By Mark Harris

Asbestos-related disease has a breathtaking legacy

In the northwest corner of Montana—a state well-known for its beautiful mountains, lakes, and forests—can be found a stark reminder of the legacy of asbestos. For much of the 20th century, Big Sky Country also meant big health risks for residents living in or near the town of Libby.

Industrial strip-mining of an asbestos-contaminated mineral called vermiculite dominated the local economy for seven decades. The mining operations, which did not end until 1990, exposed generations of area residents, many of whom worked at the W.R. Grace & Co. mine, to toxic pollution linked to asbestos fibers. Libby-area residents were exposed to asbestos through air pollution, vermiculite processing wastes, and contaminated soil, sediment, dust, and water, according to the U.S. Environmental Protection Agency (EPA).

Nearly a decade after the mine closed, the EPA took steps to begin screening residents for asbestos-related lung abnormalities. In one report covering 1979–1998, the Agency for Toxic Substances and Disease Registry (ATSDR) reported rates of malignant respiratory deaths among Libby-area residents 20–40 times higher than usual. Nonmalignant respiratory deaths, particularly from the lung condition asbestosis, were at least 40 times higher. Subsequently, ATSDR has identified 694 deaths from an asbestos-related disease in the Libby area between 1979–2011.

Worked into the ground
The story of asbestos in Libby is a cautionary lesson in reckless environmental practices. Indeed, the Libby experience might be comparable to the proverbial canary in the coal mine, a case study in the toxic potential of asbestos to overwhelm the health of a community. In fact, as late as 2009, the EPA was still describing the situation in Libby as a “public health emergency.”

What is asbestos exactly? Why is it so dangerous to human health? What explains its decades-long influence as an industrial product? Asbestos is an industry trade name for a category of six naturally occurring fibrous minerals found in the earth: amosite, chrysotile, crocidolite, tremolite, actinolite, and anthophyllite.

The long, separable fibers characteristic of asbestos minerals make it both attractive for commercial use and an insidious threat to human health. These very thin mineral fibers are strong, heat resistant, and adaptable for manufacturing uses. As such, asbestos has been used for insulation, fireproofing, and durability in a variety of commercial products, including but not limited to the following:
HAZARD

• Roofing shingles
• Floor and ceiling tiles
• Paper and cement products
• Automobile brake and transmission parts
• Clothing fabrics

Even though evidence began to appear in the early 20th century that asbestos could damage the lungs, it was not until the 1970s that the EPA and the Occupational Safety and Health Administration (OSHA) began to regulate asbestos more closely. The regulatory initiatives sprang from mounting medical evidence that asbestos exposure was damaging to human health.

In the 1960s, researcher Irving Selikoff, MD, of Mount Sinai Hospital in New York City, had begun to establish compelling clinical evidence that asbestos exposure was associated with unusually high rates of lung cancer. This was first noted among insulation workers who worked near asbestos.

Accordingly, as the links to disease grew, regulatory action was taken to limit asbestos use in commercial products. For example, in the late 1970s, the U.S. Consumer Product Safety Commission banned asbestos use in wallboard patching compounds and gas fireplaces. In 1979, companies that produced electric hair dryers voluntarily stopped using asbestos in their products.

Later in 1989 the EPA moved to ban most asbestos-containing products. Strict abatement procedures were also put in place regarding asbestos in school buildings. However, the EPA ban was overturned in 1991 by the 5th U.S. Circuit Court of Appeals, upholding only a ban on “new uses” of asbestos.

Built to lasting effects

Even though asbestos is not currently banned in the United States, the domestic asbestos market has declined considerably over the past 40 years. Unfortunately, the toxic legacy from decades of commercial asbestos remains a serious public health concern in the country, say health experts.

“Historically, we have to think about how much asbestos was used in commercial products and buildings, homes, and schools,” says Celeste Monforton, DrPH, MPH, a lecturer with the Texas State University Department of Health and Human Performance and the Milken Institute School of Public Health at George Washington University. “Tens of millions of tons of asbestos were imported and mined in the United States. As the so-called magic mineral, asbestos does not degrade. It doesn’t...
Inhaled asbestos fibers from the air can stick to the mucus in the throat, trachea (windpipe), or bronchi and might be cleared by being coughed up or swallowed. But some fibers reach the ends of the small airways in the lungs or penetrate the pleura (the outer lining of the lung and chest wall). These fibers can irritate the cells in the lung or pleura and eventually cause lung cancer or mesothelioma.

As such, we have all this existing asbestos in the United States, which we sometimes refer to as ‘legacy’ asbestos. In addition, the chemical manufacturing industry still imports asbestos into the United States.

Today, as many as 35 million American homes, buildings, and offices built between the 1940s and 1990s are contaminated with asbestos-containing Zonolite insulation. Undisturbed, asbestos contained in building materials may not pose an immediate or direct health threat. However, the existence of such a toxic carcinogen in commercial buildings and old housing stock represents an ongoing public health concern, cautions Dr. Monforton.

“Materials in a building structure can start to break down and leave the asbestos fibers exposed,” she says. “When building materials are disturbed in some way, such as for building renovations or demolitions, then we also have exposure. [and it will affect] workers or people who live in homes where there’s some type of renovation. There are proper ways to remove and dispose of asbestos, but it has to be done very carefully.”

Unfortunately, there is no official database or inventory on the presence of legacy asbestos in communities, says Dr. Monforton. Nor is the public necessarily fully aware of the real extent of ongoing health risks posed by legacy asbestos.

“What I’ve found over the last 14 years, especially as a mesothelioma widow, is that the general public has a lack of understanding about asbestos in general: what it is, where it might be, and what to do for prevention,” says Linda Reinstein, president and cofounder of the nonprofit Asbestos Disease Awareness Organization (ADAO).

As an ADAO spokesperson, Reinstein is a well-known public health advocate for asbestos awareness. She has appeared as a U.S. congressional witness and spoken nationally to health care providers, families, and others about asbestos-related health issues. Her engagement with the subject began after her late husband was diagnosed with malignant mesothelioma in 2003. In fact, the Alan Reinstein Ban Asbestos Now Act of 2017, introduced by Democratic Sen. Jeff Merkley of Oregon, is named after Reinstein’s husband (a similar bill was introduced into Congress in March 2018).

Americans might be inclined to downplay the continuing health risks associated with asbestos for many reasons, says Reinstein.

“There’s sort of this popular misunderstanding that asbestos has been banned in the United States. As well, the long latency period between exposure and asbestos-disease development—from 10 to 50 years or more—might incline some people to underestimate the risks associated with exposure. You also cannot see, taste, touch, or smell asbestos fibers. The presence or absence of asbestos has to be confirmed by testing.”

Unfortunately, Americans continue to contract diseases related to exposure to asbestos fibers. Asbestos is responsible for an estimated 12,000–15,000 annual deaths, according to a 2015 estimate.

In fact, a 2017 Centers for Disease Control and Prevention (CDC) report found there were 45,221 deaths from malignant mesothelioma alone between 1999 and 2015. Mesothelioma is a cancer that affects the tissue that surrounds the lungs (pleura) and other internal organs. Notably, it is almost exclusively related to asbestos exposure. About 37 percent of mesothelioma deaths cited by the CDC were of individuals (mostly male) 75 years and older, a reflection largely of past occupational exposure. The overall annual mesothelioma death rate also increased slightly during these years (2,579 deaths in 2015).

Significantly, the CDC report cited measurable instances of mesothelioma deaths among younger populations. As the CDC concluded:

Despite regulatory actions and decline in asbestos use, the annual number of malignant mesothelioma deaths remains substantial. Contrary to past projections, the number of malignant mesothelioma deaths has been increasing. The continuing occurrence of mesothelioma deaths, particularly among younger populations, underscores the need for maintaining efforts to prevent exposure and for ongoing surveillance to monitor temporal trends.

Accordingly, such experts as Dr. Monforton are concerned that younger Americans are still being exposed to asbestos in workplaces, homes, and products.

“When OSHA regulations were put in place in the 1970s, and then enhanced in the 1980s, … [and] with EPA regulations in place for schools and buildings, there was an expectation that these regulations were going to be effective at reducing asbestos exposures,” says Dr. Monforton. “With the benefit of this new surveillance data, we can now see in very frank numbers that those interventions have not been as effective as hoped. They’ve played a role only in reducing some of the exposures.”

Why, after decades of regulatory controls, is asbestos-related disease still seen in younger populations? “I attribute part of this to inadequate controls in workplaces,” observes Dr. Monforton. “We have individuals doing work on buildings who are not told about asbestos. They’re coming home with asbestos fibers on their work clothes. Their employers may have failed to have the proper controls in place. Some of these workers may not even realize they’ve been exposed. Often, these are low-wage workers, immigrant workers, and day laborers doing building-demolition work. Even if they ask questions or report something that looks suspicious, they may be told not to worry about it, that it’s not asbestos. Or they are not provided with the necessary protective gear. There are many examples of irresponsible practices that result in exposure.”

Unfortunately, asbestos remains a ubiquitous presence in American life, concludes
Dr. Monforton. “There is still so much asbestos in our environment, in buildings and homes, around piping and wall structures, and in tiles and roofing materials. It’s very much a part of [building] structures. Also, because it’s not banned in the United States, we still have consumer products that contain asbestos. If someone is exposed to asbestos in consumer products when they’re very young, even in a small amount, it is possible that 20 or 30 years down the road they may become the person who—in the prime of life—develops an asbestos-related disease.”

Homeowners involved in do-it-yourself renovations can also become lax about preventing exposure to legacy asbestos, adds Reinstein. “There’s the person who wants to do home repairs on the weekend and might have a deadline and either just doesn’t understand the exposure risk or can’t get something tested quickly. Or, they might think they’re just sort of immune to exposure and possible disease.”

Of course, it’s not always possible to know when building materials contain asbestos. Accordingly, the EPA recommends that concerned homeowners consult an accredited asbestos professional to inspect and test the materials.\[^1\]

**Air grievances**

Asbestos exposure can lead to several conditions, explains Raja M. Flores, MD, chair of the thoracic surgery department for the Mount Sinai Health System in New York City. “Mesothelioma is probably the most devastating. Then we have asbestos-related lung cancer, which is more common than mesothelioma, with about 4,000 to 5,000 cases a year. There is also asbestosis, which is a progressive fibrosis of the lung that causes a person to die from shortness of breath.”

Although asbestosis is not cancer, its impact on patient health is still potentially quite serious. “Some people can have asbestosis and wouldn’t even know it,” says Dr. Flores. “But other people have asbestosis with a rapid progression. They studied this in Libby, Montana, with a cohort that was exposed to contaminated asbestos. Asbestosis will kill you just like asphyxiation. I’ve had patients die from progressive shortness of breath, which is just as horrible as cancer.”

Other noncancerous conditions associated with asbestos include pleural plaques, pleural thickening, and pleural calcification. Irritating asbestos fibers can trigger such abnormalities in the lung’s thin outer lining or chest wall. Asbestos is also linked to pleural effusion, a condition in which fluid builds up in the pleural space between the lungs and the chest cavity.

Notably, recent studies have also linked asbestos exposure to cancer of the ovaries and larynx.\[^2\]

Several factors determine a diagnosis of an asbestos-related disease, including the individual’s possible exposure history, symptoms, physical examination, and test results. Caring for patients with an asbestos-related disease requires a team of providers:

- Primary care physician
- Pulmonologist
- Radiologist
- Oncologist
- Pathologist
- Thoracic surgeon

The testing toolkit often includes an initial chest X-ray, which can reveal existing asbestosis, pleural plaque, and pleural effusion. An X-ray examination might also suggest a possible diagnosis of mesothelioma or lung cancer. If so, a chest computed tomography scan, or chest CT scan, can help establish a diagnosis of asbestosis, mesothelioma, or lung cancer. Other useful imaging tests include positron-emission tomography (PET scan) and MRI. Finally, a tissue biopsy will often confirm a cancer diagnosis.\[^3\]

Although reversal of the damage done to the lungs by asbestos is impossible, many medical treatments can treat the symptoms, complications, and progression of asbestos-related diseases. For example, medicines can manage pain or prevent fluid buildup. For lung cancer or mesothelioma, surgery, chemotherapy, radiation therapy, and other treatments can often slow the progression of asbestos-linked cancer.

**Exposure issues brought to light**

While lung cancer is associated with a history of exposure to cigarette smoking, air pollution, and other factors (including asbestos), mesothelioma is almost exclusively caused by exposure to asbestos.

“Mesothelioma is a completely preventable cancer,” says Dr. Flores. “If you’re not exposed to asbestos, you won’t get mesothelioma. If you do have mesothelioma, somewhere down the line, you were exposed to asbestos, but you just didn’t know it.” Contrary to some popular misperceptions, mesothelioma is not a form of lung cancer, adds Dr. Flores, but cancer of the pleura, which is the covering of the lungs.

Unfortunately, mesothelioma is usually diagnosed in later stages, when treatment is more difficult. “Most cases are identified with more advanced-stage disease,” reports Dr. Flores. “I would say the majority of cases involve stages III and IV [by which time] you can’t treat them.”

Mesothelioma tumors are more thinly spread over tissue, as opposed to more defined tumor masses in lung cancer. For this and other reasons, the disease tends to be more difficult to treat than lung cancer, with lower long-term survival.\[^4\] The initial diagnosis of mesothelioma can also be challenging for clinicians.

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**A labor of law**

“Congress should pass legislation banning the manufacture, sale, export, or import of asbestos-containing products (i.e., products to which asbestos is intentionally added or products in which asbestos is a contaminant). The ban should also apply to products containing asbestos or arising from asbestos-contamination of other ingred- dent minerals (e.g., talc, vermiculite, taconite, quarried stone).”

— American Public Health Association (APHA) Policy Statement 20096 (2009)\[^5\]

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Silent but deadly

Signs and symptoms of asbestos-related lung diseases can vary and not appear for 10 to 40 or more years after exposure.  
• **Pleural plaque** may not cause any symptoms.  
• **Pleural effusion** is often associated with one-sided chest pain.  
• **Asbestososis** can cause shortness of breath on exertion, fatigue and dry cough.  
• **Lung cancer** includes such symptoms as a worsening or chronic cough, trouble breathing, chest pain, coughing up blood, frequent lung infections, fatigue, and unexplained weight loss.  
• **Mesothelioma** symptoms typically include shortness of breath and chest pain related to pleural effusion.

“Many people with mesothelioma actually have a delay in diagnosis,” says Leah Backhus, MD, MPH, FACS, an associate professor of cardiothoracic surgery (thoracic surgery) at the Veterans Affairs Palo Alto Health Care System. “First, you need to have a reasonably high-level initial suspicion in order to make the diagnosis in an appropriate or expeditious time frame. [Another] problem is that mesothelioma is such an uncommon cancer that the majority of providers taking care of patients who actually wind up being diagnosed with mesothelioma are probably unfamiliar with it.”

Unfamiliarity with mesothelioma also can lead to other issues, explains Dr. Backhus, who also practices at Stanford Hospital in Stanford, California. “There’s often a delay in diagnosis, but there may also be a delay in treatment,” she says. Both improper routing of patients to see the appropriate specialists or lack of awareness of available treatments further prevent patients from receiving timely treatment, explains Dr. Backhus. “Historically, mesothelioma has [had] a grim prognosis. I think many providers don’t really prioritize getting patients plugged into treatment in a timely fashion. Most commonly, this would be an unintentional bias. But there’s definitely a lack of awareness about the disease that ends up being an additional burden for a new patient.”

The mesothelioma diagnosis can be further complicated for other reasons, says Dr. Backhus. “We can have patients with pleural effusion who’ve been ‘tapped’ multiple times. [Thoracentesis, or pleural tap, is a minimally invasive procedure to diagnose and treat pleural effusions.] But they may not always see the malignant cells if they’ve sent the pleural fluid for cytology analysis. Or the patient may simply be treated as someone who has pleural effusion for other unspecified reasons like heart failure, pneumonia, or empyema, which is an infection outside the lung but within the pleural space. The findings can be relatively subtle, particularly in the early stages. The additional diagnostic work-up that we do in terms of a PET scan can also be misleading. So, it can be quite tricky to actually wind up with the diagnosis. Most people don’t get [definitive] results until they see a surgeon and have a pleural biopsy.”

What surgical options exist for qualified mesothelioma patients? “I offer two types of surgery for my patients,” reports Dr. Flores: pleurectomy and decortication (P/D) and extrapleural pneumonectomy.

“While these procedures can get rid of all the cancer that’s there, there’s microscopic disease that’s being left behind, which is why most of the time we also recommend radiation after [surgery] and sometimes chemotherapy,” adds Dr. Flores.

The estimated two-year survival rate for stage IIA malignant pleural mesothelioma, the earliest stage of diagnosable disease, is about 46 percent, according to the American Cancer Society. Five-year survival is about 16 percent. Toward the other end of the spectrum, the two-year survival rate for those with stage IIIA cancers is about 30 percent, while five-year survival drops to about 8 percent. The two-year survival rate for those with stage IV cancer is about 17 percent, while five-year survival is less than 1 percent.

Dr. Flores is frank about the benefits and limits of mesothelioma surgery. “We know surgery alone isn’t going to be the thing that fixes it. While it’s the best treatment that we have, I never use the word ‘cure.’ I can say this will help you live longer with better quality of life, but it’s not a cure.”

For Dr. Flores, the devastating impact of mesothelioma on patients only underscores the importance of asbestos-exposure prevention. “The main thing to understand about mesothelioma is that yes, we can treat it after diagnosis with different [surgical] operations. But the majority of those patients will succumb to their disease. If we really want to make a difference in this disease, we’ve got to make sure that we prevent it.”

Accordingly, Dr. Flores is also a strong advocate of identifying those who’ve been exposed to asbestos through screening for disease. He recommends the use of a CT scan, or CAT scan, for asbestos-disease screening. “There was recently a study that showed CAT-scan screening helped to improve survival for lung-cancer patients,” he says. “Mesothelioma patients or patients exposed to asbestos are at an even higher risk of developing cancer compared with patients who are smokers. I think we should extend CAT-scan screening to asbestos-exposed patients.”

The U.S. Preventive Services Task Force recommends annual lung-cancer screening with low-dose computed tomography for adults with at least a 30 pack-year smoking history, who currently smoke, or who have quit within the past 15 years.

Build a better future

Historically, asbestos-related diseases are inexorably linked to the rise of the modern industrial economy. In this sense, the use of asbestos in manufacturing and commercial products is essentially a human-made source of global pollution, disease, and disability. The latency period for the disease to manifest, the legacy of asbestos in building and home structures, and the continued import and use of asbestos in some U.S. products are all reminders that asbestos exposure remains a significant public health issue.

“Most people think the asbestos issue is a thing of the past, but it is not,” concludes Reinstein. “On the medical side, there needs
CDC and Medscape Education Present: Infection Prevention and Control for US Healthcare Workers – A Free CME/CE Certified Series

**About This Series**
Welcome to this CME/CE video series on infection control. Although institutions and infection control experts have made significant progress in preventing some types of infections, there is still a great deal of work to be done. This series will feature discussions with top faculty on infection transmission and healthcare-associated infections. We will take a look at the healthcare environment and touch on medical equipment, injection safety, risk recognition, glove use, and hand hygiene.

**Activity 1**
Learn how to recognize and mitigate the risk of infection transmission CME/ABIM MOC/CE
Learn how to reduce infection transmission and healthcare-associated infections
Faculty: Michael Bell, MD; Lisa Hasagawa, MD, MPH; Peter Pronovost, MD, PhD

**Activity 2**
Healthcare-associated infections and the role of the healthcare environment CME/ABIM MOC/CE
Healthcare-associated infections and how to prevent them in healthcare settings
Authors: Patti Costello; Ruth Carrico, PhD, MSN, FNP; Russell N. Olmsted, MPH, CIC

**Activity 3**
Recognizing Infection Risks in Medical Equipment CME/ABIM MOC/CE
Medical equipment and devices pose infection risks: a look at their use, maintenance, and reprocessing
Faculty: Michael Bell, MD; Daniel Diekema, MD; J. Hudson Garrett, Jr, PhD, MSN, MPH, FNP-BC

**Activity 4**
Infection Transmission Risks Associated with Nonsterile Glove Use CME/ABIM MOC/CE
Nonsterile gloves and hand hygiene and infection control
Faculty: Michael Bell, MD; Ruth Carrico, PhD, MSN, FNP; J. Hudson Garrett Jr, PhD, MSN, MPH, FNP, Sujan C. Reddy, MD

**Activity 5**
Infection Prevention: A Hierarchy of Controls Approach CME/ABIM MOC/CE
Learn how the “prevention through design” strategy can reduce or prevent infections, fatalities, and occupational injuries
Faculty: Wendell Chipps, MD, MSc; Bryan Craven, PhD, DSc; Lynne Isenberger, MD, CC, CFER

**Activity 6**
Learn how to implement a system-wide approach to prevent breaches in injection safety CME/ABIM MOC/CE
Learn how to implement a system-wide approach to prevent breaches in injection safety
Faculty: Joseph P. Price, MPH; Sharane A. Kavan, MD, MPH, FNAAC, FISHEA; Timothy Hendrix, PhD, MPH, CC

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Beyond the call of duty

Workers in high-risk occupations for asbestos exposure tend to handle asbestos in high concentrations on a regular basis:\n
- Asbestos miners
- Asbestos-plant workers
- Boiler workers
- Construction workers
- Firefighters
- Industrial workers

Notably, construction jobs are a major source of asbestos exposure in the U.S., with demolition crews and home renovators being among the most at risk of exposure. Approximately 25 percent of people who die of asbestosis worked in the construction industry, according to the National Institute for Occupational Safety and Health.\n
...to be more awareness. If we can better educate the medical community about early warning symptoms, high-risk occupations, and the exposure risks from natural disasters, such as hurricanes Katrina or Sandy, and then also educate workers and others at risk, we can have a better conversation about asbestos exposure and get people to medical treatment centers sooner.\n
Unfortunately, the long gap between asbestos exposure and the first appearance of disease symptoms contributes to the challenge of obtaining an early, timely diagnosis. With a latency period of 10 to 50 years for mesothelioma to present, for example, there’s a lag between exposure and the disease being diagnosed, says Reinstein.

As she recalls from personal family experience, “If a doctor only asks, as with my husband, ‘Have you ever been exposed to asbestos?’ the answer may be, ‘I don’t think so.’ But if he had asked, ‘Have you ever worked in a shipyard? Have you done home repairs? Was your home built before 1980?’—questions that will circle around high-risk exposures—my husband would have said, ‘yes, yes, and yes.’”

Dr. Reinstein adds, “The medical community [needs] to understand the issue of occupational exposure history and familial exposure in the home. If we don’t train primary care physicians or patients to think about where exposure could happen, then we’re missing a very large subpopulation.”

There are certainly many fronts to improving diagnosis and treatment options for patients with an asbestos-related disease, from primary care to oncology and pulmonology, thoracic surgery, and other specialty areas. Overall, the medical community has a vital role to play in furthering public awareness of asbestos risks, including improving early diagnosis of asbestos-related cancer and diseases. But perhaps the paramount challenge remains preventing asbestos exposure in workplaces, homes, and products.

Indeed, the watchword of prevention—eliminating all asbestos use and exposure—is at the heart of hopes for a healthy, asbestos-free future.\n
References