Helium: Impending Crisis for Radiology, or Just More Hot Air?

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We never know the worth of water till the well is dry.

—Thomas Fuller

It is one of the most ubiquitous elements in the universe, second only to hydrogen. Balloons filled with it are almost everywhere and can be purchased for only a few dollars. One can easily be forgiven for assuming that helium, which plays a currently irreplaceable role in the superconducting magnets used in MRI and particle accelerators, is not only relatively easily obtained but in inexhaustible supply.

Unfortunately, the reality of the global helium supply may come as a surprise even to those of us who directly rely on it. According to a report published in 2010 by the National Academy of Sciences, helium is a precious resource at risk of permanent depletion in the very near future, with major and potentially devastating shortages as early as 2015. How did we get here? And what can be done to avert a possible crisis for our specialty, which accounts for approximately a quarter of all the helium used in the United States?

The United States first identified helium as a critical strategic resource in the 1920s and began aggressively stockpiling helium in 1960, with almost the entire world's supply now stored within 250 miles of Amarillo, Texas. In 1996, however, the government decided to get out of the helium business. The Helium Privatization Act passed by Congress that year required that all of the helium in the Federal Helium Reserve be sold off by 2015, regardless of market price. Since that time, the use of helium has soared, used not only in MRI machines and particle accelerators but also in the manufacture of fiber optics, liquid crystal displays, radiation detectors, and rocket engines. Because of the artificial market cap on the price of helium, its price remains very low despite escalating demand, thereby removing any incentives that might otherwise exist to recycle or conserve this resource. There is no way to recycle helium unless countermeasures to preserve it are used at the time it is used; once released into the atmosphere, it drifts into outer space and is lost forever.

There is currently no way to artificially manufacture helium. A byproduct of billions of years of radioactive decay, helium is distilled from natural gas that has accumulated in the presence of radioactive uranium and thorium deposits. One of the largest helium-rich natural gas pockets in the world fortuitously lay under the Great Plains of the United States, allowing the United States to become by far the largest global supplier of helium. In an ironic twist, if the United States does not soon cease selling off its reserves at the current rate, within 15 years our country will be forced to import helium from abroad. More ominously, even if every natural gas field left on the planet is tapped for helium moving forward, we still have only a few decades' supply remaining, even assuming a low growth rate of consumption.

As supplies diminish, helium will undoubtedly be used more efficiently, and investments in recycling technologies will grow. By that point, however, we will have already squandered the bulk of the earth's 4-billion-year bounty and may have only a very small quantity of helium left for recycling.

What can be done to avert or at least delay a crisis? Nobel laureate Robert Richardson, a professor of physics at Cornell University who coauthored the National Academy of Sciences report on the looming shortage, suggests that the price of helium be increased by 50 to 100 times to reflect its true value and encourage conservation and recycling. This may raise the cost of MRI, as well as the many other scientific and industrial products that rely on helium, not to mention the prospect of helium balloons for children costing a hundred dollars apiece. Without some sort of action, however, the cost of helium may eventually skyrocket to such lofty levels anyway, before vanishing from the earth forever.

At a time when our profession faces many visible challenges, why should we be worried about an invisible gas and a crisis that may not arrive for years? The answer I believe is obvious, although the solutions may not be. Scientists have already started sounding the alarms about the impending helium shortage. As the profession that uses helium for some of this element's most vital applications, radiologists should join them.

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