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Occupational Disease Caused By Asbestos

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As is well known, the danger to health stemming from the effect of dust in occupational situations occurs, in part to an extraordinary extent, in very different industries and occupations. The legislative authorities have taken this fact, which concerns public health all too urgently, into account also insofar as today in most countries recognized occupational diseases under insurance protection also include damage to health stemming from dust of a variety of origins and composition, including free silicon acid, silicon acid compounds (silicates), asbestos, alcali chromates, Thomas slake meal, aluminum, beryllium, among others. Occasionally an attempt is made to adapt these kinds of dust to a ranking in terms of their specific danger. These efforts seem perhaps thankless tasks, but yet they may contribute to the combatting of dust diseases by pointing the finger at a generally weak point of health efforts. Here we shall sketch out the undoubtedly special position of asbest dust, which may by breathing in cause the most serious form of asbestos lung diseases and also lung cancer.

Asbestos is a mineral which may be found in nature in an unusually large number of forms. However, it always is a silicate of magnesium with fibrous character. This fibrous structure permits the spinning of asbest, an industrial value which is increased manifold by the relatively high melting point which is about 1150°C in the case of amphibol or horn blend asbestos and as high as 1,550°C in the case of chrsostile or

serpentine asbestos, which permits a very useful resistance against medium temperature in technical fields. Further, the characteristic acid solidity and its low capacity of conducting heat contribute to its constantly increasing manifold use in line with today's increasing technical uses. The varieties of asbestos based on differing content of metal oxydes, including magnesium, iron, aluminum, and calcium are the basis for special characteristics stemming from these, so that one type or another is more acid resistant, respectively fire resistant than the other, as well as the reverse thereof.

Surely the chemical analysis of asbestos in general and particularly in occupational medicine is of less interest than the technology, but nevertheless it is not unimportant in terms of health problems that for instance amphibole asbestos with its average of 55% silicon acid contains about 13% more silicon acid than chrysostile asbestos (about 42% silicon acid) which is mainly found in Canada. Nevertheless, as a rule, no type of asbestos stemming from quartz contains free silicon acid. This is not without importance because the lung diseases provoked by silicon acid compounds, the silicatoses, according to past experience do not reach the severe stage of damage, as compared with silicosis brought about by free silicon acid.

Places where asbestos is found in the area of central Europe do not play an important role. Asbestos occurs mainly in Canada, South Africa, Italy, and Siberia. Mined above ground in the same way as our stone quarries and mineral industry, at the mining site there occurs only the first rough processing,

whereas true preparation and further processing must take place within the framework of the various processing industries, because it must be adapted to the type of preparation in line with the respective end use.

Danger to health is thus to be expected wherever asbestos can develop its dust as a result of its processing in any form whatsoever. Primarily and obvious the development of asbestos dust will be seen during its rough preparation (raw material) and the further processing into the generally known plates (asbestos shingles). As in the case of different textile fibers the start of preparation is also the loosening, cleaning, and opening of the asbestos bundles. This activity in tunnels and openings necesaarily proceeds under the impact of partly very pronounced dust clouds. On the other hand, the mixing, turning, threading, rolling, weaving of the basically stiff, but long asbestos fibers is also surrounded by an extreme danger of dust. The inclusion of cotton into the production process does not necessarily always bring about a substantial loosening of the asbestos dust cloud. More risky additives are initially graphite and paraffin, and less the oils, stearine, and wax which serve the same purposes of firming, impermeability, and increased ability to glide. Further, for the production of plates one uses to an extent also heavy spar, iron oxide, clay, cellulose, and other substances, where occupational attention must also be paid to the widely used solution and thinning elements of the benzines, benzole and its derivatives, halogen carbon hydrogens and alcohols, used for a variety of plate

applications.

To produce these asbestos plates, the long fibers are mostly processed according to the method of textile production. With the aid of bobbin machinery, one weaves or twists the fibers into tubes, ropes, cords. The shorter fibers are used (comparable to paper production) as a rule for building plates, cardboard, cartons, and paper. The always existing dust development must not be feared less in this connection and this means taken into consideration. Therefore we wish to point with no less emphasis also to the basic necessity of dust prevention in the course of all further industrial and commercial areas of the use of asbestos materials.

In this connection we think perhaps of the construction industry where asbestos is used not only as an additive to cement, or the chemical industry, which gives for example to artificial substances such as artificial resins an increased firmness by the addition of asbestos. In electrical technology, in the construction of machines and devices, and in labaratories asbestos is central to insulation and tightening technology. Further, asbestos can also be used as brakeband material, coating of couplings, as filter (both in the filtration of fruit juices, such as for the impregnation of low-germ juices, as well as the de-impregnating of water in the area of effluent use, and finally in the field of fire protection, in the textile and paper industry in terms of heat-related occupations, and specifically in metal and glass industries, as heat protection an d as heating insulation material.

The intake of the magnesium silicate occurs in the form of dust. It produces the effect of asbestos in a very characteristic occupational disease: asbestosis. With the pull of breathing in, the asbestos fibers advance into the lung (assuming that they are small enough for this), and as a result of the breathing movements they advance into the inter-alveolar tissue of the lungs, thus being responsible in a more acute form or in the case of individually or constitutionally over-sensitive persons for interstitial lung inflammation. In ordinary situations there is nothing more than coughing and ejection of sputum with a feeling of anxiety up to definite pain in the chest area, whereby simultaneous night sweating is typical, without any substantial oscultatoric or percussive finding. The settling down of the asbestos needles causes the diffused infiltration of the lung by lung fibrosis and cirrhosis, which is histologically a binding tissue excess growth. This binding tissue interspersal can attack more or less the entire lung, but the characteristic phenomenon is the affecting of the lower lung segments, of the periphery, where there is a tendency toward bronchial ectases from fibrous adhesions, as well as the affections of the heart surroundings. The start of the fibrosis at the borders of the heart involves the activity of the heart at a relatively early stage, which shows as short breath even in the case of milder exertions.

As a rule, the asbestos worker initially complains about coughing which is scary because of its appearance in the form of attacks. The sputum is very torturous, because it adheres

firmly and obdurately, so that it is difficult to remove by coughing, it is more clustered than slimy and has a gray appearance. Body exertions, as well as change of weather sharpen the coughing condition, which reaches a high point during fog, northeast wind, and cold wet weather. Aside from it, there exist stabbing pains in the chest. The progressive shortness of breath, as the occupation with asbestos goes on, is accompanied by sensible reduction in the general condition and in reduced strength, with cyanosis, loss of weight, emaciation, loss of appetite and sleep, exhaustion and tendency toward fatigue, decrease in working capacity and willpower. In such older cases the objective finding continues to be rather meager; a weakened, up to rough breathing can be heard above the lung, and also whistling, humming, and rattling. The X-ray picture similarly provides a limited finding, which does not indicate by any means that it entitles the examiner because of the inadequate conclusion through physical and x-ray examination, in such marked contrast to the subjective bad condition of the asbestos case, (to say that) there is nothing more than an unimportant lung disease. Quite to the contrary, we would want to accuse the asbestos dust as being altogether more dangerous than the quartz dust with silicon acid, which by itself is cause for considerable misgivings.

In addition, experienced persons will also find quite soon in the x-ray picture a useful assist for prophylaxis, for which there is a basic need for films, because taking x-rays is generally inadequate. If on the one hand the so-called snow storm and the tumor-type changes of the silicosis are lacking,

and on the other hand there are only weak indications of the fine spotting and of the honeycomb network sketching of the affected lung regions in the beginning, nevertheless the continuous medical condition control is indicated clearly , on the basis of its determination, as well as the usually uncharracteristically reinforced stripe-like lung sketching with the reinforced and broadened ductsleading into and out of the hilus, whose shadows in fact also do not remain hard, but always uncertain and not condensed. As conditions worsen, the cloud-like obscurances, such as the deepening and the increase in size of the initially only small corn-like knot formations as they become ever denser spot shadows, but never as much as swelling-type shadows, there invariably appears the more typical picture of the asbestos lung which changes predominantly in symmetric fashion, and thus on both sides of the lower lung regions. Now the picture is also clarified by a substituted emphysema of the upper lung regions.

Despite a certain lack of space we have referred in greater detail to the disease picture, because we believe that in the future greater importance must be assigned to prevention, in view of the relatively unpromising and thus only symptomatic treatment, because with the progressive technical developments and industrialization in our era, the ever-increasing industrial use of asbestos will contribute to the worsening of health conditions. According to experiences to date, everywhere in the world, no worker in an asbestos plant can expect to remain unaffected by asbestos dust in the long run; rather, all reports indicate that after an average of 10 years of working

with asbestos, no lung is any longer free from the specific changes in the asbestos. In actual situations the relevant complaints are to be expected after perhaps three to five years of occupational activity. An especially unfortunate circumstance may beyond this be seen in the fact that - once there are enough asbestos needles in existence in the lung tissue - asbestos may on occasion develop even after termination of the work with asbestos; and naturally this increases rather urgently our desire for the earliest possible recognition (see X-ray film).

There is still need to point to a typical unusual factor of the asbestos effect, namely the formation of asbestos corpuscles in the tissue, which develop as brownish (also light-colored) formations, resembling in their form that of a club, dumb-bell, spindle, or roll, within the lung. These peculiar formations of 20 to 150 micron (1 micron = 1/1000 mm) in length and about 10 to 30 micron in width are likely to flow together in the tissue with asbestos needles penetrating with the asbestos dust, whereby a certain albumen silicate surrounds the individual needles, connected in their totality, and as an expression of counteraction of the organism dissolve the asbestos needles. In the course of the asbestos dissolution due to albumen impact, the metal atoms of the iron, magnesium, aluminum, and calcium are likely to migrate into the albumen cover, while the silicate acid framework, on the average contained to the extent of about 50% in the asbestos, consists of: serpentine asbestos 41.84%, Siberian asbestos 41.92%, blue cap asbestos 51.1%, and amphibol asbestos up to 54.6%. After it initially remains in existence, it also breaks down slowly and

is likely to be deposited in the connective tissue in a colloid condition. These asbestos corpuscles can be found in the sputum which is difficult to cough away, so that they may also be found in the x-ray picture, and in principle also in the lung punctate. The presence of the asbestos corpuscle can be proven in the sputum (punctate) by the Berlin blue reaction (thinned salt acid and ferrozyancali).

From the knowledge concerning the creation meachanism of the asbestos corpuscles it becomes clear that in the sputum not only the later asbestos corpuscles, but also the original asbestos fibers are coughed out, with an average size of about 2 to 6 micron. And since, of course, not all the asbestos fibers (already not because of their somewhat inhibiting size) can necessarily penetrate into the lung tissue, but rather normally deposit in the mucous membrane of the upper air passage as well as by swallowing (more seldom) also in the intestinal tube, infectious reactions on the part of these organical regions are entirely according to expectation in the work with asbestos. A characteristic picture also occurs when the needles hook into and under the skin. The so-called asbestos warts resulting from this are in fact the occupational stigma of those working with asbestos. Where skin injuries already exist, such as cracks, rhagades, tears, and splits, especially in the area of the folds between the fingers, the asbestos needles penetrate and push on under the skin, until they collect either under the normally calloused and scarred area of the palm of the hand or at the hollow side of the finger,

and in the case of those working barefoot below the sole of the foot, to which the adjoining body tissue responds with chronic processes of inflammation. In this situation only surgical procedures are helpful, so that this granulation swelling can be scratched away. It is important for the asbestos worker and his health care to pay immediate full attention even to basically minor injuries and to see to it that in each instance the wounds are properly cared for. In this sense the supposition is really not so distant that this kind of asbestos wart respectively damaged sub-skin can form the basis for malignant new formations of swellings on top of them. However, to date these have not come under observation, where there was assurance of the underlying conditions.

According to prevailing conditions, the main emphasis in combatting asbestos tissue diseases is based on prophylaxis. For this purpose guidelines have appeared in all the countries of Central Europe; these indicate not only the general measures of fighting dust, but also promising individual steps in regard to machines and other installations, also the testing of the effectiveness of all dust removal installations, further, the employment of young persons whose working below the age of 18 is known to be unsuitable according to the prevailing laws, and finally the conduct of asbestos workers themselves -- and thus the question of the altogether too common inadequate personal hygiene. To be sure, it is praiseworthy that such regulations are designed and printed, and are in the majority of the cases also made accessible to all interested parties,

and yet one must complain that guidelines of this kind have even now not yet become the desirable general property of employers and employes, which means on the one hand the management, the technicians, and the engineers, and on the other hand the worker, his local union, and the unions on the national level, with the result that there is still need that in the future they should still become "part and parcel" of everyone's behavior. Yet, at the same time the practicing local doctors in the regions of the asbestos industries should acquaint themselves even more with general health problems of the medical profession. As far as the connections and transitions to the formation of lung cancer are concerned, they must definitely be considered positive, because observations in agreement with one another are present. However, on the average, such lung cancer after asbestos occurs in multiple form in the form of horny plate epithel carcinomas. Such damaging effect must be presumed to involve on balance at least a few years of continuous work with asbestos. Fortunately, by contrast, there are the relationships between asbestosis and tuberculosis. While naturally cases may be observed where asbestos dust lung diseases are diagnosed together with tubercular processes, we would nevertheless not want to maintain that in reverse these lung diseases are enhanced, that is in terms of industrial medicine tuberculosis being promoted by asbestos. And yet it would be desirable to learn more about these relationships from medical experts in this ara.

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