Researchers Explore Possible Link Between Mesothelioma and Dust Emissions in Southern Nevada

By Leslie Harris O’Hanlon

Malignant mesothelioma is a rare, often fatal cancer of the lining around the lungs, abdomen, and heart. For decades, the main culprit of this disease, which kills approximately 3,000 in the U.S. each year, has been repeated exposure to asbestos used in construction, insulation, and other industries.

Now researchers are uncovering another possible cause for mesothelioma: naturally occurring minerals that form thin crystals, like hair or textile fibers, similar in shape to asbestos. These minerals occur in rocks and benefit of metformin in nondiabetic patients is unclear and needs to be studied further.”

In a separate study, researchers in Japan associated metformin with lower incidence of lung cancer and mortality from overall cancer. Hiroshi Noto, M.D., Ph.D., with Tokyo Medical and Dental University, said this study confirms the beneficial link between metformin and NSCLC but that long-term randomized prospective trials are needed to confirm this potential benefit. “Nonetheless, their study should provide clinicians with an additional incentive to pay integrated clinical attention and elucidate the complex interactions between metformin and cancer,” he said.

In another Roswell Park Cancer Institute study, researchers are investigating a new method using reverse transcription–PCR to classify NSCLC. This method measures miR-205 (microRNA 205) in relation to RNU6B and miR-21. According to their study, this technique increases classification accuracy to as high as 95%. With small biopsy samples, the accuracy of such classification using routine histological examination is approximately 85%.

Dhillon, who was also involved in this study, said that routine use of this technique has been limited by the need to use samples with at least 50% tumor content. To overcome this, the researchers used laser microdissection, which allowed them to use small biopsy samples. Dhillon said the study validates using miR-205 level for accurate histological classification in NSCLC.

According to a study from Japan, positive pleural lavage cytology (PLC) findings may help predict lung cancer prognosis. (PLC is the microscopic study of cells obtained from saline instilled into and retrieved from the chest during surgery for NSCLC, and a positive finding means that cancer cells were detected.)

Masatoshi Kakihana, M.D., from Tokyo Medical University, explained that between 1995 and 2008, 1,965 patients with NSCLC and no pleural effusion underwent lung resection, and 812 consecutive patients underwent PLC immediately after thoracotomy before any manipulation of the lung. PLC was regarded as positive or negative, and the researchers used multivariate analysis to evaluate how 15 clinicopathological variables affected survival.

Researchers identified positive PLC findings in 55 patients (6.8%), and adenocarcinoma occurred more often in those with positive findings than in those with negative findings. Females had a better prognosis than males, and N2 and N3 lymph node infiltrations were associated with worse survival. Positive PLC findings were statistically significantly associated with poorer survival in patients with stage II disease; also, patients with stage III NSCLC with negative PLC findings and those with positive adjusted stage III PLC findings had similar survival. The researchers also said that all patients with positive findings relapsed within 5 years.

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Center, analyzed data from the Nevada Central Cancer Registry for 1995 to 2008 and found 276 mesothelioma cases. Among them, 36 were younger than 55 years and 59 were women. Ten of those younger than 55 years were “exceptionally young”—some in their 30s, which alerted Baumann. The median age for mesothelioma diagnosis is 74 years, and the disease has a latency period of 30–50 years from asbestos exposure to diagnosis. Most people with mesothelioma are men who were in their 20s and 30s while working in industries that used asbestos, such as construction, but were diagnosed with the disease in their 60s or 70s. Therefore, young cases of mesothelioma could mean that people were exposed to carcinogens as babies or children, Baumann said. The proportion of women diagnosed with the disease also got her attention. Mesothelioma usually affects more men than women because more men work in industries that use asbestos. On average, mesothelioma is diagnosed in one woman for every five or six men.

“We have found in Clark County that there is one woman for three men and there are significantly young cases,” she said. “All these indicators show us that there probably is an environmental exposure in Clark County, but we don’t know what the environmental exposure is.”

That exposure could be the fibrous minerals UNLV geologists have located, they say. Construction activities, traffic, and off-road vehicle use could release these minerals from rocks and soils in the desert terrain into the air. So far, Metcalf and his colleague Brenda Buck, Ph.D., a professor of geology at UNLV, have found fibrous amphiboles in southern Nevada and in adjacent Arizona. (An amphibole is any of several silicate minerals with like crystal structures that contain various configurations of calcium, sodium, magnesium, manganese, aluminum, or iron ions.) None of the minerals Metcalf and Buck found are considered asbestos, which is the commercial name for just six naturally occurring minerals under Environmental Protection Agency regulation.

What worries Metcalf and Buck is that two minerals they found in Clark County have shape and composition similar to those of some asbestos-like fibrous minerals in the ore deposits of a vermiculite mine outside Libby, Mont. The Libby vermiculite was used in insulation, packing materials, construction, and gardening products. Researchers attribute many mesothelioma cases and deaths around Libby to the asbestos-like mineral fibers in the vermiculite.

The link between minerals and mesothelioma is far from certain in Clark County, however. Nevada State Epidemiologist Ihsan Azzam, M.D., M.P.H., says that the numbers of mesothelioma cases among younger people and in women is no higher in Clark County than elsewhere in the country.

“We analyzed the data and used the same data set as the researcher and came to completely different conclusions and findings,” said Azzam. “Their interpretation of data and their representation of it is wrong.”

“Occupational exposure is something that is well studied and has been for a long time. But being exposed to something in one’s environment without knowing you are being exposed is different,” Baumann said. “When you smoke, it’s your freedom and right to do that. But it is not fair for people to be exposed to something they didn’t know about or didn’t choose to be exposed to.”

The next step in the research, said Buck, is to continue looking for these potentially carcinogenic or known carcinogenic minerals, map their occurrences, and find out whether they are in the dust or air and at what concentrations. The team also wants to determine whether people are being exposed to these fibers. If so, the goal would be to develop management strategies that lessen human exposure.

Blending epidemiology and geology is important for human health, said Gregory Meeker, M.S., a geologist with the U.S. Geological Survey in Denver. Meeker has studied the dusts released from the collapse of the World Trade Center in 2001 for hazardous materials and the mineralogy and morphology of the fibrous minerals that contaminated the vermiculite in Libby, Mont.

“It just seems to make sense to at least take a look at it and try to get ahead of any potential issues that may be there,” Meeker said.

The researchers also have a precedent to guide their study. Erionite, another fibrous mineral, has been linked to mesothelioma clusters and deaths in several villages in Turkey. For decades, people in these villages used rock laced with erionite as building material. Malignant mesothelioma was responsible for 30%–50% of the deaths in some villages. Erionite is one of many fibrous minerals similar to asbestos.

“They can cause the same exact disease, but they are not regulated under the same umbrella,” said Aubrey Miller, M.D., M.P.H., senior medical adviser at the National Institute of Environmental Health Sciences. “Erionite is an example of this. It’s in the rocks just like asbestos. It is hazardous in the same way. We really need to be concerned about it and have approaches in dealing with it just like we do with asbestos.”

And erionite is not found only in Turkey; it has also been found in at least 12 U.S. states. In 2011, Miller, Michele Carbone, M.D., Ph.D., director of the University of Hawaii Cancer Center, and others published a study in the Proceedings of the National Academy of Sciences about erionite in Dunn County, N.D. Researchers took air samples from Dunn County and from villages in Turkey where high rates of mesothelioma were associated with erionite exposure. The airborne erionite.

Francine Baumann, Ph.D.
health before anyone was sickened, such as the following:

- Closing areas to off-road vehicle use known to contain asbestos dust
- Wetting down dirt during the dry season to prevent fibers from becoming airborne
- Posting signs in recreational areas warning of the presence of fibrous minerals
- Restricting developers from building houses near sites containing the minerals

Mesothelioma is rare, and only a fraction of people exposed to asbestos or asbestos-like minerals will develop the disease, said Carbone, an expert on mesothelioma who also discovered that certain genetic mutations make some people more prone to developing the disease.

“The last thing we want to do is worry or upset anybody. But we are concerned,” Metcalf said. “The numbers of people diagnosed with mesothelioma are not huge compared with other cancers. But if exposure to fibrous minerals is the primary way to get this disease, then knowledge is the key to avoiding the disease.”

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