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## A new standard of care in the ICU? 'Universal decolonization' cuts BSIs 44%

*'[The CDC] is likely to take this very seriously in guidance for prevention of hospital infections in ICU patients.'*

By **Gary Evans**, Executive Editor

In findings that may set a new standard of care in intensive care units, researchers demonstrated in a large-scale trial that a combination of daily chlorhexidine baths and a five-day regimen of nasal mupirocin reduced bloodstream infections (BSIs) for all pathogens by a staggering 44%.



Dr. Edward Septimus

The unpublished study has major implications for patient safety, as BSIs are among the most deadly and costly of health care associated infections (HAIs).

"I do think that this is a landmark study," says one of the lead investigators, **Edward Septimus**, MD, medical director of infection control and epidemiology for the Hospital Corporation of America.

Indeed, the study protocol is already being implemented across all ICUs in the Nashville-based 165-hospital HCA system.

"We expect to implement [this protocol] across all of our ICUs starting now and over our whole system by sometime early next year," Septimus tells *Hospital Infection Control & Prevention*. "Everywhere we have ICUs we will be implementing [this]."

There is the expected and appropriate concern about spurring resistance — particularly to mupirocin — but the caveats were overshadowed at least initially by the dramatic findings. (See related story, p. 124.) Though it began primarily as an intervention against methicillin-resistant *Staphylococcus aureus* (MRSA), the trial proved effective against a wide array of pathogens — yielding benefits that appeared to exceed the researchers' expectations.

"We are talking about bloodstream infections — this is a big

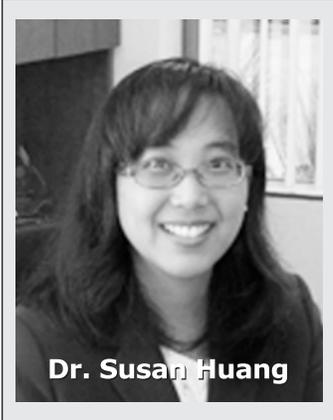
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Dr. Susan Huang

deal," lead investigator **Susan Huang**, MD, MPH, FIDSA, medical director of epidemiology and infection prevention at University of California Irvine Healthcare, tells *HIC*. "[The findings] suggest that the reduction is across the board — gram positive bacteria, gram negative bacteria,

and candida.

Unveiled Oct. 19, 2012 in San Diego at the IDWeek Conference, the randomized trial flexed plenty of statistical power. It included some 74,000 patients in 74 ICUs at 43 hospitals in 16 states.

"We think it is large enough that it is unlikely to be replicated," Huang says. [With a lot of research] people will still say — no matter what you found — 'We need a large-scale trial.' We really believe that *this* is the large-scale trial."

### ***Three arms in randomized study design***

Researchers conducted a three-arm cluster-randomized trial of MRSA prevention strategies.<sup>1</sup> Study design included a one-year baseline period (Jan-Dec 2009; 48,390 ICU

admissions) and an 18-month intervention period (Apr 2010 - Sept 2011; 74,256 ICU admissions). All ICUs in a given hospital were assigned to one of the following arms of the study:

**1. MRSA screening and isolation:** Nasal MRSA screening followed by contact isolation if positive.

**2. Targeted decolonization:** MRSA screening followed, if positive, by isolation and decolonization with chlorhexidine baths and nasal mupirocin for five days

**3. Universal decolonization:** Stop MRSA screening and go to use of mupirocin for five days with daily chlorhexidine baths for the duration of ICU stay.

There were significant differences between the study arms for both clinical isolates of MRSA and bloodstream infections caused by all pathogens. In each case, universal decolonization produced a significantly greater reduction than screening and isolation. Targeted decolonization was not significantly different from screening and isolation alone. Adjusted analyses yielded similar results. (See table, p. 123.)

"We found that giving all ICU patients a daily bath with antiseptic soap to remove bacteria from the skin, and applying antibiotic ointment to the nose of all patients was the most effective strategy," Huang says. "This reduced ICU bloodstream infections from all pathogens by nearly half."

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While the research group has not released the full study protocol and is still analyzing the findings, it appears the daily baths and nasal decolonization not only lower the risk of cross-transmission but make it less likely the patients will infect themselves with their own bacterial flora.

"It is known that if you don't have MRSA on your body then you are less likely to get infected by it," Huang says. "We also know that if we decolonize people they are less likely to transmit. That has been shown in other smaller studies, and it looks like that is the case here."

In addition, while the mupirocin was only administered for five days to decolonize the nose, the chlorhexidine baths were given daily for the entire patient stay — "for two days or two months," she notes.

"We know from other studies that chlorhexidine has a very broad spectrum for bacterial and fungal coverage," she says. "Even though we stopped screening people [for MRSA], the numbers still came down. So it's not like we were missing people and not detecting folks. We were able to get the MRSA off the body and show that the total amount of cultures that were positive for MRSA were lower in the decolonization arm. We suspect that is because we were able to reduce the bioburden. That translates to protection for the patients themselves and also prevents transmission to others."

Overall, universal decolonization with chlorhexidine and mupirocin in adult ICUs yielded a 37% reduction in risk of an MRSA clinical isolate and a 44% reduction in risk of bloodstream infections due to all pathogens. Bloodstream infections due to all causes in

the universal decolonization group decreased from 6.1 infections per 1,000 patient days to 3.6 infections.

"The results are fairly conclusive that the daily bathing and using the ointment in the nose significantly reduced bloodstream infections in a very high-risk population," Septimus says. "We call this a horizontal [study] — that is, we did an intervention that was effective against not just MRSA, but against multiple organisms. When you target an organism that's one thing, but when you target a high-risk population and you can reduce infection risks across multiple pathogens I think that has a great deal of validity. Our study group feels that this certainly should be strongly considered as a standard of care for intensive care unit patients."

The approach eliminates that need for active surveillance for MRSA upon admission to an adult ICU "under normal circumstances," he says. "Anytime you get into an outbreak situation you may alter that, but in the normal circumstance day in and day out, Arm 3 confirms that active surveillance is probably not necessary."

In dropping MRSA screening in favor of the universal decolonization approach, it follows that there will be less patients under contact isolation precautions in the ICU.

"That may have some benefits on a number of fronts. One, it will reduce the costs associated with having patients in isolation," Septimus says. "Secondly, some [isolated] patients feel abandoned. They don't have their vital signs [checked as] frequently, so there are some unintended consequences of putting people in isolation. All of these factors make the intervention in arm three very

**Table. Primary Outcome Event Rates and Proportional Hazard Model Results for REDUCE MRSA Trial**

Strategy	ICU-Attributed MRSA Clinical Cultures				ICU-Attributed Bloodstream Infections (all pathogens)			
	Baseline*	Intervention*	HR <sup>†</sup>	HR <sub>adj</sub> <sup>‡</sup>	Baseline*	Intervention*	HR <sup>†</sup>	HR <sub>adj</sub> <sup>‡</sup>
Screening and Isolation	13.7	11.9	0.92	1.0	16.8	15.3	0.99	0.98
Targeted Decolonization	16.1	12.2	0.75	0.83	17.9	13.8	0.78	0.77
Universal Decolonization	13.8	8.3	0.63	0.69	23.7	13.7	0.56	0.55
P-value <sup>§</sup>	--	--	<b>0.01</b>	<b>0.02</b>			<b>&lt;0.0001</b>	<b>&lt;0.0001</b>

\* Events per 1,000 patients

<sup>†</sup> HR = Hazard Ratio from primary unadjusted analysis; model estimates are not equal to ratio of raw risk due to differential length-of-stay and effect of clustering within hospital

<sup>‡</sup> HR<sub>adj</sub> = Hazard Ratio from secondary adjusted analysis

<sup>§</sup> P-value from proportional hazards model

**Source:** Huang SS, Septimus E, Kleinman K, et al. Randomized Evaluation of Decolonization vs. Universal Clearance to Eliminate Methicillin-Resistant *Staphylococcus aureus* in ICUs (REDUCE MRSA Trial). IDWeek 2012. San Diego, CA. Oct 17-21 2012.

attractive in a high-risk population like the ICU.”

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### ***Findings in ‘bread and butter’ hospitals***

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Another promising aspect of the trial is that it was conducted primarily in community hospitals rather than large academic centers, meaning the results should translate broadly to U.S. hospitals.

“Most of these trials are done in academic centers and a lot of the other hospitals can’t relate,” Huang says. “We just never know if the outcomes will be the same in the community-based settings, but these were really bread-and-butter hospitals across America, which makes it really promising.”

Similarly, the trial was performed using the typical infrastructure for quality improvement interventions at community hospitals. No study investigators were onsite at the various ICUs, suggesting the approach could be adopted locally without new staff and special expertise.

“That is one of our favorite things about this — how practical it was and how it really used infrastructure that already exists in every hospital,” Huang says. “Every hospital normally does their own quality improvement. They all have campaigns, whether it’s for hand washing or something else. We believe that these same teams that normally do this for every hospital can readily adopt this in the same way.”

The results speak to the much-debated question of whether it’s best to target patients who have high-risk pathogens or to target patients in high-risk settings. “We’re really pleased to find that a more universal approach is better,” she says. “It benefits more patients and it prevents infections from all pathogens — not just MRSA. This may also call in to question the legislation that requires targeted pathogen screening in ICUs in many states.”

Indeed, various states have adopted screening requirements for MRSA and other HAIs, but they are unlikely to revisit them in the absence of a formal endorsement of the findings by the Centers for Disease Control and Prevention. That is something that will likely have to go through review by the CDC’s Healthcare Infection Control Practices Advisory Committee (HICPAC), and the study has yet to be published in a peer-reviewed journal. Both the CDC and the Agency for Healthcare Research and Quality (AHRQ) were involved in funding the study, but the researchers issued a disclaimer stating that the findings and opinions were theirs alone. Septimus emphasizes that hospitals should continue to follow their state screening laws, but expressed hope that such mandates will be reconsidered in light of the findings.

“[The CDC] is likely to take this study very seriously in upcoming guidance for prevention of hospital infections in ICU patients,” Huang says.

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## **Caveats and cautions of landmark ICU study**

### *Mupirocin resistance top concern*

Preventing bloodstream infections — among the most costly and potentially fatal patient complications — provides a benefit so powerful that one is tempted to dismiss the risk. However, there were some caveats and cautions sounded amid a recent announcement that a combination of daily chlorhexidine baths and a five-day regimen of nasal mupirocin ointment nearly halved BSIs due to all causes in adult ICU patients.

“We caution people that we have to be on the lookout for any unexpected or collateral damage. For instance over time, will we see more resistance?” says **Edward Septimus**, MD, medical director of infection control and epidemiology for the Hospital Corporation of America. “We know there can be low levels of resistance to the ointment, though it’s very rare to get resistance to the chlorhexidine. But these are things that have to be carefully monitored as more facilities begin to implement this intervention.”

Past research on the issue suggest mupirocin resistance may be kept at bay under limited use protocols, but can increase rapidly if use for patients and/or health care workers becomes indiscriminate. “In particular, resistance seems to emerge readily in health care facilities with unrestricted policies that allow widespread mupirocin use for prolonged periods, especially when application to decubitus ulcers and other skin lesions is allowed,” researchers found in a review article on the issue.<sup>1</sup>

“We didn’t directly analyze this question [of resistance] for the abstract,” says **Susan Huang**, MD, MPH, FIDSA, medical director of epidemiology and infection prevention at University of California Irvine Healthcare. “I

think that the value in the hybrid study is that if we can prevent infection there is probably some tolerability of some level of resistance. We don't know what that might be and we are going to have to be very careful to look at it. We do have some strains collected from the trial that we will be evaluating carefully, but more importantly as this moves towards wider spread adoption as a nation we'll have to be very vigilant."

While limiting ICU patients to a single five-day regimen may well fall within a safe-use definition of mupirocin, that still means that hospitals that adopt the protocol will have to comply with those parameters. In that same vein, there are some implementation steps which are important in adopting the protocol, which has not been published in any detail. "[That includes] applying the baths correctly and then not using things that might negate the activity of the antibiotic solution," Septimus says. "There are things you have to have in place, but providing you have them in place and use a similar protocol we are hopeful you will get the same results."

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### **AHRQ will eventually post toolkit**

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Plans call for eventually creating a toolkit to ease implementation for other hospitals. If all goes as planned, the toolkit will be posted on the website of the Agency for Healthcare Research and Quality (AHRQ), which supported the research. "We want to share the implementation steps so everyone can benefit from the results of the study," Huang says.

In terms of adverse topical reactions to the chlorhexidine, Huang says there were 'very few, mainly related to skin rash. It was far below the expected number. All of our rashes disappeared very rapidly on discontinuation of the product."

While the study was targeted particularly at MRSA, infections due to other pathogens generally fell as well. That said, the true benefit of the protocol against infections of other etiologies warrants further analysis, she adds.

"We have to be careful — you can't put a statistical amount on it, but what you see is that the number [of infections] comes down," she says. "It appeared in the descriptive analysis that they are all headed in the right direction, but we did not specifically test in [specific pathogen groups]. We weren't powered to look for that, but it is promising from what we see with the 'eyeball test.'"

In addition, a detailed cost benefit analysis is still being conducted, as the various cost savings of, for example, dropping MRSA

screening and isolation measures must be weighed against the purchase and application of the chlorhexidine and ointment. The study was based in adult ICUs, so more research is planned to see if the findings have implications for other hospital patient groups.

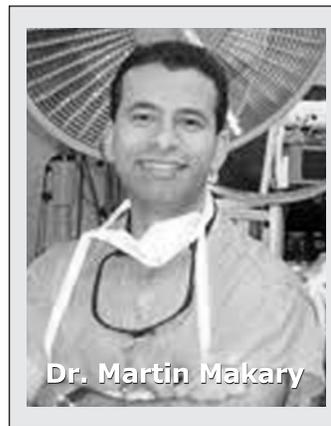
"In the non-ICU setting we really don't know very much," she says. "There are anecdotes of people using these types of bathing techniques outside of the intensive care unit. We're really pleased to have a clinical trial that was recently funded that will actually test this [intervention] in the non-ICU settings as well."

### **REFERENCE**

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## **Q&A with author of provocative new book**

*'Medical mistakes and preventable infections constitute the number three cause of death in the U.S.'*



Dr. Martin Makary

**Martin A. Makary, MD, MPH**, an associate professor of surgery and health policy at the Johns Hopkins Hospital in Baltimore, MD is the author of the recently published book "Unaccountable: What Hospitals Won't Tell You and How Transparency Can

Revolutionize Health Care." We talked to him recently about health care associated infections (HAIs) and other patient safety issues raised in his provocative book.

"I talk about infections a fair bit and about the progress that has been made in measuring infections, and how increased measurement results in improvement in infection rates," Makary tells *Hospital Infection Control & Prevention*. "When infection rates are available to the public, hospitals place more resources into the effort to prevent them."

Our interview with Makary continues as follows:

**HIC:** *The old recommendation to calculate and feedback surgeon-specific surgical site infection (SSI) rates seems to have fallen out of favor. Why isn't that being done more?*

**Makary:** "The problem with surgeon specific infection rates is that they are often not statistically valid because if you look at the case mix of an individual surgeon many times they have a broad range of operations that they do with high and low risk of infections. I believe that the best level to evaluate infection rates is at the hospital level. When the hospital infection rate is public the administration will scramble to tap their local wisdom, to talk to their infection control personnel and their doctors to find out how to fix the problem. The public disclosure of infection rates is what creates accountability at the hospital level, and accountability is what drives resources to be dedicated to fix the problem on a local level."

*Regarding SSIs, are many post-discharge infections still going undocumented for lack of follow-up? Historically, that has been a problem.*

"It's still an issue; we still lack standardized measures nationwide. For example, the American College of Surgeons (ACS) has a program called NSQIP — the National Surgical Quality Improvement Program — that has highly standardized independent definitions of what constitutes an infection. Yet only 500 hospitals in the United States participate in their measurement program. Historically, we have a problem with hospitals that do a poor job of measuring infections coming out looking good, but those that do a very good job of tracking down their infections come out looking bad. Without standardized definitions we end up punishing people that are doing a good job."

*What about the Centers for Disease Control and Preventions rapidly expanding surveillance system — the National Healthcare Safety Network?*

"It definitely moves to more standardized definitions for infections. The best way to measure surgical infections is actually the one authored by the surgeons — the standardized definitions by the American College of Surgeons. There are so many types of surgical infections, there are deep infections within the abdomen or you could have a superficial infection of the skin. There are so many different types, and of course, certain types of operations are more likely to have higher rates versus the others. But I applaud the CDC's NSHN as a force to try standardize the definitions."

*Such systems are still only as good as the data they receive, of course, and we hear anecdotal stories of pressure to narrowly define*

*infections in an age of "zero tolerance" for HAIs.*

"There are flaws to self-reported data that is not independently collected. The American College of Surgeons tries to use independent clinical reviewers. In business we have the Sarbanes-Oxley Act, which means if a CEO misreports their earnings they can go to jail. In health care, a hospital can misreport their performance on infections and there is really no accountability for it. That is a problem, and unfortunately with self-reported data that means again we reward those who do a sloppy job of closely following their patients while penalizing those that do a very aggressive job tracking their patients."

*We are certainly hearing calls for increased transparency regarding HAIs and other patient outcomes, but how does that really translate to improved quality?*

"We have seen this before in states that reported mortality rates for heart bypass surgery. When the hospital average is a bad outlier — I don't want to say 'high' or 'low' because that can confuse people — with respect to the national average, [administrators] put more resources into fixing the problem. Many times the local doctors and nurses on the front lines say that they know how to improve quality of care and reduce infections, but they often describe feeling disempowered. They describe feeling like their management isn't interested in their input. So you have the sense of frontline workers feeling like tenants and the hospitals are their landlords. When frontline providers don't own the entire delivery of care their performance [suffers]."

*You give accounts in your book of impaired surgeons, who clearly pose a risk to patients, but you also point out that the risk of infections and other adverse events is highly dependent on the procedures practiced by a particular surgeon or at a given facility.*

"Take for example the minimally invasive option for surgery. Surgeons who don't do the minimally invasive approach — who don't offer it — have patients in their practice that will have a disproportionate high rate of 'open' operations, which are known to have higher surgical infection rates. Other hospitals — such as the University of Pittsburgh that do most of their GI surgery as minimally invasive — will have lower infection rates.

The decision as to who gets minimally invasive surgery and who gets an 'open' operation among those that are candidates [is often arbitrary]. If hospitals were accountable for their infection rates in a meaningful way they would be more incentivized to encourage [minimally

invasive] operations for their patients. There are some hospitals that do 90% of a procedure through the open surgical methods, whereas another similar hospital will perform that same procedure in a more minimally invasive method.”

*Are you hopeful that ongoing efforts to improve transparency will improve outcomes?*

“Well, anytime there is a valid measurement of health care outcomes, outcomes globally seem to improve. Transparency is a great way to empower the public, because right now we have a free market that is dysfunctional. Patients choose hospitals based on the ease of parking and other factors which essentially leave them walking in blind when it comes to quality. Measurement is a dangerous business when the measures are not scientifically valid. We have suffered with invalid or inaccurate measures for a long time, which is why now there is an exciting revolution in health care where doctors have endorsed valid ways to measure complications like infections fairly. The question we have to ask as a society now is do we believe the public has a right to know about the quality of their hospitals? The information is now collected, for example by the ACS program. It is being housed in a data base where you have valid ways to measure infection rates in hospitals in a way that is endorsed by surgeons. But the information is not available to the public — yet. It is becoming available and that is the revolution I talk about in the book.”

*Did you write the book as a sort of call to action?*

“Exactly. There are massive disparities in the quality of health care in the United States. And in observing disparities and participating in the revolution in these quality improvement efforts it became clear to me that there is a dilemma in society right now. We have good valid information about hospital outcomes that the public have a right to know about. Medical mistakes and preventable infections constitute the number three cause of death in the U.S. One of the reasons why that statistic is a shock to people — even doctors — is that we have not been a culture that openly talked about this problem in the past. It is only now that doctors’ groups are talking about trying to improve this problem. [We are talking about] transparency with valid and fair ways to measure outcomes, with physician endorsed measures — the right measures.

*There will be the inevitable questions and comments about the additional cost of adopting these better metrics and other improvements.*

“Absolutely, hospitals have to pay for this. But I think increasingly Medicare is realizing that hospitals shouldn’t be losing money by trying

to improve quality. We saw that with the readmission reimbursement provision that went into effect [recently]. Hospitals are going to be docked, 1% based on whether or not they are an outlier in readmissions. Right now it is just [readmissions] for heart disease, heart attacks and pneumonias but that will likely expand. Even though it’s 1% this year, it is going to be 2% next year and 2% the following year. It is all part of the Affordable Care Act. I think it is already making a difference with readmissions. In the past, hospitals that reduced readmissions would earn less money because they wouldn’t be able to profit from the readmission. Now it is a more even playing field.” ■

## Mission possible: Drug stewardship in pediatrics

### *Prescribing for pneumonia drops 75%*

Although efforts to cut the overuse of antibiotics have made some headway in hospitals, the majority of prescriptions are written by community-based clinicians — often for pediatric patients with common ailments.

“If you really want to impact antibiotic use, you have to do it with outpatient prescribing,” says **Jeffrey Gerber**, MD, an assistant professor of pediatrics at Children’s Hospital of Philadelphia. “Our message is that targeting common conditions and intervening in the outpatient setting is doable.”

In a study presented recently at the IDWeek 2012 conference in San Diego, Gerber and colleagues tried to reduce inappropriate antibiotic use and underscore current prescribing guidelines.<sup>1</sup>

“In a network of primary care out-patient practices we performed a cluster randomized trial of encounters for common pediatric infections — ear infections, sinus infections, strep throat, and pneumonia,” he says.

The researchers focused on the hospital’s affiliated primary care network of more than two dozen practices. Eighteen of those pediatric practices agreed to participate, offering a look at 174 clinicians’ prescribing habits in urban, suburban and rural communities from the Main Line of Philadelphia to the New Jersey shore. Over nearly three years, that included more than 1.4 million office visits by 185,212 patients. Half of the groups randomized in the intervention received onsite education about the prescribing guidelines, and were provided individual provider-based audit and

feedback of their prescribing for the targeted infections.

"[This] greatly affected prescribing in a group of practices after only a year," Gerber says. "The biggest impact was with inappropriate use of antibiotics for pneumonia, which dropped from 16% to just 4%. A 75% reduction where there was no change in the control group."

The practices were randomly divided into two groups and their prescriptions tracked through the network's electronic health record. The researchers reviewed prescribing for sinusitis, Group A strep throat and pneumonia after omitting cases that involved children with chronic medical conditions, antibiotic allergies or antibiotic use during the three months preceding the study period.

The control group was merely told the study was under way. In the intervention group, however, each practice was given a short lunch-hour refresher on the latest prescribing guidelines recommended by the American Academy of Pediatrics and the Infectious Diseases Society of America. Additionally, each clinician in the intervention group received quarterly one-page updates on his or her prescribing habits. This feedback showed how individuals compared to the guidelines and to others within their own practice, as well as how practices compared to each other. It involved no clinical decision-making support tools.

The initial data showed that about 28% of all children inappropriately received a broad-spectrum antibiotic for a targeted condition — with the variance across practices ranging from 15% to 60%.

But after the antibiotic primer session and a year of regular prescribing evaluations, clinicians in the intervention group cut their off-guideline use to 14%. The control group rate also declined, but only to 23%.

There was little change in the already low prescribing of broad-spectrum antibiotics for strep throat. Inappropriate prescribing for sinusitis had already been trending down in both groups, but it dropped by half, to 20%, in the practices that had gotten the refresher and regular feedback.

"The impact in the intervention group was much better than we thought it would be," Gerber says. "It shows that getting people up to speed and providing simple reminders are helpful. It also shows that you can leverage electronic health records to put together a relatively low-maintenance system to improve prescribing."

The researchers say they now need to look at the staying power of their effort. Have clinicians continued to be vigilant or returned to old habits? Gerber acknowledges that pediatricians often are pressured to see patients quickly and by families that often demand antibiotics when a child is sick. Writing that prescription sometimes seems like the most expeditious solution.

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## UV light kills bugs on surfaces

*Will decline in infection rates follow?*

Researchers are finding that a specific spectrum of ultraviolet light kills drug-resistant bacteria and other problem pathogens on common environmental surfaces, including door handles and bedside tables and rails in hospital rooms.

A collaborative study by researchers at Duke University Medical Center and the University of North Carolina Hospital System used short-wave ultraviolet radiation (UV-C) to nearly eliminate *Acinetobacter*, *Clostridium difficile* and vancomycin-resistant enterococci (VRE) in more than 50 patient rooms at the two medical facilities.<sup>1</sup>

"We're learning more and more about how much the hospital environment contributes to the spread of these organisms," says lead researcher **Deverick J. Anderson**, MD, an assistant professor of medicine at Duke and co-director of the Duke Infection Control Outreach Network.

Given previous findings by the University of North Carolina team that UV-C is effective at decreasing methicillin-resistant *Staphylococcus aureus* (MRSA) in hospital rooms, he believes that the new study lays critical groundwork.

"We have a solid foundation to show that this approach succeeds in both experimental and real-world conditions," Anderson said. "Now it's time to see if we can demonstrate that it indeed decreases the rate of infections among patients."

UV-C has been used for decades in food, air

and water purification and to sterilize equipment in laboratory settings. In the study, the researchers questioned whether UV-C could be used to eliminate three problematic pathogens and improve the cleanliness of patient rooms. The study focused on general-medical and intensive-care units of the two medical centers and identified patients with infections from the targeted bacteria.

After the patients were discharged, the researchers obtained multiple cultures from each of five specific locations in the hospital rooms and bathrooms — “high-touch” areas that included bed rails, remote controls and toilets. A special machine with eight UV bulbs mounted on a central column was then positioned strategically in each room and turned on for as long as 45 minutes to eradicate both vegetative bacteria and bacterial spores. Fifteen more cultures were taken from the same locations in every room, and the pre- and post-treatment bacteria counts were compared.

The numbers of bacterial colony-forming units (CFUs), fell precipitously. Fifty-two CFUs of *Acinetobacter* were seen before irradiation, but only 1 CFU afterward — down 98.1%. As for VRE, the proportion decrease was nearly the same — 719 CFUs before and 15 after, a 97.9%. The culturing initially was not sensitive enough to isolate *C. diff*, but improved techniques allowed the researchers to do further testing and the results in the UV-C treated rooms showed comparable CFU reductions, Anderson says.

“We would never propose that UV light be the only form of room cleaning, but in an era of increasing antibiotic resistance, it could become an important addition to hospital arsenals,” he says.

## REFERENCE

1. Anderson D, et al. Effectiveness of UV-C light against *C. difficile*, *Acinetobacter*, and Vancomycin-Resistant Enterococci in the Hospital Environment . IDWeek 2012. San Diego, CA. Oct 17-21 2012. ■

# Fatal flu infections in otherwise healthy children

## *Cytokine storm? Healthy died faster*

Influenza poses a rare but real risk of fatal infection in otherwise healthy chil-

dren, a Centers for Disease and Control and Prevention epidemiologist reports.

**Karen K. Wong**, MD, reviewed case reports for the 2004 to 2012 influenza seasons in data presented recently in San Diego at the IDWeek conference.<sup>1</sup>

“Almost half the children who died had been previously healthy,” she says. “The numbers demonstrate how important it is for all children, even children who are otherwise healthy, to get a flu vaccine every year, and underscore why all children with severe illness should get treated early with influenza antiviral medications.”

Wong and colleagues analyzed U.S. pediatric influenza-associated deaths over an eight-year period, finding that 43% of the deaths occurred in children with no health conditions, such as asthma or diabetes, that would have predisposed them to being at high risk of serious flu complications. Moreover, the study found that those young, previously healthy patients succumbed faster. The median duration of illness from onset of initial symptoms to death was four days in children with no underlying high-risk health conditions compared with seven days in children with at least one such condition.

The CDC study reviewed influenza-associated deaths among children younger than 18, as reported by city and state health departments and confirmed through laboratory testing. From Aug. 1, 2004 through Sept. 1, 2012, there were 829 such deaths, most of which were associated with influenza A infection. Of the 793 children with a known medical history, 341 had no high-risk health conditions. Of the remaining cases, more than half were children with neurological disorders, and nearly half had pulmonary disease. The median age at death was 7. About a third of the children died in the emergency department or outside the hospital, the researchers found.

“Children with and without underlying medical conditions can die from influenza, and death can occur rapidly,” Wong says. “Caregivers should be aware of early warning signs of severe influenza virus infection in children — including labored breathing, decreased fluid intake or urination, drowsiness or a lack of interaction — and should seek medical attention for them quickly.”

## REFERENCE

1. Wang S, et al. Influenza-Associated Pediatric Deaths — United States, 2004–2012. IDWeek 2012. San Diego, CA. Oct 17-21 2012. ■

# Fatal infection in lab worker remains a mystery

## *Case underscores threat to lab workers*

No specific infection control breach has been identified in the death earlier this year of a 25-year-old research laboratory associate at the VA Medical Center in San Francisco. **Richard Din** was working on a project to develop a vaccine against *Neisseria meningitidis* serogroup B, the very pathogen that was found in his blood upon autopsy

Soon after he came home from work one day last spring, Din complained of headache, fever and chills. He developed a rash and lost consciousness in the car on the way to the hospital. He died about 17 hours after his first symptoms appeared.

"There's no evidence that he did anything outside of laboratory routine practice," says **Harry Lampiris**, MD, chief of infectious disease at the San Francisco VA Medical Center. "At the end of the day, it's a mystery. He had only been working in the lab for about six months. We tried hard to get to the question of whether he did something to increase his risk. He didn't disclose anything to friends, coworkers didn't observe anything."

The medical center undertook a review of "all the potential microbiologically transmissible agents that we work with in all our research laboratories," he says.

The hospital also beefed up its lab safety and training. Lab workers should be aware of the signs and symptoms of early infection with an organism such as *N. meningitidis* and should seek antibiotic prophylaxis if there's an exposure, he says.

Clinical laboratories operate under the standard of "universal precautions. Any specimen could be high risk," Lampiris says.

Reporting of exposures, incidents such as spills, and near-misses is important to maintaining a culture of safety, he says. "Laboratory safety is everyone's responsibility. If there's any kind of breach, lab employees [should] feel they can report it to the [principle investigator] with no risk of recrimination," Lampiris says.

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### ***A continuing risk***

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The meningitis case highlights the serious risks that face lab workers in both clinical

and research labs. In a 2005 report, researchers from the Centers for Disease Control and Prevention in Atlanta identified six cases of laboratory-acquired meningitis, with a fatality rate significantly higher than for community acquired cases.<sup>1</sup> Other deadly organisms also transmitted to workers in a lab include plague (*Yersinia pestis*) and Brucella.<sup>2,3</sup>

No one knows the actual number of laboratory-acquired infections — or lab exposures — because there is no national reporting system. A Biosafety Blue Ribbon Panel of experts representing all laboratory disciplines advised CDC to create a surveillance system and to promote a "culture of safety" in the nation's diagnostic labs.<sup>4</sup> In response to their concerns, the CDC and National Institutes of Health are working on an online, voluntary, non-punitive reporting system which may be available later next year.

"Working in the microbiology laboratory is inherently risky because we work with live, virulent infectious agents. We do that every day, 24 hours a day, and we do everything we can to protect our patients, ourselves, our coworkers and our families from [being exposed]," says **Michael Miller**, PhD, D(ABMM), former associate director for laboratory science at the CDC's National Center for Emerging and Zoonotic Infectious Diseases and now a private clinical microbiology laboratory consultant based in Dunwoody, GA.

Miller led a writing team of experts to produce the new "Guidelines for Safe Work Practices in Human and Animal Medical Diagnostic Laboratories." The document provides detailed information on analyzing hazards and reducing risk. "We think that these guidelines fill a gap that hasn't been filled for quite some time," he says.

## **REFERENCES**

1. Sejvar JJ, Johnson D, Popovic T, et al. Assessing the risk of laboratory-acquired meningococcal disease. *J Clin Microbiol* 2005;43:4811-4814.
2. Centers for Disease Control and Prevention. Fatal laboratory-acquired infection with an attenuated *Yersinia pestis* strain – Chicago, Illinois, 2009. *MMWR* 2011;60:201-205.
3. CDC. Laboratory-acquired brucellosis – Indiana and Minnesota, 2006. *MMWR* 2008;57:39-42.
4. Singh K. Laboratory-acquired infections. *Clin Infect Dis* 2009;49:142-147. ■

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Upon completion of this educational activity, participants should be able to:

- Identify the clinical, legal, or educational issues encountered by infection preventionists and epidemiologists;
- Describe the effect of infection control and prevention issues on nurses, hospitals, or the health care industry in general;
- Cite solutions to the problems encountered by infection preventionists based on guidelines from the relevant regulatory authorities, and/or independent recommendations from clinicians at individual institutions. ■

## CNE/CME Questions

1. In a study of intensive care units, researchers demonstrated that a combination of daily chlorhexidine baths and a five-day regimen of mupirocin reduced what type of infections by 44%?  
A. urinary tract  
B. pneumonia  
C. bloodstream  
D. surgical site
2. Which of the research arms proved most effective in reducing infections?  
A. universal decolonization  
B. MRSA screening and isolation  
C. targeted decolonization  
D. universal glove use
3. What was one of the primary concerns expressed by investigators regarding broader implementation of the ICU protocol?  
A. adopting the intervention in non-teaching hospitals  
B. mupirocin resistance  
C. hiring additional personnel to collect the data  
D. resistance to chlorhexidine
4. In an outpatient pediatric intervention, the biggest impact was on inappropriate antibiotic prescriptions for pneumonia.  
A. true  
B. false

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