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Fiberglas Health Hazard Investigation

WALTER J. SIEBERT, M.D.
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THE development and use of a new basic material frequently gives rise to a question as to the possible health hazards for workers handling the material. Glass fiber products, now widely used for thermal and electrical insulation, are still of such comparatively recent origin that the question of a possible health hazard is not unnaturally associated with them.

This association, while it is to be expected because of the newness of the products, is due in part to a special circumstance. The word glass is surrounded by connotations which suggest a hard, shatterable, transparent material. Although Fiberglas is glass in a new physical form, and with physical properties which make it unrecognizable as glass by persons who are familiar only with glass in its more conventional forms, the old connotations may cling to the new products.

Purpose of the Investigation

THIS article summarizes an investigation which was carried out by the author during the month of June, 1941, at the request of WILLIAM H. BARTLEY, of the law firm of Bartley and Mayfield, St. Louis. MR. BARTLEY is attorney for the International Association of Heat and Frost Insulators and Asbestos Workers, Local Union No. 1, of St. Louis, Missouri.

The purpose of the investigation was to determine the existence or non-existence of health hazards in connection with Fiberglas thermal insulating materials which are used or may be used by members of the union. The investigation was conducted by the author as an unbiased, independent consultant, in no way, other than in carrying out the assignment, associated either with the union or with Owens-Corning Fiberglas Corporation, manufacturers of Fiberglas.

Throughout the course of the investigation the author was given complete cooperation by Owens-Corning Fiberglas Corporation, and untrammelled access to all its pertinent records. The author, however, accepted no statements made by the corporation's officials as valid unless supported by his objective examination of the records, and by objective evidence adduced from disinterested sources and his own research.

The investigation covered the following specific phases:

1. Pulmonary disorders, diseases of the upper or lower respiratory system, and gastro-intestinal diseases.

[NOTE: DR. SIEBERT, formerly assistant professor of pathology, Washington University School of Medicine, is Pathologist and Director of Laboratories of DePaul Hospital, Lutheran Hospital, St. Louis; St. Joseph's Hospital, Alton, Illinois, and St. Mary's Hospital, Cairo, Illinois. He is a member of the American Board of Pathology, American Association of Pathologists and Bacteriologists, American Association of Experimental Pathology, and the Society of Experimental Biology and Medicine.]

2. Eye, ear, nose and throat infections,
3. Dermatitis.

Fiberglas a Form of Mineral Wool

FIBERGLAS is true glass, but, chemically, it is substantially identical with mineral wool. It can properly be classified as a new, refined form of mineral wool. The fact that mineral wool has been used for many years without causing any known industrial diseases, while by no means conclusive, in itself suggests that there is nothing in the inherent physical characteristics of Fiberglas that is likely to introduce any serious occupational hazard.

The chemical and physical characteristics of binders used in manufacturing and processing Fiberglas, like the chemical and physical characteristics of the glass fibers, are not of a kind from which serious industrial health problems would theoretically arise. This conclusion is based upon examination of formulas used in the manufacture and processing of Fiberglas products.

1. No free silica is present in the material known as Fiberglas.

2. No carcinogenic hydrocarbons or other hydrocarbons could be present in Fiberglas because of the extremely high temperatures employed in fusing the batch during the manufacturing process.

3. No harmful fumes could be given off, since no substances are present in the Fiberglas which would volatilize within the recommended service ranges.

4. Absent from Fiberglas is any free sodium silicate.

5. Only three binder substances are present in glass wool products used for industrial insulation. These are bakelite, a refined mineral oil, and bentonite.

6. Bentonite is a refractory clay that is employed as an ingredient of candy with the cognizance of the United States Food and Drug Administration. There is no evidence from factory experience that either bakelite or the mineral oil used for binding substances is the cause of a health hazard.

Medical Literature Searched

AN important phase of the investigation was an exhaustive search of world medical literature for references to possible health hazards in the handling of Fiberglas. This search failed to reveal references to any new or unusual occupational hazards in the handling of these products.

In view of the continually expanding market for Fiberglas products since 1932, and in view of the promotion and advertising campaigns directed toward increasing their sale, the scarcity of references to the subject in the literature of science and medicine, and the lack of controversy or interest in the subject on the part of persons usually alert to possible industrial hazards, cannot be attributed to a lack of familiarity with the existence and use of the products. On the contrary, it warrants the conclusion that the handling of the products is attended by no unusual occupational hazard.

Fiberglas Free of Dusting Characteristics

ON the basis of his own careful observation, and dust counts made in Owens-Corning's Newark, Ohio, plant, the author finds that Fiberglas is remarkably free of the dust which characterizes certain products. Because of the length of the fibers and the "pack strength" of Fiberglas, there is negligible dusting of the material during handling. The glass fibers break, rather than shatter, along clean edges at points where they are abraded by sawing, chopping or cutting during production line or fabricating operations.

The following extract is from "Researches of Mellon Institute 1940-41":

"L. U. GARDNER, Director, Saranac Laboratory, has reported on the researches which the Foundation supports at his institution, saying in part. . . 'We have been studying the effect of inhaled glass wool. Apparently even the finest textile glass set up as an atmospheric dust is not inhaled in appreciable concentrations and does not produce any dangerous effects upon the lung.'"

A further report on DR. GARDNER'S work appears in the Annual Report of the Saranac Laboratory for the Study of Tuberculosis of the Edward L. Trudeau Foundation for the Year 1940. The following statement is made on page 11 of the report:

"The apparent lack of pulmonary damage from exposure to glass wool dust is being demonstrated by an inhalation experiment. For over a year animals have now been exposed to as high a concentration of this material as could be maintained, with no serious effect upon their lungs. The dust has been produced by breaking into short lengths the finest textile glass that is made but none of the fibers that are floating in the air can be found in the lungs of the exposed animals. Their tendency, unlike that of asbestos, to form felt-like masses upon any object with which they come in contact, probably prevents their inhalation. Slight amounts of chronic inflammation similar to those observed with other harmless dusts, have resulted from accumulated particulate debris. These very fine, non-fibrous particles are the by-product of the violent beating used to break up the material."

X-ray Plates of Employees

THE author examined several hundred stereoscopic x-ray plates of the chests of employees of Owens-Corning Fiberglas Corporation. These were selected at random by the author from the files of some 1500 plates taken since the company, in 1939, instituted the policy of making x-ray plates of the chests of all Newark employees. Among the plates selected for special inspection were those of employees working in the batch house where the raw materials for Fiberglas are handled, and the plates of employees with records of silicosis.

Beginning in May, 1939, serial stereoscopic chest films were made of the 15 men who are now working, or who have worked, in the batch house. A repeat examination of all of the men was made in June, 1941. In no case was there any radiographic evidence of pulmonary disease.

Three cases of silicosis were discovered by the company. None of these men had ever been employed in the batch house, but their employment does require the handling of Fiberglas products. It is the policy of the company neither to refuse employment to, nor discharge, any man for whom safe employment can be found. The following covers the occupational histories of these three workers:

1. CASE No. 1 worked for another company as a molder from 1924 to 1929, and roentgenograms of the chest were made in 1929 because of the presence of tuberculosis in his family. Chest plates were again made in 1936 because of suspicion of silicosis. He was first employed by Owens-Corning Fiberglas Corporation on June 6, 1940.

2. CASE No. 2 was employed as a bottle blower and machine operator from 1901 to 1930. He was first employed by Owens-Corning Fiberglas Corporation on March 26, 1941. Silicosis was diagnosed following an

x-ray examination of the chest made on May 12, 1941.

3. CASE No. 3 worked for 12 years as a molder before entering the employ of Owens-Corning Fiberglas Corporation on October 25, 1939. Silicosis was diagnosed following an x-ray examination of the chest on November 1, 1940.

In each of these silicosis cases there is a sufficient causative factor in the man's previous employment history or other circumstances, and the evidence is entirely inadequate to indicate that the condition of any one of these three men should be attributed to any silicosis hazard encountered in handling Fiberglas, even assuming such a hazard to exist.

Physicians Give Fiberglas Clean Bill

EXAMINATION of the records of disability and absenteeism in the office of the plant physician of the Owens-Corning Newark plant reveals that there is no unusual incidence of respiratory infections among Owens-Corning employees. Statements furnished directly to the author by Newark physicians whose practices are limited to eye, ear, nose and throat diseases, and who are in no way affiliated or associated with the company, indicate that these specialists notice no unusual incidence of respiratory disturbances among their private patients employed by the company, as compared with their private patients who are not employees.

The following letter, dated June 17, 1941, written to the author by JOHN E. HENDRICKS, M.D., of Newark, is typical of letters received from Newark eye, ear, nose and throat specialists:

"I am one of five E.N.T. [ear, nose and throat] specialists located in this city. I have practiced my specialty in Newark for three years following a four-year residency in an Eastern hospital. During these three years I have treated my share of Owens-Corning employees. I can safely say that I have noticed no unusual preponderance of head or throat infections among these people as compared to my other patients who are not employed there.

"If I ever make a table showing percentages of different diseases that I have treated, I feel sure that there would be only a normal proportion of Owens-Corning employees in each classification."

On the basis of the evidence, the author finds that workers handling Fiberglas products are subjected to no special occupational hazards that manifest themselves in eye, ear, nose or throat disorders, pulmonary disorders, diseases of the upper or lower respiratory system, or diseases of the gastro-intestinal tract.

Temporary Skin Irritation

NEW employees of Owens-Corning Fiberglas Corporation engaged in handling Fiberglas products occasionally suffer a mechanical irritation of the skin for a few days at the start of the job. Except for extremely rare cases of workers who may be allergic to an ingredient of binders or lubricants used in processing glass fibers, the irritation disappears within a few days. The new workers apparently become immunized against the action of the fibers, and they suffer no further discomfort.

The company recommends that workers wear clothing loose at the neck and wrists, and that they use plenty of warm water and soap when the day's work is done. Soap and water has proved most effective in removing particles of fibers, whether of glass or any other material, from the skin. The company has found that there is seldom, if ever, need of gloves, armlets or other protective clothing. In the absence of gloves or similar protective clothing there is less tendency for fiber particles to be rubbed into the skin.

Two Hundred Employees Examined

ON June 3, 1941, the author made an examination of the wrists, arms, ankles, necks, eyes, shoulders and waists of approximately 200 production employees engaged in handling Fiberglas products in Owens-Corning's Newark plant. These workers were employed on production lines and at fabricating operations, cutting, sawing, shaping, transporting and packaging glass thermal insulating wool, both bonded and unbonded.

The author did not see a single case of eye irritation or conjunctivitis during this inspection. Only one worker who had begun to work in the plant four days before on a fabricating job showed evidence of significant skin irritation. One 22-year-old employee who told the author he had worked in the plant for two and a half years said that, although he had become accustomed to handling Fiberglas and suffered no discomfort while continually on the job, he had noticed a mild skin irritation that lasted a few days after returning to the job following his two-week vacation.

"As long as I am working right along," he told the author, "I stay toughened up to it. But if I haven't been handling it for a while, like when I'm on my vacation, then it takes a few days to get over the itch when I start in again."

Many of the workers who were examined said the temporary irritation was similar to blisters on the hands that are the result of unaccustomed manual work while the hands are getting toughened to a job. "It don't bother me none," was the reply repeatedly heard by the author in response to his question as to whether the handling of Fiberglas products caused irritation.

Biopsy Specimens Taken

AT THE request of the author, DR. H. A. CAMPBELL, the Newark plant physician, removed two biopsy specimens of skin from the arm of the newly-employed worker who showed a moderate degree of skin irritation. Serial microscopic sections of this tissue showed a mild degree of capillary dilatation in the corium of the skin. In addition, there were a few scattered lymphocytes around several of the dilated capillaries. The epidermis was entirely normal. No glass particles were found. There was no evidence of fibrosis, bacterial infection, allergy or hyperkeratosis.

Several of the serial sections revealed a small amount of a brownish pigment in the corium which showed no inflammatory reaction around it. It is assumed that this pigment is bakelite, one of the substances used as a binder for the glass fibers. The fact that there was no foreign body reaction around this indicates that this material is an inert substance, and that it does not produce either a foreign body reaction or a fibrosis. The extremely mild inflammatory reaction in the corium of the skin would result from any slight mechanical irritation.

Report of Louisville Dermatologist

DR. ADOLPH B. LOVEMAN, Louisville dermatologist, reporting on an examination of 10 workers who handled Fiberglas, writes, "I did not find any evidence of a definite contact dermatitis in any of the employees although some complained of a mild itching when handling the product. The dermatitis produced was unquestionably of a very mild and transient nature."

"I did examine one patient who complained a great deal of a skin eruption and who felt certain it was due to the Fiberglas. He presented, however, a toxic eruption,

and upon questioning him I learned it had been present at times prior to working with Fiberglas. Nevertheless, we removed him from this work for a period of two or three weeks, after which I again examined him and he presented the same type of eruption. In this particular case, it is my opinion that his teeth were probably the foci of infection."

The author believes that the following generalization is warranted by the evidence:

Contact with glass wool may cause ephemeral discomfort among workers inexperienced in handling the material. The skin irritation, however, cannot be regarded as a progressive dermatitis, for it is non-toxic and usually disappears in a few days. In extremely rare instances, where a worker may be predisposed to secondary effects of mechanical skin irritation because of idiosyncrasy, allergy, or the presence of foci of infection elsewhere in his body and otherwise dissociated from the effects of mechanical irritation, lesions may persist. But these cases are encountered with such rarity that they do not justify incriminating glass fiber as a causative factor.

No Claims for Workers' Compensation Validated

FIBERGLAS products have been produced in the Newark, Ohio, plant of Owens-Corning Fiberglas Corporation over a period of nine years. The number of employees has ranged from approximately 20 when production was started in 1933 to more than 1800 in 1941. During this nine-year period no claims for workers' compensation, on the basis of an industrial disease arising out of employment in the manufacture and handling of Fiberglas, have been validated in the State of Ohio.

A letter dated June 17, 1941, from MR. J. A. SHAW, Claims Referee of the Industrial Commission of Ohio, Legal Section, addressed to the author reads, in part, as follows:

"For your information, we recognize diseases of the respiratory tract as compensable occupational diseases, such as silicosis, asbestosis, anthracosis, and siderosis. As a matter of fact, there is a provision under the law to recognize any disease of this type which is caused by the inhalation of any injurious dusts."

"We endeavor to keep a complete statistical record in the Department of Safety and Hygiene of all cases of this type. I have made a thorough check with this department, and to date we have never had a claim filed for a disease of the upper respiratory tract caused by the alleged inhalation of Fiberglas particles."

Health Better Than Average

THE health of Fiberglas workers is regarded as better than average by the Aetna Life Insurance Company, which underwrites group insurance (life, disability, sickness and hospitalization) for employees of Owens-Corning Fiberglas Corporation. In a letter to an executive of the corporation dated June 11, 1941, JOHN A. HILL, Toledo General Agent of the Aetna Life Insurance Company, wrote, in part, as follows:

"The health of your employees has been better than average. This is evidenced by the fact that we now have in effect a 35% reduction in rate (from standard) on both the sickness and hospitalization insurance carried by your employees. This is the result of nearly four full years' exposure, and develops a rate lower than any similar industry that we have insured. . . .

"There is in effect a permanent and total disability feature in connection with your life insurance, and as yet there has been only one claim from an employee, and this was due to a non-occupational

accident, far removed from the course of his occupation or from any health hazard in his occupation."

The author regards as particularly significant the following paragraph from Mr. Hill's letter:

"... our Casualty Company carries what is known as products liability at an extremely low rate, and no claim has ever been presented, indicating, of course, that there is no hazard in the use of Fiberglas or any of its products."

In submitting his best judgment, based on his professional interpretation of all facts assembled in the course of the investigation, the author finds that there is no silicosis, fibrosis or dust hazard connected with working with Fiberglas, and that the manufacture, fabrication and application of Fiberglas products is attended by no unusual occupational hazards.

Head Injuries

—An Analysis With Reference to
Accident Prevention—

LT. HYMAN LIEBER, (MC) V (S), U.S.N.R.,
Navy Yard, New York

THE U. S. Navy Yard at New York recently instituted a policy requiring the wearing of safety helmets by all workers exposed to head injuries. It was considered desirable to prepare an analysis of head injuries for a period preceding the new regulation, to serve as a basis of comparison for similar studies after the general adoption of skull guards. Special attention was therefore directed to injuries of the skull, scalp and forehead within the area that can be protected by safety helmets. This report is presented as a

characteristic experience at a large shipbuilding plant that does not utilize skull guards.

Frequency of Head Injuries

TWO hundred and fourteen cases of head injury were treated at the Dispensary during the six-month period ending June 30, 1941. This represents a gross yearly incidence of 2.62% of the average industrial complement of 16,287 workers during this period.

Nineteen cases have not been included in this study because the nature of the accident or the location of the injury bore no possible relation to safety helmets or skull guards. The remaining 195 cases represent a yearly incidence of 2.4% of the average industrial complement. In other words one in every 42 workers has a head injury every year.

Time-Loss Due to Head Injuries

ONLY 10 of the cases (5.1%) were serious enough to require pass-out. These 10 men lost 77 days, or an average of 7.7 days each. The longest period of disability was 40 days.

The 10 pass-outs necessitated by head injuries accounted for 1.63% of the 611 tabulatable injuries from all causes during the period of observation, and the time loss they occasioned was 1.02% of the 7904 working days lost because of all non-fatal accidents during the six-month period.

Comparative Hazard of Head Injuries

THE incidence of head injuries varied markedly among the various trades.

TABLE II.

	Average Number Employed	Head Injuries	Yearly Incidence %
Painters	463	14	6.04
Shipfitters	1,968	34	3.4
Laborers	919	16	3.4
Riggers	628	10	3.0
Sheet metal workers ...	893	10	2.2
Electricians	1,300	15	2.2
Machinists	2,938	25	1.6
Pipefitters	946	7	1.4
Welders	1,208	7	1.0
All industrial employees	16,287	195	2.4

Painters have almost twice as many head injuries as any other trade in the yard. It is noteworthy, however, that these injuries are not serious. Only one required a pass-out and the patient returned to work after two days.

Shipfitters, laborers and riggers form the next most hazardous group. Their numerical incidence of injuries is one and a half times the Yard average.

Type of Accidents Causing Head Injuries

THE nature of the accident causing the head injury was reviewed in all the cases of this series. In 92 cases (47.2%) "something fell"; in 84 cases (43.3%) the patient "bumped his head against something"; in seven cases (3.6%) the injury was caused by a fall; and in the remaining 12 cases (5.9%) the accident was ascribed to such miscellaneous causes as "hit self with shovel," "hit by elevator gate," "hit by coupling while disconnecting air hose," "hit self with wrench that slipped," "hit by swinging chain," "hit by door blown by wind," and "hit by pipe handled by fellow worker."

Head injuries caused by falling objects are potentially much more dangerous than those due to striking the head against overhanging structures; especially when material falls from a height. This difference was not demonstrated in our cases. In fact, it was only by

TABLE I.
DISTRIBUTION OF CASES BY OCCUPATION

Apprentice: Boilmaker	1
Electrician	1
Shipfitter	3
	5
Blacksmith	1
Boatbuilder	1
Chipper and caulker	17
Coppersmith	1
Coppersmith helper	1
	2
Driller	8
Electrician	12
Electrician helper	3
	15
General helper	4
Joiner	2
Laborer	16
Machinist	22
Machinist helper	3
	25
Painter	14
Pipecoverer	1
Pipefitter	3
Pipefitter helper	4
	7
Plumber	2
Puncher	1
Rigger	5
Rigger helper	5
	10
Sailmaker	1
Sewer	1
Sheet metal worker	10
Shipfitter	14
Shipfitter helper	20
	34
Shipwright	9
Welder	7
Woodworker	2
	195

MEDICINE



SURGERY

OCCUPATIONAL DISEASES
TRAUMATIC, INDUSTRIAL

INDUSTRIAL MEDICINE
& RAILROAD SURGERY

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IF it be true that good wine needs no bush," these pages need no prologue. Suffice it, then, to note a few significances. . . DR. WHITTAKER'S "Inter-Innomino-Abdominal Operation" (page 1) is eloquent proof that, regardless of all the added responsibilities connoted in "industrial," the industrial surgeon is no less the surgeon. . . THE coincidence noted on the Editorial page seems additionally conclusive that NOW is the time. . . DR. SAPPINGTON'S review of DR. RUTHERFORD JOHNSTONE'S new book (page 29) is more than a review; it is a critique. . . THE quoted paragraph in "DR. GRAY'S BUREAU" (page 36) pointing out the practicality of a well-rounded medical service might well be the text of many an employer-persuasion: "To employees, poor health means loss of wages, shorter periods of usefulness and resulting social and financial privations which they and their dependents must bear. To the employers, such health experiences mean loss of services of the employee, forced use of less skilled employees, retarded production schedules and increased manufacturing costs." . . . As we go to press we learn, via *New York Times*, that DR. JOHN J. MOORHEAD (see item on page 10) arrived in Honolulu December 3, and was lecturing to a group of physicians there early that Sunday when the Japanese planes "roared overhead." The copyrighted report continues: "When he heard bombs dropping he rushed to the Army hospital and started work. He has been on active duty since."

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