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December 21, 1973

CERTIFIED MAIL
RETURN RECEIPT
REQUESTED

Hearing Clerk
Food and Drug Administration
Room 6-86
5600 Fischers Lane
Rockville, Maryland 20852

Dear Sir:

I am responding in behalf of Johns-Manville Products Corporation ("J-M") to the Food and Drug Administration's (FDA) Notice of Proposed Rule Making relating to asbestos particles in food and drugs, as published in the Federal Register on September 28, 1973 (hereinafter referred to as the "Proposal").

The Proposal indicates that interested persons may, on or before December 27, 1973, file with the Hearing Clerk, written comments regarding the petition from the Center for Science in the Public Interest and the Environmental Defense Fund and the Proposal.

Desert Minerals, Inc., an affiliate of Johns-Manville Products Corporation, is a major producer of crude and processed talc, a substantial portion of which is sold for use in the manufacture of food and drug packaging materials.

On April 20, 1973, J-M forwarded to FDA a letter with attachments containing comments to proposed regulations covering the use of talc in food and food packaging material, as published by FDA in the Federal Register on August 12, 1972.

It is requested that those comments be incorporated as part of the record with respect to the Proposal. The Proposal, as it relates to the use of talc, differs importantly from the earlier FDA proposal in that FDA is now additionally proposing a restriction on the use of talc containing asbestos fibers in "any drug, drug ingredient, or drug packaging material."

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Although J-M's comments dated April 20, 1973 did not specifically refer to the use of talc in drugs, drug ingredients, or drug packaging materials, all of the comments and evidence submitted by J-M with respect to the use of talc in food and food packaging material is relevant and applicable to its use in drugs, drug ingredients, or drug packaging materials.

J-M'S POSITION

The use of talc is ecologically and economically desirable and essential in the manufacture of food and drug packaging materials. Based upon all known research studies and tests, J-M is convinced that any tremolite present in talc used in food or drug packaging materials will not migrate into food or drugs and the use of talc in food and drug packaging materials poses no health hazard to the public and significantly reduces pollution of water supplies associated with the production of pulp and paper.

1. THE VALUE AND USE OF TALC IN THE MANUFACTURE OF PULP AND PAPER

Talc serves a number of very valuable functions in the manufacture of pulp and paper. The paper industry would be severely handicapped and pollution of streams increased if the use of talc containing tremolite were restricted, as there are no viable substitutes for talc in these processes. As discussed below, surface active agents or emulsifying agents can be used as a substitute for talc, however, these agents are undesirable as their presence in the process effluent results in significant pollution problems including the mass killing of fish.

The use of talc in the manufacture of pulp and paper is not limited solely to the manufacture of paper for food and drug packaging applications. Talc is used in the manufacture of pulp generally and in the manufacture of all types of paper.

At the time pulp is produced, it is not specifically designated for end use applications in food and drug packaging materials. Therefore, limitations on the use of talc in food and drug packaging materials would affect the entire paper industry and it would be totally impractical, if not impossible, to place a restriction on the use of talc solely limited to the manufacture of food and drug

packaging applications. United States paper manufacturers import significant quantities of pulp from Canadian and Scandinavian producers for consumers in the U. S. Packaging materials and packaged foods and drugs are imported from many areas of the world. Thus, the Proposal adversely affects the entire worldwide pulp, paper and packaging industries. Therefore, limitations on the use of talc cannot practically be restricted to only food and drug packaging materials.

It should be noted that the only form of asbestos found in J-M talc is tremolite. J-M "CYCLO-SORB", which is used for pitch control contains 2% to 5% tremolite by volume and J-M "CYCLO-FIL", which is used for high brightness filling, contains 20% to 30% tremolite by volume. Some highly tremolitic talcs, such as those from upper New York State (which contain as much as 60% to 70% tremolite and some traces of chrysotile) are too abrasive for use in the manufacture of pulp and paper. The Valley Abrasion loss with these products is well over 100 mg. Any talc addition which results in a Valley Abrasion loss over 20 mg. is impractical to use. These highly tremolitic talcs, with possible traces of chrysotile, have been tried and rejected for use in the paper industry.

Use of commercial talc in the manufacture of pulp and paper in substantial amounts was begun approximately 15 years ago and its use has incresed enormously during the period. As used in these processes, talc becomes an integral part of the pulp and paper formulation. As such, the talc becomes locked into place in the paper. Talc is never dusted dry on the surface of the paper.

Use of Talc for Pitch Control

In the 1950's, a study undertaken as to the fundamental properties of talc, and particularly its surface characteristics, showed that the mineral talc is virtually unique among mineral substances in that it is strongly hydrophobic and organophilic. It is capable of adsorbing various kinds of organic, fatty, or resinous materials in the presence of large volumes of water. When added to a latex, it will selectively adsorb and rob the latex of its stabilizer system causing the latex to gel. Latex stabilizers are generally either anionic or nonionic surface active agents. These are fairly high molecular weight compounds with a hydrophobic end and a hydrophilic structure at the other end of the compound.

This early work showed that the talc surface always adsorbed the hydrophobic or ogranophilic end of such surface active agents. It was also found that if the talc surface was sufficiently satisfied through the adsorption of these surface active agents, its gelation effects on latex could be eliminated. It was further determined that commercial talc was most strongly adsorbent for these organic compounds. Sorptive capacity was also determined to be roughly related to surface area. Talcs having a very fine particle size and high surface area appear to be more sorptive.

An attempt to apply the results of this fundamental study to the coating pigments for paper was made at a California paper mill. Other less expensive coating pigments such as kaolin were found to work as well, so the use of talc for that purpose never developed. However, this contact with the paper industry resulted in the use of talc for pitch control. It was reasoned that these qualities of talc might be useful in controlling pitch by adsorption. The first trial of talc for this purpose in 1957 was a complete success.

Pitch is the natural resinous substance that occurs in wood. During the manufacture of pulp and paper, this resinous substance is released from the intercellular structure of the wood. When first released, these pitch particles are colloidal in size. They have a strong tendency to agglomerate and to deposit out on various parts of the paper making machine, to plug the wire, saturate the felts, and to show up as dark specks in the finished sheet of paper.

With improper control, numerous shut-downs are required to clean the system with organic solvents. This type of control is really no control at all and is very costly. High speed paper mills cannot afford to operate this way.

The method of pitch control used prior to the introduction of talc, and a method still used to some extent, is the application of surface active agents or emulsifying agents in the pulp and paper manufacturing process. These materials form an emulsion with the pitch which is then washed out of the cellulose pulp and into sewers or streams. It has been found that these surface active agent effluents are highly toxic to fish and cause significant pollution problems. The Province of British Columbia, a major pulp producing area with a significant tourist

industry based largely on fishing, has recently required mills to close up their water systems and to limit the use of surface active agents. The use of talc for control of pitch is the only feasible alternative.

When talc is used for pitch control in the pulp mill, colloidal pitch particles are adsorbed onto the surface of the talc. The talc holds the pitch in a finely dispersed and innocuous state preventing agglomeration and deposition on the machinery. The talc with its adsorbed pitch remains locked in the pulp or paper. The pitch itself aids in binding the talc into the paper.

The use of talc for pitch control has grown very rapidly worldwide. Talc is now used in most pulp and paper mills throughout the United States, Canada, Western Europe, Scandanavia, Japan, and in all other major pulp and paper producing areas, solving a problem that had plagued the paper industry for years. No other product works as well under such a variety of conditions and at the same time, solves major stream pollution problems associated with paper production. Pitch control is now the major use on certain grades of talc.

The rate of talc addition for pitch control will vary with the severity of the problem, the type of pulping (Kraft or sulfite), the kind of wood, the age of the wood, time of year, water temperature, pH, etc. In the pulp mill, talc is added just ahead of that processing step where the pitch first begins to appear. Under these conditions, the talc is present to adsorb the pitch as it is released. If the talc is added later, after the pitch has started to agglomerate, it is not as effective and higher rates of addition are needed for control. Normal rates of addition in the pulp will vary from as low as 0.25 per cent to 1.5 percent, although additions of up to 5 percent are infrequently encountered.

Talc introduced in the pulp mill is carried over into the paper mill as an integral constituent of the pulp. As the pulp is further refined in the paper mill, more pitch is released and additional talc must be added for control. Here the pitch is in a more agglomerated form requiring higher rates of talc addition. Paper mill addition rates are normally between 0.50 percent and 2.0 percent.

Use of Talc as a Functional Filler

Talc is also used in the paper industry as a functional filler. In this use, talc is added in the paper mill to increase the brightness and opacity of the paper. It also makes the paper smoother, more amenable to calendering, and more receptive to high fidelity color printing. As with the pitch control use, talc for filling is beat up with the pulp and becomes locked in as an integral part of the sheet of paper along with the cellulose fiber, resin size, clay, titanium dioxide ("TiO_2") and all of the other parts of the furnish.

In this use, talc can and is being used to replace a portion or all of the TiO_2 in some papers. Although heavier loadings of talc are needed to develop the same opacity as TiO_2. This application is becoming more important as TiO_2 is in critically short supply.

For high brightness filling applications, up to 15 percent loading might be used. Normal rates of addition would range between 5 and 10 percent of talc based in the weight of dry paper pulp. In all cases, the talc is incorporated wet into the cellulose fiber matrix. High brightness opaque papers containing talc filler are generally a high-grade paper typically used as stationary, memo, bond ledger, offset, duplicating and publication paper. The use of such high-grade paper in food or drug packaging would be most unusual due to the relatively high cost. Talc is infrequently used as a filler in food and drug packaging materials, as brightness and opacity is not of primary concern in these paper applications.

Use of Talc in Recycling Paper

Of increasing importance is the use of talc in the deinking process for recycling of paper. In this application, talc selectively adsorbs the oil and resin which serves as the vehicle or binder for printing ink and other residual organics. The ink is then flushed from the waste stock leaving the residual organics bound to the talc in the waste stock. The talc also controls the agglomeration and deposition of latex binder and impurities found in the waste paper.

Waste stock containing talc is then added in varying degrees to pulp for production of finished paper. The percentage

of waste paper which may be used in recycled paper is increased dependent upon the effectiveness of the deinking process. Thus, the use of talc permits a much greater use of a wider variety of waste paper in the furnish. The increased cost and shortage of pulp, as well as ecological considerations, dictate the increased use of waste paper, necessitating greater use of talc for that purpose. Surface active agents, while useful for these purposes, are less effective than talc and have adverse ecological impacts as indicated above.

Use of Talc as a Direct Food or Drug Additive

The vital use of talc in the manufacture of pulp and paper should be contrasted with its use as a direct additive in food and drugs (such as dusting chewing gum and as a tableting aid). In these latter applications, talc does not serve a vital and valuable function, adequate substitutes for talc are readily available and a restriction on the use of talc as a direct additive would have little if no adverse economic consequences on the U. S. talc industry or the food and drug industries. However, as was noted in J-M's April 20, 1973 comments and as is indicated hereinafter, the use of talc containing tremolite, even as a direct food or drug additive, poses no real health hazards from ingestion.

2. TREMOLITE DOES NOT MIGRATE FROM PACKAGING MATERIALS TO FOOD OR DRUG CONTENTS

Studies performed by J-M and independent consultants and reported on in J-M's prior comments conclusively demonstrated that any tremolite contained in talc used in food packaging materials does not migrate to the food. As a result of the raw meat wrapping and sandwiching freezing tests reported in our earlier comments, no tremolite migration at all was detected.

As a result of J-M's discussions with FDA, J-M conducted further migration studies to determine whether or not the possible abrasive action of dry food substances or drugs would result in the migration of tremolite fibers from packaging paper containing tremolitic talc. In designing a migration test capable of producing scientifically valid results, J-M consulted with Mr. Allen Spiher, Chief, GRAS Review Branch, and Mr. G. Higgenbottom of FDA, who provided certain test guidelines.

The initial study of dry food abrasion requested by FDA is set forth in Report No. E414-2 from the Johns-Manville Research & Engineering Center, a copy of which is attached hereto as Exhibit I and referred to as the "scuff test."

The "scuff test" was designed to determine the extent to which tremolite fibers contained in talc used in the manufacture of paper for food and drug packaging applications might be expected to migrate into food or drugs with which it would come in contact. The test conditions used were arrived at after considerable discussions with FDA. At the suggestion of FDA, salt was used as the medium for the scuff test, since its sharp edged cubic crystals would act as a more abrasive material than any other dry food substance or drug. The test was "artificial" in that it was designed in an attempt to duplicate, in a laboratory, the conditions present during actual commercial shipment of food and drugs. The test consisted of lining glass containers with paper manufactured with tremolitic talc, partially filling the containers with salt (NaCl) and vibrating the containers for a period of 24 hours on a shaker tester.

As Exhibit I indicates, the scuff test established that migration of tremolite did not occur in the absence of partial destruction of the paper itself. When partial destruction of the integrity of the paper occurred, the resulting migration had the composition of the paper insofar as could be measured, indicating that tremolite does not "dust out" or selectively migrate from the paper.

At a frequency of 10 cycles per second (a frequency equivalent to that of a freight train having a flat spot on one pair of its wheels, traveling almost 60 miles per hour) no evidence of paper breakdown was detectable and no tremolite migration whatsoever could be detected. Only when vibration was increased to 19 cycles per second did substantial breakdown of the paper occur after 24 hours, with resulting migration of all components of the paper.

Additional testing was performed to determine if during commercial shipment of food and drugs, the vibration and movement actually encountered results in abrasion sufficient to cause the partial breakdown of the integrity of the paper packaging materials.

The second migration study performed is contained in Report No. E414-6 from the Johns-Manville Research & Engineering

Center, a copy of which is attached hereto as Exhibit II.

The test consisted of lining containers with tremolitic talc containing paper (identical to that used in the test described in Exhibit I) and shipping these containers which were partially filled with salt by commercial truck from Denver, Colorado to Manville, New Jersey and back (a round trip of approximately 72 hours and 4,000 miles of travel). The shipment of these test containers of salt resulted in no breakdown in the integrity of the paper and no migration into the salt of tremolite or any other ingredient of the paper.

In addition to the salt shipping test, a variety of dry foods packaged in paper containing tremolitic talc were purchased at a local supermarket and examined to determine whether migration of tremolite had occurred. This study established that tremolite contained in talc used in food packaging does not migrate to any dry food substances during normal commercial shipment and handling. The food purchased at a local supermarket showed no evidence of tremolite migration. This was so even though foods were chosen which were likely to have been shipped long distances and were likely to be abrasive, such as corn flakes, macaroni and salt.

On the basis of studies reported in Exhibit II, J-M has concluded that actual commercial shipping and handling conditions of packaged dry foods does not cause sufficient abrasion to the containers to result in the breakdown of the integrity of the paper or migration of tremolite. The latter tests (Exhibit II) establish that the conditions existing in the scuff test (Exhibit I) are indeed much more severe than actual commercial shipping and handling conditions.

In Exhibits I and II, results are reported to the reliable levels of identification by optical (petrographic) microscopy and weight determinations and with the additional use of transmission electron microscopy in Exhibit II.

The shipped salt samples and the purchased food materials were first examined by petrographic methods as recommended in the Proposal. Over 100 fields of view were examined for each sample, with considerable effort exerted to identify the possible presence of talc or tremolite.

In addition to the petrographic examinations, the samples were also examined by transmission electron microscopy. Each entire sample was scanned in its entirety for suspicious particles and fields were chosen at random for specific counts.

However, even following these stringent analytical procedures, the presence of tremolite could not be detected.

It is evident to J-M as a result of the studies reported herein, that actual conditions of commercial transportation do not create a severe enough environment for paper breakdown to occur, and the migration of tremolite from paper containing tremolitic talc used in food and drug packaging applications does not occur.

3. NO EVIDENCE EXISTS OF A HEALTH HAZARD ASSOCIATED WITH THE INGESTION OF TREMOLITE

In J-M's comments dated April 20, 1973, it was stated that there is no evidence whatsoever to indicate that the ingestion of tremolite constitutes a health hazard. Tremolite cannot properly be considered as a "poisonous or deleterious substance" as contemplated in in Section 402(a)(1) of the Food, Drug and Cosmetic Act. The studies which have suggested that the ingestion of asbestos fibers may be carcinogenic are based on substantial occupational exposures to other asbestos minerals, and not to tremolite.

In the animal ingestion and injection studies and human epidemiological studies of talc workers, cited in J-M's April 20, 1973 comments, no excess incidence of gastrointestinal cancers have been reported. Animal studies involving tremolitic talc have been conducted by Dr. William E. Smith, Health Research Institute, Fairleigh Dickinson University, Madison, New Jersey and by F. Pott and Friedrichs in West Germany, both of which studies were reported by Dr. Wright in Exhibit F to J-M's April 20, 1973 comments.

Pott and Friedrichs introduced tremolitic talc directly into the mesothelial spaces, which failed to produce mesotheliomas, a finding in contrast to the production of mesotheliomas using other forms of asbestos.(1)

Dr. William E. Smith has both fed chrysotile and amosite asbestos to hamsters and has administered tremolitic talc by

intrapleural injection to hamsters. A summary of Dr. Smith's findings is attached hereto as Exhibit III.(2) Dr. Smith's findings are as follows:

> "In 45 hamsters maintained throughout their lives on diets containing 1% of the chrysotile or amosite varieties of asbestos, we found no gastric carcinomas and no tumors in the gastrointestinal tract except for a neoplasm in the mesentery of the colon. We are unable to relate that lesion to the treatment, since ashing has revealed no asbestos fibers in it.
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> We have now completed an experiment in which the hampster intrapleural method was used to test for carcinogenicity of a sample of talc containing asbestos. For this work, we have obtained samples of commercial talcs from Whittaker, Clark & Daniels, Inc., New York City ... X-ray diffraction analysis revealed the presence of major amounts of tremolite asbestos and talc and a minor amount of a serpentine mineral (antigorite).
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> Each of 50 hamsters were given right intrapleural injection of 25 mg of this sample suspended in 0.5 ml saline. The animals were followed for their life spans. No tumors attributable to the treatment were found."

In a meeting on December 7, 1973, with Dr. Virgil Wodicka and Dr. Albert C. Kolbye of FDA, a copy of Dr. Smith's Terminal Progress Report: Grant No. 3R01-EC-00226-0451 entitled "Mesothelioma in Relation to Asbestos" was delivered to them. Among other studies, this contained his finding that long fiber tremolite injected directly into the pleura space of hamsters did not produce mesotheliomas, whereas other kinds of asbestos used in similar amounts did produce these tumors. A copy of Dr. Smith's Terminal Progress Report is attached hereto as Exhibit IV.

J-M's comments of April 20, 1973, cited the study by Dr. Morris Kleinfeld of talc miners and millers exposed to talc containing extremely high concentrations of tremolite.(3) In this study, Dr. Kleinfeld concluded that there was no significant difference between the observed and the expected mortality from carcinoma of the gastrointestinal tract and peritoneum among these talc workers. Also included as Exhibit G to J-M's April 20, 1973 comments

was a copy of a letter from Dr. Kleinfeld dated January 24, 1973, reporting the results of his follow-up study of these talc miners and millers. Dr. Kleinfeld concluded in his follow-up study that "With regard to cancer of the gastrointestinal tract and peritoneum among the talc workers, we did not find any significant differences between the observed and expected values in the overall and specific age groups studied".

This follow-up study has not yet been published, although Dr. Kleinfeld has advised us it has been accepted for publication. In view of this fact, and the importance of Dr. Kleinfeld's work, J-M has obtained from Dr. Klenfeld a paper which he presented at the Metal and Non-Metallic Mine Health and Safety Symposium on Talc Dust Hazards sponsored by the Bureau of Mines and held in Washington, D. C. on May 8, 1973. A copy of this paper is attached hereto as Exhibit V, and summarizes both his earlier study and the follow-up study.

It should be noted that at the recently held EPA-NIEHS Joint Symposium on the Biological Effects of Ingestion of Asbestos, Dr. William E. Smith mentioned his animal feeding experiments, in which he fed quantities of asbestos to hamsters with no resulting gastrointestinal cancers. After reporting on his animal studies, he then posed the following question to all those in attendance at the Symposium: "Was there anyone who has conducted animal experiments where asbestos fibers had been ingested (including inhalation studies) and observed any evidence of gastrointestinal cancers?" There was no response received from anyone in attendance at the Symposium and no evidence was introduced at that Symposium to indicate that any animal ingestion studies involving asbestos had resulted in the development of gastrointestinal cancers.

It should also be noted that to the extent that tremolitic talc has been used in dusting chewing gum and in preparations of oral medicines, the public has participated in a large scale ingestion study over a lifetime. If one thinks of ingestion of tremolite at this level as being hazardous with respect to causing mesothelioma, why is this such a rare tumor, occurring at a rate of 1 to 1.5 per million population annually in the public at large? This sort of exposure dates back to the beginning of the century. The ingestion of fibrous tremolite in this manner would exceed any possible potential from the use of packaging ma-

terial containing tremolitic talc for food and drug packaging applications.

Evidence offered by FDA in its earlier proposed regulation on talc (August 12, 1972), to support the proposition that ingestion of tremolitic talc is hazardous, is limited to an article by Dr. R. R. Merliss in Science (September 17, 1971), in which Dr. Merliss attempts to show a causal relationship between the use of talc-polished rice and the high incidence of gastric cancer in Japan. The data used for this purpose is spurious, to say the least. Dr. Merliss, himself, now doubts his conclusion as is indicated in his recently published article entitled "Talc-Coated Rice," Life and Health, March 1973. A copy of this paper is attached hereto as Exhibit VI.

No medical-scientific evidence was offered by FDA in the latest Proposal (September 28, 1973) to prove that the ingestion of asbestos, and particularly tremolite, is injurious to health. As a matter of fact, the studies cited by FDA in the Proposal indicates that ingestion is not injurious, based on the animal studies reported.

No one in the medical-scientific community has concluded that asbestos, when ingested, is carcinogenic. Even in those studies where there is some suspicion that ingestion of asbestos may result in a higher incidence of gastrointestinal cancer, this suspicion arises only in cases involving individuals most highly exposed to asbestos in occupational settings, and the asbestos being forms other than tremolite.

The Center for Science in the Public Interest and the Environmental Defense Fund in their petition submitted to FDA, do not introduce any evidence whatsoever tending to either incriminate tremolite or to prove that tremolite will migrate from packaging materials. The studies cited by these two groups in their petition relate to insulation workers most heavily exposed to asbestos in occupational settings for prolonged periods of time. As indicated in J-M's earlier comments, these studies may not be validly related to tremolite. One cannot assume that all forms of asbestos will react biologically in the same way and one must also recognize that there is a dose-risk relationship with respect to exposure to asbestos. Even in those studies of individuals occupationally exposed to asbestos, there is a substantial dose tolerated by occupationally

exposed individuals before evidence of any possible excess cancer experience develops. These two groups in their petition fail to cite any studies relating to the effect of ingestion of tremolite. Such studies are conspicuously absent from the petition.

4. THE FDA PROPOSED TEST METHOD IS NOT WORKABLE

In its Proposal, FDA has proposed a test method for determining the presence of asbestos fibers in food-grade talc. The Johns-Manville Research Center believes the test to be unworkable on both practical and technical grounds. This belief has been confirmed by independant consultants. Attached hereto as Exhibit VII is a test method which is a modification of the one proposed by FDA and which, in the opinion of J-M, is a more suitable method for determining the presence of asbestos fibers in food-grade talc.

However, it should be noted that J-M's talc does not meet the FDA proposed test method, nor the one proposed herein, and the talc of most other talc producers falls in the same category unless the limits of detectable tremolite are increased substantially.

Conclusion

In conclusion, we have attempted to respond in our comments dated April 20, 1973 and in this document to the issues raised by FDA in its proposals published on August 12, 1972 and September 28, 1973, with respect to the use of talc containing asbestos in food and drug packaging materials.

J-M believes that the use of talc is essential in the manufacture of pulp and paper and is ecologically and economically desirable. Tremolite does not migrate from tremolitic talc containing paper packaging materials to the food or drug contents during commercial handling and shipping. There is no credible evidence indicating a health hazard due to the ingestion of tremolite and there is conclusive evidence that the ingestion of tremolite by humans and animals and the injection of tremolite into the pleura space of animals does not result in an increased incidence of gastrointestinal cancer or mesothelomia.

It is submitted that on the basis of all known facts, adoption of the Proposal would constitute an arbitrary and capricious action totally in conflict with the best scien-

tific evidence and needlessly destructive of the domestic talc industry and disruptive of the world-wide pulp and paper manufacturing industry. As there is no justification for imposing any restriction on the use of talc containing tremolite in food and drug packaging applications, it is urged in the public interest, that, no cause being shown for its adoption, the Proposal severely restricting the use of tremolitic talc in food and drug packaging material, be withdrawn.

Very truly yours,

Richard Carter
Director, Government Relations
Johns-Manville Products Corporation

REFERENCES

(1) Pott, F. and Friedrichs, (1972), "Tumors in Rats After Intraperitoneal Injection of Fibrous Dusts" (German). Naturwissenschaften 59: 318.

(2) Smith, William E. (May 1973) "Asbestos, Talc and Nitrites in Relation to Gastric Cancer" American Industrial Hygiene Association Journal, May: 227-228.

(3) Kleinfeld, M., et al (1967), "Mortality among Talc Miners and Millers in New York State", Archives of Environmental Health 14:663-667.