Sleeping well in Seattle with lab's shift to x-ray

Karen Titus

June 2017—For laboratories and blood centers, thinking about safety is second nature, like rain in Seattle or sunshine in San Diego. Everyone understands the need to prevent transfusion-associated graft-versus-host disease, and standards, protocols, and habits have settled in to ensure a safe blood supply.

Second of two parts

Creating a product safe from TA-GvHD means relying on blood product irradiators, either cesium or x-ray. "They're like any other piece of laboratory equipment," says Karen Nelson, PhD, vice president of laboratories, Bloodworks Northwest, a Seattle-based blood center and research institute. To decide which machine is best, "You have to look at the cost-benefit ratio, and what cost it adds to each procedure that you do." Cesium irradiators are boringly reliable; x-ray irradiators don't share that same reputation for consistency. X-ray irradiators can fit in almost anywhere in the laboratory, while cesium irradiators must dwell in their own carefully secured rooms.

Institutions that have continued to use cesium irradiators, however, have one more element to think about. In the post-9/11 era, when ensuring a safe blood supply has just as much to do with thinking about terrorism (and possibly other types of attacks) as it does reducing viable leukocytes in the blood component, they have to decide whether it makes sense to replace a cesium irradiator with an x-ray device. The risk of a terrorist attack on a blood center may be low, but it's a risk nonetheless.

The specter of a terrorist attack raises the stakes of this decision significantly. The patient population quickly becomes the population of a city or region. And laboratory safety means figuring out how to protect staff when a SWAT team bursts through the doors.

In Seattle, three blood experts who have followed the debate weighed in with CAP TODAY. (The first CAP TODAY article on the topic, "New rays on blood safety," appeared in the March issue.) As they each made clear, grappling with safety issues means thinking outside the locked box.

At most institutions, the type of irradiator in use is weighted in history. New irradiators are expensive (a quarter of a million dollars on the low end, plus costly annual service contracts), and a why-change-what's-always-worked attitude makes even more sense given that cesium irradiators, with their long-lived, Dorian Gray-like source, do, in fact, always seem to work.

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Meghan Delaney, DO, MPH, understands these views, having witnessed the transition from cesium to x-ray in one of her laboratories. The aim was to have a more flexible device with a lower safety risk profile. It was no small matter, says Dr. Delaney, medical director of blood transfusion and apheresis services at Seattle Children's Hospital. The percentage of blood that's irradiated at a pediatric hospital compared with that of other facilities is quite high, she notes. "We're almost at 100 percent irradiated red cells and platelets," Dr. Delaney says.

While cesium and x-ray irradiators both require routine maintenance, it's the unscheduled downtime that can push a lab to the brink, especially when volumes are high. "When our first x-ray irradiator kept breaking early after we installed [it], we'd reminisce that our cesium irradiator never broke," Dr. Delaney recalls. "We're using irradiators a lot. So it's a big deal when they go down. You need to very carefully think about how you're going to get irradiated blood products to the patients when it does go down."

As she's watched the migration to x-ray irradiators, she's also seen improvements. "Our unexpected downtime has significantly decreased over the years. So I think the devices are much more stable now." The early machine at one of her labs has become reliable since the installation of upgraded parts.

Dr. Delaney also recalls the difficulties of moving an irradiator into the laboratory. The building was old—not England old, but creaky enough that moving in an x-ray device required load testing of floors prior to installation. And the water pressure required was significant—a problem initially because "the native water pressure in the building wasn't that high. They had to install a booster."

Like the French horn, "These can be difficult instruments," says Dr. Delaney.

Nevertheless, there have long been reasons to switch to x-ray even before the Sept. 11 attacks, Dr. Delaney says. "It's hard to say which came first, the chicken or the egg," she says. Even without the threat of an assault, cesium has to be managed more stringently.

With experience as a CLIA director as well as a radiation safety officer at Bloodworks Northwest, Dr. Nelson has a foot in both the medical and regulatory worlds. Along with the burden of meeting safety standards, she sees another drawback to cesium. The strict oversight of personnel who work with these irradiators, including background checks, can affect hiring. "It's difficult to recruit people to work in laboratories nowadays," she says. The extra qualifications may drive away prospective hires. "It's another set of hoops to jump through. They may end up not choosing the job you're offering and choosing someone else's because they may not want to bother having fingerprints on file with the government."

Cesium irradiators are also big and hard to work around, says Dr. Nelson, whose own institution began swapping out cesium irradiators shortly after 9/11. "It reduces your ability to be nimble and to respond to new challenges and opportunities."

Despite the early difficulties, Dr. Delaney now declares herself "thrilled" to have x-ray irradiators at her disposal. "I can have it right in my lab, and I don't have to deal with Homeland Security any longer."

It's hard to know how terrorists—or another attacker—might think. For those who might be targeted, merely talking about it is just as hard. Conversations about the topic have the air of Victorians discussing sex, with no one really comfortable mentioning actual details. Asked to speculate how a security breach might unfold, one source previously told CAP TODAY, "That's nasty, crazy talk—we don't want to think about it."

A strain of "This would never happen here" thinking also pops up, and it's not necessarily wrong-headed. But a haunting aria—call it *Ma forse* (But maybe . . .)—also echoes through these discussions. Even if the idea of an attack seems far-fetched, Dr. Delaney says, "You don't necessarily want to dismiss it, because that seems naive."

And, as she points out, the federal government considers the risk real enough that it has helped foot the bill for removing and decommissioning cesium irradiators.

In her position as the medical director of a centralized transfusion service at Bloodworks NW for the past 13 years, Theresa Nester, MD, has become well-schooled in the far-reaching implications of a lab-based cesium disaster. Dr. Nester is also familiar with the security drills, conducted under the auspices of the Department of Homeland Security, that walk laboratories and other key players through the steps of responding to a security breach. Certainly she's seen radiation safety officers cringe post-drill as they consider vulnerabilities in their laboratories. And she understands what happens when a laboratory is no longer merely a lab—when it becomes essentially the ganglion of police and fire departments, county health officials, bomb squads, the FBI, and Homeland Security.

As she listens to the wide range of concerns from this chorus of voices, one thought becomes a sticking point: Once an alarm is pulled, "that means you'll get a squadron of armed people coming into your lab," Dr. Nester says. "Nobody wants a SWAT team descending on their lab. When I talk to colleagues at other labs who still have gamma, that's their big fear. They're always a little worried someone will pull a trigger inappropriately because someone in the lab inadvertently pushed an alarm."

Just as worrisome may be a situation in which alarms need to be triggered but aren't. A real-life attack doesn't require movie-worthy action—staff may not even realize initially that something is amiss. Rather than focus on how an attack might occur, Dr. Nester suggests a better starting point for labs is to assume that one will, then think about what needs to happen next.

When, for example, should security personnel set things in motion? As they monitor video cameras, how can they identify a problem with certainty? Do laboratory personnel know where the alarm buttons are located? A false-positive, so to speak, can have frightening implications. Ever since the federal government upped its security measures, "Every lab person I talk to who has a cesium irradiator is very scared the SWAT team is going to show up inappropriately and hurt lab staff because it's a false alarm and they don't realize it," Dr. Nester says.

Laboratories also need to think about how to communicate with others in the building if there were a terrorist in the lab or elsewhere in the building, and work through how to keep everyone safe, including evacuation procedures. Even if there's no immediate harm to lab personnel, laboratories might also have to discern how much radiation staff have been exposed to.

Just as frightening, at least to Dr. Nelson, is the idea that if an attack does occur, "your lab becomes a crime scene." She's been advised that personnel can be sequestered off site and not released until they've been interviewed by the authorities. And the building itself, again as a crime scene, might be locked down for weeks. Labs still housing cesium irradiators should plan how to transfer testing quickly to another work site.

Talking to others outside the laboratory has been equally instructive, Dr. Nester says. It's a smart idea for first responders to have maps of the lab's layout, for example, and to walk them through the facility at some point.

But those talks have also been dispiriting. In a conversation she had with a bomb squad expert, Dr. Nester says, she learned that cesium can be transformed into an explosive device in a matter of minutes. "It's frightening to realize how fast you can make a dirty bomb."

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