In Iowa, addressing PPE shortages with ionized hydrogen peroxide

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When preparing for the possibility that they would have a patient with Ebola, University of Iowa (UI) Hospitals and Clinics developed and created a biocontainment unit. But there needed to be a way to safely turn the unit back into an intensive care unit that was safe for all patients. That is when Mike Hartley, emergency manager for UI Hospitals and Clinics, learned about the effectiveness of ionized hydrogen peroxide, which would prove to be beneficial once COVID-19 hit.

UI Hospitals and Clinics—an AMA Health System Program Partner—includes an 845-bed hospital in Iowa City that annually admits more than 36,000 patients and employs more than 1,800 physicians, dentists, residents and fellows.

“I wanted something that could sanitize a room by seeping into every nook and cranny, but still be safe and not harm anything like surfaces, the monitor equipment, computers and workstations—whatever might be in the room,” said Hartley, adding that in 2017 he came across SteraMist, which was “developed by the military around 9/11 under the Defense Advanced Research Program Agency.”

This agency “guides all the defense contractor research and development for the U.S. military. One of those defense contractors developed this plasma science disinfection technology to use as a biological warfare counter measure,” he said. “In other words, it was designed to counteract things like anthrax.”

SteraMist contains 7.8% hydrogen peroxide—more than double what can be bought at the pharmacy—and is dispersed through a 17,000-volt cold plasma electric arc under high pressure. It demonstrated 99.999% destruction of infectious spores, including SARS-CoV-2.

That would prove beneficial for addressing the shortage of personal protective equipment (PPE) during the COVID-19 pandemic.
PPE supply threatened

“The experience with this stuff demonstrated to me that not only is it an effective killing agent, but it also leaves no residue behind and it didn't harm any electronic equipment,” said Hartley. “When COVID-19 hit, we admitted the first inpatient in the state of Iowa on March 10.

“By the end of that month, we felt our PPE supply was threatened, so I got to thinking about it because we couldn't buy any—they were just disappearing off the market and we didn't have a huge stockpile of them,” he said, adding that mirroring the University of Nebraska’s use of ultraviolet lights to disinfect lines full of N95 masks, they set up a room to do the same but with SteraMist.

“Taking the logistics work done by our friends in Nebraska, we did our first batch after doing some tests with it and found out it didn’t harm the respirators,” said Hartley. “We tweaked it a little bit because we got a little bit of degradation in filtration, but we found out that we were probably too close to the respirators when we sprayed them with the device.”

“That’s 17,000 volts of electricity within a foot and a half of these respirators,” he said, adding that “N95 masks work because they’ve got an electrostatic charge to them—that’s why they’re thinner and you can breathe through them, but they still filter like a much thicker mask.”

After backing up, “We were still able to achieve the disinfection,” said Hartley, adding that after retesting, “found out we could reprocess these masks at least six times. ... That’s huge because if you only have so many, but you can reuse them up to six times safely without harming the filtration, that extends our stockpile.”

Learn how the University of Nebraska Medical Center tackled the N95 shortage with novel decontamination.

Reprocess N95 masks

Twenty days after they got their first patient with COVID-19, UI Hospitals and Clinics started using SteraMist to reprocess N95 masks for physicians and other health professionals. To do this, a Central Sterilization Services (CSS) technician fogs the N95 masks with ionized hydrogen peroxide, or SteraMist, which is one of three reprocessing methods described by the Centers for Disease Control and Prevention under its crisis standards of care decontamination recommendations.

Each health professional marks their own mask with a black marker, noting their name, date first used, and unit name and location. Masks are placed in a breathable brown paper bag and picked up by a
CSS technician. After decontamination, the health professional will receive their own mask back in a white paper bag sealed with their name and unit printed on the outside and delivered to their unit by CSS.

The N95 masks are inspected four different times before they go back to the user and are thrown out if they have makeup on them or the bands are worn out. After four blue slash marks, the mask is discarded.

“We’ve reprocessed about 36,095 respirators because we’ve got a big spike going on in our state and in our area, we have a pretty good size inpatient population right now,” said Hartley. We’re probably reprocessing about 250 to 350 a day, so we’re going through a lot.

“The only reason we’re doing this is because we are in a declared disaster situation,” he said. “As soon as the supply chain can catch up and provide what we need, then we’re going to shut this operation down and go back to single use, throw away masks.

“Even though we know the method we are using is very safe and effective, killing 99.9999% of infectious spores, using single use masks is more efficient and requires less staffing and resources,” Hartley added.

With PPE in short supply as the pandemic resurges, the AMA offers a 10-step road map to ensure health professionals have the equipment they deserve.