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Article

Summary of the MRSA Problem

By Dr. Jay Glasel

CATEGORIES: SCHOOLS, HEALTHCARE, FOOD SERVICE, COMMERCIAL BUILDINGS, HEALTH & HYGIENE

Overall, S. aureus is the most common cause of bacterial infections involving the bloodstream, lower respiratory tract, and skin/soft tissue. MRSA (methicillin resistant S. aureus) is at present the most commonly identified antibiotic-resistant pathogen in many parts of the world, including Europe, the Americas, North Africa, the Middle East, and East Asia. Worldwide, about 70% of all S aureus infections involve resistant strains.

It is important to understand that S aureus is present in and on many non-hospitalized individuals. It has been estimated that asymptomatic carriers of S aureus number about 2 billion (about 1/3 of a total world population of 6 billion) and conservative predictions of the carriers of MRSA strains among these asymptomatic carriers range from 1 to 25 per 1000 individuals.

But MRSA rates have been swiftly increasing worldwide over the past decades, as data from continuing international surveillance initiatives show.

Most MRSA infections are of nosocomial (hospital or other healthcare facility) origin and manifest themselves as complications of healthcare procedures or underlying disorders. These complications may be serious, hence the recent publicity in the popular press of the high mortality rate of serious MRSA infections.

Prior to the 1990s most documented MRSA infections were acquired nosocomially as described in the previous paragraph. During that time, community acquired MRSA was restricted to patients with frequent contact with health facilities, such as residents of long-term care facilities but also included intravenous drug users.

Since the 1990s, there has been worldwide recognition of the striking evolution of genuine community acquired MRSA strains, which were transmitted in the community and differed from conventional endemic nosocomially acquired MRSA strains. These strains differ genetically from nosocomial strains, but the results are the same—infections that are dangerous and difficult to treat.

Community acquired MRSA has been reported most often in certain populations: homeless people, male homosexuality, jailed inmates, military recruits, children in day care centers, and competitive athletes. Common to all these groups is high intensity physical contact which might help with transmission.

A US publication showed that more than 70% of community-acquired S aureus infections were MRSA. Not unexpectedly, community acquired MRSA has also found its way into hospitals where outbreaks have been reported.

How important are contaminated environmental surfaces as a reservoir for MRSA? The reported frequency of MRSA-contaminated environmental surfaces has varied from a few percent in most studies to as high as 64–74% in others. The US Centers for Disease Control and Prevention isolation guidelines recommend that hospitals have adequate procedures for routine care, cleaning, and disinfection of environmental surfaces, beds, bedrails, bedside equipment, and other frequently touched surfaces. Noncritical equipment (e.g., stethoscopes and blood-pressure cuffs) should be dedicated to one patient whenever possible. Further studies are needed to find out if thorough decontamination of rooms occupied by patients with MRSA will affect MRSA transmission rates.

Recommendations to prevent the acquisition and spread of community acquired MRSA center around personal hygiene such as frequent hand washing, covering of wounds with dry bandages, and seeking advice from doctors when skin infection occurs. Sharing of personal items such as razors, towels, nonlaundered clothing, uniforms, or equipment that has come into contact with wounds should be avoided. Showering after intimate or close body contacts and after sharing equipment in health clubs is also advisable.

However, a recent published study has found that hospitalized patients with S. aureus nares (S aureus carried in the nasal passages) and/or stool carriage frequently had S. aureus on their skin, and it was also present on nearby environmental surfaces. S. aureus intestinal colonization was associated with increased

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MRSA
Staph
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Flu
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Salmonella
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Nosocomial Infections
Disinfection
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Viruses
Indoor Air Quality
Asthma
Allergies
Allergen
Mold

Persistent Pathogens

"Pathogens can remain alive and active even on dry surfaces, and be picked up by hands, feet, etc. A large percentage of seemingly normal asymptomatic individuals can be carriers of pathogens. MRSA is a good example of this. Perhaps 15-30% of so-called normal individuals are carriers of MRSA; that is why the problem is so widespread."

Jay Glasel, PhD
Microbiologist

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frequency of positive skin cultures, which could potentially facilitate staphylococcal infections and nosocomial transmission.

References

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Emergence and resurgence of methicillin-resistant Staphylococcus aureus as a public-health threat, Grundmann, H et al. (2006), Lancet 368 874-885

Staphylococcus aureus intestinal colonization is associated with increased frequency of S. aureus on skin of hospitalized patients, Bhalla, A et al. (2007), BMC Infectious Diseases 7 105.

Questions and Answers

1. With staph infections occurring in many public settings, what is the risk to employees and employers?

The public has been somewhat mislead by recent incomplete press reports about staph infections, and in particular, about two facts—staph infections have probably existed throughout human history and a high percentage of so-called normal humans (that is, individuals showing no signs of infection) carry the bacterial species S. aureus that cause many staph infections in other individuals to whom they transmit the species. These normal carriers have stores of S aureus in nasal and respiratory passages and other places including their skin and lower intestinal tracts.

There have been no major “breakouts” of staph infections in public settings. The problem is that treatments of staph infections that do present themselves has become very difficult due to the presence of MRSA strains. These resistant strains form a major risk to employees/employers where close human-to-human contact is frequent. Examples of this are given in the “Summary” above.

2. What steps are employers taking, and what steps should they take?

In hospitals, and where community acquired MRSA may be important, control measures such as frequent hand washing, cleaning of surfaces, etc. are being recommended and enforced. In some particularly critical cases—for example, in cleanrooms producing certain pharmaceuticals—frequent screening of employees for MRSA is being done. This is expensive and probably impractical in most cases.

An important step that employers should take is to ensure that all skin injuries that employees suffer be reported promptly and receive adequate and competent medical attention.

3. What liability or losses might employers face, and how can employers limit or restrict those losses with an effective science-based cleaning program?

I do not know the legalities of the transmission of infectious agents such as MRSA from individual to individual. However, it seems clear that in their own self-interest employers in situations where employees or products could easily become contaminated with MRSA would want to minimize the chances of contamination by using adequate cleaning methods.

In particular, the study mentioned in the last paragraph of the “Summary” above implies that fecal burdens of MRSA in carriers are associated with the presence of MRSA on surfaces used by carriers. This is not surprising since even in cleanrooms, enterobacteria are a frequently found contaminant. Therefore, the use of cleaning methods such as the Kaivac “spray-and-vac” system that has been shown to be highly effective in removing fecal-borne pathogens would be indicated.

4. What advice do you offer customers who are dealing with an MRSA situation at their facility?

I don’t know the meaning of an “MRSA situation”. All environments are subject to MRSA contamination simply because so many unidentified individuals who are carriers are present in almost all working environments. The contamination can only be minimized—never completely eliminated. Minimization can be accomplished by rigorous cleaning methods especially for floors and other surfaces that are touched frequently.

5. What preventive measures can end users take to minimize an outbreak?

“Outbreak” is a particularly bad description of the MRSA problem an employer faces. Typical workplace-acquired S. aureus infections are caused by contamination of cuts, burns, skin abrasions, etc. If the damaged skin areas contact a surface or object or body fluid contaminated by the bacteria, they stand a high probability of becoming infected. The most practical preventive measure is to frequently clean surfaces effectively.

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About Dr. Jay Glasel

Dr. Jay Glasel is the Managing Member and Founder of Global Scientific Consulting, LLC. He is a Professor Emeritus in the Department of Microbial, Molecular and Structural Biology at the University of Connecticut Medical/Dental School in Farmington, Connecticut. He has lectured and done research in many countries in Europe and Asia. Dr. Glasel's scientific research has been in the fields of structural biochemistry, molecular immunology, pharmacology, and cell biology. Major portions of the research involved the structure and properties of water and aqueous solutions and on the structural chemistry and molecular biology of opiates and opiate peptides. He pioneered the uses of anti-morphine monoclonal antibodies and anti-opiate receptor anti-idiotypic antibodies in research on the cellular effects and actions of narcotics.

Dr. Glasel is co-editor and an author for the Academic Press textbook "Introduction to Biophysical Methods for Protein and Nucleic Acid Research" and many other contributed book chapters and original scientific research articles.

Dr. Glasel obtained a B.S. in chemistry and physics from Caltech. His Ph.D. from the University of Chicago was in chemical physics for work on chemical reactions on comets. He has served on active duty in the U.S. Air Force as a nuclear research officer.

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