are not applicable to asbestos dust as they are with quartz.

Accordingly, in the fall of 1938 another dust room was taken over for an experiment with unground asbestos of the same lot. After some experimentation a suitable dust, containing a high proportion of fairly long fibres was secured by affixing both to the sides of the dust hopper and to the rotating paddles a series of steel wire brushes. The sheering action of the opposing sets of wires broke the asbestos into lengths that could be inhaled. Inside the cages the average atmospheric concentration of fibres that could be expected to be inhaled into the lungs was 37.5 million particles per cubic foot of air.

On the same 8 hour daily schedule 100 guinea pigs, 20 white mice and 6 cats were exposed in this room.

The guinea pigs have been sacrificed at intervals, the last group being killed on November 3, 1939, one year after starting the exposures. As shown in figure 3B there is much more reaction to the long fibres than to the finely ground material from the same lot, even though the concentration in the air was only about one-fourth as great. Higher magnifications show that the longer fibres are beginning to cause fibrosis rather than the chronic inflammation produced by the fine material.

To learn more than could be inferred from mere inspection of microscopic sections about the quantities of dust inhaled into the lungs, representative proportions have been subjected to chemical analysis. For the fine material these tests were not started until the 12th month of exposure, when it came to be appreciated that the anticipated fibrosis was not developing. In the long fibre experiment they were made earlier but only a few of them will be reported here as they have no basis of comparison. In the following figures it will be noted

that in neither series is the weight of inhaled material sufficient to affect the per cent of ash very much.

Magnesium silicate cannot, of course, be determined as such and the amount of available tissue in each lung precluded determination of both magnesium and silica. Therefore only the latter was done. It is to be understood that in the table the SiO_2 values are merely an index of the relative amounts of asbestos present in the different lungs. The values shown by the figures for 1 month's exposure to long fibre asbestos begin to approximate those for a normal guinea pig. It will be noted that 3 or in some cases 2 animals' lungs were analysed after each interval of exposure. The results for each is given to indicate the degree of individual variation.

Table

Period Exposed	<u>Long Fibre Asbestos</u>			<u>Short Fibre Asbestos</u>		
	<u>Dry Lung Tissue</u>		<u>Ash</u>	<u>Dry Lung Tissue</u>		<u>Ash</u>
	<u>% Ash</u>	<u>% SiO₂</u>	<u>% SiO₂</u>	<u>% Ash</u>	<u>% SiO₂</u>	<u>% SiO₂</u>
1 mo.	4.35	0.04	1.10			
	4.33	0.09	2.11			
	4.37	0.04	0.93			
8 mo.	4.72	0.10	2.21			
	4.92	0.09	1.90			
	4.34	0.07	1.58			
12 mo.	4.87	0.25	5.20	5.02	0.51	10.25
	5.02	0.20	4.09	4.58	0.46	10.08
	5.16	0.31	5.99	5.16	0.54	10.54
15 mo.				5.00	0.49	9.96
				4.76	0.43	9.00
				4.95	0.53	10.60
20 mo.				5.86	0.85	14.46
				6.34	0.90	14.07
24 mo.				5.42	0.78	14.48
				5.50	0.78	14.20
30 mo.				5.35	0.96	17.89
				6.55	1.27	19.46

The above figures prove that with both long and short fibre dusts significant quantities are entering the lungs. The comparisons at the 12 month interval indicate that more short fibre enters the lung than long. This of course would be expected in view of the more ready penetration of the fine dust and the fact that its average concentration in the air was four times as great.

The proof now seems conclusive that grinding asbestos to this degree of fineness destroys its capacity to irritate the lungs.

1. It has been shown that long fibre asbestos will produce significant changes in guinea pigs lungs within a period of one year.
2. It has been shown that on grinding some of the same lot of asbestos it is no longer capable of causing the same effect in 30 months.
3. It has been proved by chemical analysis that the failure to react is not due to failure of the fine material to penetrate into the lungs.
4. It has been shown that about one-fourth the atmospheric concentration of long asbestos fibres has much greater effect upon the lungs than a concentration 145 million per cubic foot of exceedingly fine particles.

This evidence strongly suggests that the irritation from asbestos is not chemical but mechanical in nature. Attempts to prove this hypothesis have taken various directions.

It has been shown in a series of injection experiments that no fibrosis results when asbestos is injected into other organs of the body than the lungs. Chemically active quartz, however, causes fibrosis wherever it comes in contact with connective tissue cells.

It has been shown that, in animals, asbestosis does not progress after cessation of exposure. The reverse is true in the case of chemically active quartz. The smooth covering deposited upon the surface of an asbestos fibre that forms the asbestosis body after two months contact with the tissues would tend to minimize mechanical injury.

It seemed probable that the lungs rather than the other organs should be mechanically injured by asbestos because the lungs move rapidly and constantly. To test this theory the lungs of four dogs were injected with a heavy suspension of long fibre asbestos. By means of a tube in the wind pipe, material was carefully introduced in both lungs. Then one lung was collapsed by

cauterizing the inside of its stem bronchus with silver nitrate so that ~~it~~^{no} longer moved in respiration. Thus we had what was thought to be effective doses of asbestos in either lung but only one would move to produce the mechanical injury and resultant fibrosis.

The animals survived their treatment with no apparent ill effect. A month ago two of the dogs were killed on the first anniversary of their injection. In each case one lung was well collapsed and there were asbestos fibres on each side. However, there was neither fibrosis nor asbestosis bodies in either lung of both animals. Apparently we were misled by a report in the literature that dogs were susceptible to the action of asbestos. The result was disappointing but the method of attack seems reasonable if it can be applied in guinea pigs. We are now trying to overcome the technical difficulties involved in working with such a small animal.

The matter of species susceptibility is a puzzling feature which need not be discussed here. None of the rats, rabbits or cats exposed to the short fibre asbestos have reacted. The 6 cats, now exposed to long fibre dust for 13 months, are being kept in the dust room until their exposure reaches two years before comparative x-ray and anatomic studies are begun. The guinea pigs continue to be a reliable animal with which to experiment.

While the experiments have demonstrated that it is not possible to accelerate the rate of reaction in the body, and the anticipated results have not been realized, it is felt that the effort has been extremely profitable. As pointed out in a previous report to the sponsors, they have shown the innocuousness of finely ground asbestos, which is of real practical significance. They probably explain the lack of asbestosis in the mills at Thetford. They may help to define the hazard in other plants where very finely ground material rather than fibres constitute the major element in the dust. They serve as a guide to engineers who must control the hazard in plants, indicating that their efforts must be directed particularly toward the fibrous material in the air.

In view of the probability of fulfilling the original purpose of these experiments, it is hoped that the sponsors may agree to renew their appropriation for another year. For the past 12 months the Laboratory has assumed the obligation of operating a second dust room for the asbestosis work. The expense is somewhat over \$5000. In addition it has carried on various collateral injection experiments, such as those upon the dogs and others not mentioned in this report. It has secured an appropriation for an inhalation experiment upon the

✓
admitted
1000 ft
Jan

the effect of glass wool, which may prove a useful control to the mechanical theory of the action of asbestos. It is hoped that you may find these accomplishments sufficiently valuable to be willing to continue the work.

Respectfully submitted,

A handwritten signature in cursive script, reading "Leroy U. Gardner". The signature is written in dark ink and is positioned between the phrase "Respectfully submitted," and the typed name "Leroy U. Gardner, M.D.".

Leroy U. Gardner, M.D.