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Chrysotile asbestos and health

Хризотил-асбест және денсаулық

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ДДҚ-ның қорытындысына сай, ДДҰ-ның жанасымды бөлімшелері асбест әсерінен ауруға шалдығулармен күресу үшін түрлі стратегияларды құрастыру керек. Стратегиялардың бірі — хризотил және хризотил өнімдерін аз мөлшерде пайдалану. Өкінішке орай, ДДҚ-ның шешіміне қарсы ДДҰ-ның кейбір шенеуніктері халықаралық ауқымда асбест және оның өнімдерін пайдалануға тыйым салуды қолдайды. Мұндай қарама-қайшылықтарды шешу үшін халықаралық ұйымдардың шеңберінде, сарапшылардың қатысуымен, барлық ғылыми мағлұматтарды мұқият әділ талдауға мүмкіндік беру қажет.

В статье дан анализ научных данных по борьбе с асбестообусловленными заболеваниями. Согласно решениям ВАЗ, соответствующие подразделения ВОЗ должны выстраивать различные стратегии по борьбе с асбестобусловленными заболеваниями. Одна стратегия — для хризотила и содержащих его изделий — это их контролируемое использование ввиду низкого риска. Другая стратегия — для амфиболовых асбестов и содержащих их изделий — запрет в соответствии с Конвенцией МОТ № 162. К сожалению, вопреки решению ВАЗ, некоторые чиновники ВОЗ, ответственные за осуществление решений ВАЗ, продолжают навязывать политику запрета применения всех видов асбеста в международном масштабе. Для решения имеющихся противоречий в рамках международных организаций необходимо проведение тщательного беспристрастного анализа существующих научных данных с участием экспертов, представляющих все точки зрения на проблему.

Introduction

The article presents results of studies of chrysotile asbestos and health conducted by the Russian Academy of Medical Sciences (RAMS) Institute of Occupational Health, a brief review of foreign studies, the list of protective measures in the use of asbestos and other fibrous materials ensuring their controlled use.

The Institute of Occupational Health founded in the Soviet Union in 1923 is the first institute not only in Russia, but in the whole world, that attended (and still attends) to occupational health problems. One of the issues of occupational health studied by our Institute is that of chrysotile asbestos and health [1].

In Russia chrysotile asbestos was found more than 300 years ago. Its industrial use dates back to the discovery of the Bazhenovskoye deposit (the town of Asbest, Sverdlovsk Region) in the end of the 19th century [2].

As is known, various types of fibers are widely used in industry today: asbestos and other natural and man-made mineral fibers (MMMF), synthetic, organic and many other fibers. Since this article concerns asbestos fibers, let us consider in detail the above-mentioned issue of chrysotile asbestos and health.

Until the end of the 20th century asbestos was considered to be the most important non-metallic mineral in the world used in the production of over 3 thousand asbestos-containing materials and products [3]. The term asbestos covers two groups of minerals: serpentine that includes chrysotile asbestos and amphiboles (amosite, crocidolite, anthophillite, tremolite, etc.). All types of amphiboles were banned for use by ILO Convention 162 due to their high biological aggressiveness [4].

Until 1980s the use of all types of asbestos was practically uncontrolled which led to a significant increase in the risk of such diseases as chronic bronchitis, asbestosis, lung cancer, and malignant mesothelioma [5]. This stimulated demands to ban the use of asbestos including chrysotile.

However, based on results of long-term Russian studies we can now claim that with the current level of equipment and technology, in case of controlled labor conditions and proper medical and preventive care of industrial workers provided, there are no grounds to ban the use of chrysotile [6]. The data of Russian researchers are confirmed by studies conducted with our foreign colleagues.

Our institute was the initiator of international studies conducted in 1994–1997 in mines and mills of Uralasbest, JSC in the town of Asbest, Sverdlovsk Region, by scientists of the U.S.National Institute of Occupational Safety and Health, the Finnish Institute of Occupational Health, the RAMS Institute of Occupational Health, and the Ekaterinburg Medical Research Center [7]. The joint Russian-Finnish-American research project was entitled «Health and Exposure Surveillance of Siberian Asbestos Miners». It included:

– an X-ray examination of 2,003 workers of Uralasbest;
– external respiration tests in 414 X-rayed workers;
– an in-depth medical survey of 289 workers;
– the analysis of current and past dust concentrations in mines and mills; and
– the analysis of the contents of fibrous particles in assays of lung tissue taken during autopsy of Asbest citizens or Uralasbest workers.

The mean age of the examined subjects was 47 years (range: 27–78 years). The length of service ranged 1–47 years (22 years on the average). The minimum time of exposure equaled a year and the maximum — 59 years, the average being 25 years. Most of the subjects worked at the time when dust concentrations in workplace air were tens and hundreds of milligrams per cubic meter.

At this, no radiological changes typical of chrysotile exposure were observed in almost 90 % of X-rayed workers despite high levels of dust in the workplace air and a long employment period. In 70 % of cases we found no X-ray changes at all. Abnormalities were mainly detected in workers of old asbestos mills already closed by the time of this study. We observed a statistically significant correlation between the dose of dust and its health effect.

It should be noted that malignant pleural mesothelioma is usually attributed to asbestos exposure although other causes of the disease are known today [8]. Mesothelioma is a very rare disease; its incidence rate is 1–3 cases per million a year. In the countries using chrysotile asbestos the rate of malignant mesothelioma was almost on the background level (Russia — 3, Latvia — 3, Lithuania — 3, etc.). It was much lower than in the countries with the past wide use of amphiboles (Belgium — 29, Australia — 22, Netherlands — 21, etc.).

In 1997–1999 the project for Prevention of asbestos-related diseases in Hungary, Estonia, and the Republic of Karelia of the Russian Federation was implemented on the grant of the European Union to study the incidence of pleural mesothelioma in those countries [9]. The researchers established that in 1990s the mesothelioma incidence was 8 cases per million a year in Hungary and 3 cases — in Estonia and Karelia.

The number of incident cases, at least relatively comparable to that in West European countries, was observed only in Hungary, the country with a history of partial industrial use of amphibole asbestos. Only in lung tissue assays from Hungary did we find amphibole fibers (amosite, crocidolite, and anthophyllite). Thus, the study became yet another proof of the link between the increase in mesothelioma incidence and the exposure to amphiboles, but not chrysotile mined in Russia. For many years Russia has been the world largest producer and consumer of chrysotile, the only type of asbestos used in the country for civil purposes, and unlike European countries it has not got the negative experience in the wide use of amphiboles.

As for occupational asbestos-related diseases, there exists evidence that the highest risk for workers and general population is posed by:

– exposure to amphiboles, as such and mixed with chrysotile;
– uncontrolled spraying, demolition, removal and maintenance of friable insulation materials containing all types of asbestos in construction and other industries by people having no special equipment and/or training; and
– other operations involving excess dust emissions made without proper safety precautions.

If we consider the use of asbestos-containing materials, it should be noted that almost 90 % of chrysotile mined worldwide is used in the production of asbestos-cement products, the risk of fiber emissions from which is minimal. Other types of chrysotile-containing products include friction materials (7 %), textiles, etc.

Let me remind you of the asbestos phobia that developed in Europe when public buildings were demolished as the proof of asbestos hazard. At that time we asked our foreign colleagues to show us an epidemiologic study indicating that indoor weathering of chrysotile fibers does pose health risk, that chrysotile-cement pipes cannot be used for the drinking water supply systems. We have never got the answer. The thing is that there exist no such studies.

Thus, to establish the possibility of population exposure to asbestos and other mineral fibers in construction materials, in 1999–2001 the RAMS Institute of Occupational Health conducted a study to estimate concentrations of respiratory fibers in ambient air of Moscow and in houses and public buildings constructed of materials and products containing chrysotile and man-made mineral fibers [10].

Based on our findings we came to the following conclusions:

– the use of asbestos-containing materials and products in industrial enterprises of Moscow, motor transport, and public and residential buildings does not lead to excess environmental pollution with respiratory fibers. The only exception includes areas in the vicinity of industrial premises where large volumes of asbestos-containing materials are used uncontrollably;
– a controlled use of asbestos-containing materials, both high density products (asbestos-cement sheets, panels, and blocks) and friable products (asbestos-containing plaster, pipe coating, and molded products) is no source of excess environmental or indoor air pollution with respiratory fibers; and
– the uncontrolled, irresponsible use of materials containing both asbestos and MMMF may be dangerous for health of workers and the general population. At the same time, there is no need to remove materials containing both asbestos and its substitutes, including friable and easily damaged insulation from public and residential buildings. The prerequisite of their further use is a controlled maintenance of objects in a satisfactory technical condition.

The discussion of chrysotile was especially sharp within the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade.

During the 5th Conference of Parties to the Rotterdam Convention, 20–24 June 2011, the issue of including chrysotile in Annex III of the Rotterdam Convention was raised for the 4th time. Yet another time the consensus was not reached and the decision was made to include the issue in the agenda of the next, 6th Conference of Parties to be held in 2013.

It should be noted that Annex III includes the list of dangerous pesticides and some hazardous industrial chemicals. As a rule, they are chemicals proven to be extremely hazardous for use of workers and general population and banned in the majority of countries.

The issue of including chrysotile in the PIC list was raised due to notices of its ban in some countries. The notices declare that the reason for the ban was concern about human health. At the same time, no comprehensive or unbiased analysis of scientific data in support of such conclusions had ever been carried out. We are of the opinion that there are neither scientific nor practical reasons to include chrysotile asbestos in the PIC list of Annex III.

We should pay significant attention to the possibility of decisions made by different international organizations that neglect differences between amphiboles and chrysotile as well as recent scientific evidence.

For example, in September 2006 the document on the policy of the WHO in elimination of asbestos-related diseases appeared on the official Website of the World Health Organization stating that the best solution of the issue was the ban on the use of all types of asbestos [11]. In this connection we have sent letters to the WHO and expressed our opinion that the document caused serious doubts. Here, like in many other documents calling to ban asbestos, the notions of «asbestos» and «chrysotile» and, which is more important, «danger» and «risk» are being confused [12].

It is well known that the risk of adverse health effects is determined by biopersistence of fibers, which, in its turn, depends on their quantity, duration of exposure, dimensional characteristics, and acid resistance.

When inhaled, chrysotile fibers are dissolved in the acid medium of the lings. Acid-resistant fibers of amphiboles and other fibers suggested as «safe» chrysotile substitutes remain in the lungs for the rest of the life [13].

Numerous studies give no grounds to speak about excess risk of exposure to chrysotile used under controlled conditions. Many issues still require further research. The same is written in the review of recent data on chrysotile prepared by the World Health Organization in 1998 [14].

Tenets about excess health risks posed by controlled chrysotile exposure were not confirmed in «Chrysotile Asbestos. Priority Chemical No. 9», the document prepared in Australia in 1999 within the National Industrial Chemicals Notification and Assessment Scheme, either.

«…Risk assessments made in many studies … were based on historical data when workers were exposed to very high concentrations of chrysotile-containing dust. Now the exposure levels are much lower, and thus past risk estimates seem overestimated. There are many other reasons to consider conclusions based on transferring data on historical exposure to present conditions as doubtful.»

MMMF become more are more prevalent in various industries of many countries of the world.

In November 2005 a WHO workshop on mechanisms of fiber carcinogenesis and assessment of chrysotile asbestos substitutes was held at IARC. This Workshop was convened in response to a request from the Intergovernmental Negotiating Committee for the Rotterdam Convention to consider modes of carcinogenic action of chrysotile and its substitutes.

Very interesting conclusions were made based on the results of discussing recent scientific data, namely:

– fully inert fibers that could have been used as a control in comparative assessment of biological effect, were not found;
– epidemiologic data on whiskers, fiberglass, stone and slag wool, and ceramic fibers considered by the IARC were found insufficient;
– there exist no epidemiologic data on special-purpose glass fibers and newly developed fibrous materials;
– sensitivity of European and American epidemiologic studies known to date may be insufficient due to the assessment of lung cancer only in workers of modern enterprises where exposure levels are negligible; and
– cancer risks cannot be excluded in industries consuming MMMF (e.g., construction), and airborne concentrations of fibers might be significantly higher especially among experienced workers, who apply and remove fibrous isolation.

Taking into account all mentioned above, today it is important to introduce such safety measures in the use of asbestos and other fibers as:

– the ban on amphibole asbestos;
– the ban on the production and use of friable materials containing asbestos and many other dangerous fibers;
– types of work involving possible emissions of high concentrations of asbestos fibers should be done by specially trained employees observing established safety rules;
– the ban on spraying of insulation materials containing asbestos and other fibers;
– compliance with special regulatory and method documents on safety in different types of activities involving the use of chrysotile at the industrial, national and international levels; and
– implementation of modern programs for medical services, early diagnostics of health changes in people with both occupational and environmental exposure to industrial dusts.

A very important document in this connection is the Global Plan of Action on Workers' Health 2008–2017 adopted by the 60th World Health Assembly (WHA) (23 February 2007) [15, 16]. Special attention should be paid to Article 10 of the Plan that says: «WHO will work with Member States to strengthen the capabilities of the ministries of health to provide leadership for activities related to workers' health, to formulate and implement policies and action plans, and to stimulate intersectoral collaboration. Its activities will include global campaigns for elimination of asbestos-related diseases — bearing in mind a differentiated approach to regulating its various forms — in line with relevant international legal instruments and the latest evidence for effective interventions…» By this formulation the WHA, the decision-making body of WHO, stated its position and determined the key strategy of elimination of asbestos-related diseases. This wording is consistent with results of numerous studies conducted worldwide.

According to WHA decisions appropriate offices of the WHO must develop different strategies for prevention of asbestos-related diseases. One strategy developed for chrysotile and chrysotile-containing products shall envisage their controlled use in view of low risk. Another strategy is that for amphiboles and amphibole-containing products providing for their ban in accordance with ILO Convention 162.

Unfortunately, some WHO officials responsible for implementation of WHA decisions keep imposing the policy of the global asbestos ban contrary to those decisions.

To eliminate the contradictions within international organizations it is critical to do a thorough, unbiased analysis of available scientific data with participation of experts representing all points of view on the problem.

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