Microbe of the month

Breaking The Chain of Infection

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JANUARY 2021

Newsletter

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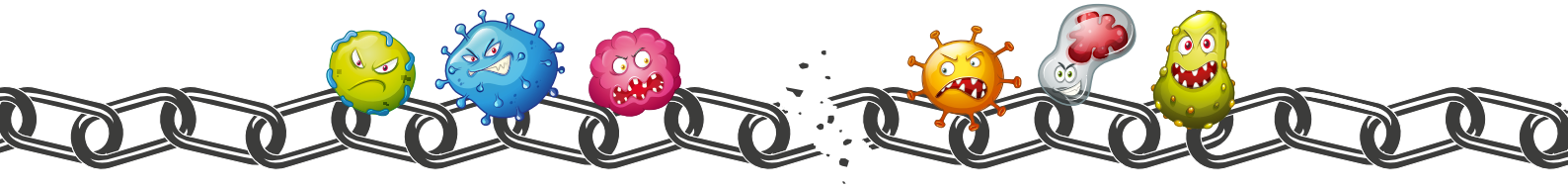

Featured this month:

Staphylococcus aureus infections in the NICU

New CDC recommendations

Hello readers!

The first ***Staphylococcus aureus*** *(S. aureus)* outbreak in infants in hospital nurseries was reported in the literature in the late 1800's. This organism is now the most commonly reported healthcare-associated infection (HAI) pathogen in neonatal intensive care units (NICUs) in the United States.

The US Centres for Disease Control and Prevention (CDC), in collaboration with the Society for Healthcare Epidemiology of America (SHEA) have recently issued new clinical recommendations for the prevention and control of *Staphylococcus aureus* in neonatal intensive care unit (NICU) patients. The updated guidelines are based on our current understanding of the transmission dynamics of *S. aureus* in the NICU setting and were developed through a systematic review of published expert consensus.

Staphylococcus aureus

('*aureus*' from the Latin term for gold) is a Gram-positive bacterium often found on the skin and in the nares of healthy people, who are generally referred to as 'carriers'.

Carriage rates are much higher in hospitalised patients and healthcare workers.

The reader is encouraged to review past issues of Microbe of the Month (February 2018, January 2019, and June 2020) **which also covered aspects pertaining to *Staphylococcus aureus* and methicillin resistant strains (MRSA) of this pathogen.**

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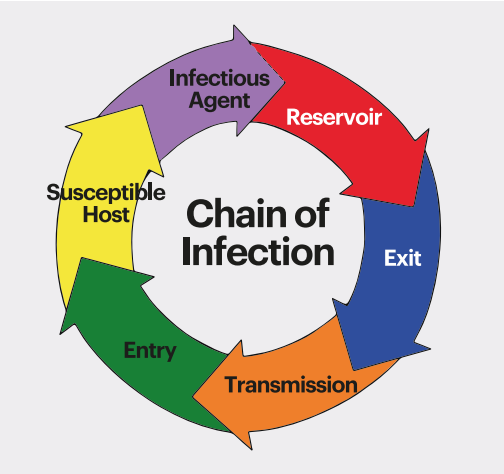
S. aureus invades the skin locally to cause infections such as boils, pimples, impetigo, cellulitis, and skin abscesses. It is also the most common cause of wound infection. If *S. aureus* enters the bloodstream (e.g. via vascular catheters or by contaminated manual manipulation of invasive devices) it causes potentially fatal infections in debilitated and immunocompromised patients such as septicaemia, pneumonia, osteomyelitis, and bacterial endocarditis.

Rates of invasive *S. aureus* infections are high in neonates, especially in preterm and low birthweight infants. Methicillin-resistant *S. aureus* (MRSA) infections in the neonatal population have been described since the early 1980s, and numerous outbreaks in NICUs have been reported. Although outbreaks of *S. aureus* among neonates (especially MRSA) pose significant challenges for NICUs, *S. aureus* is also endemic in the NICU, giving rise to the need for prevention strategies in both outbreak and endemic settings. While MRSA remains an epidemiologically significant and 'priority pathogen', methicillin susceptible *Staph. aureus* (MSSA) infections far exceed MRSA infections in the NICU, so infection prevention strategies are needed for *Staphylococcus* aureus as a whole.

Recent studies have demonstrated that infection caused by methicillin-susceptible *S. aureus* (MSSA) has an equal morbidity and mortality risk to MRSA and occurs more frequently in NICU patients.[2]



IMPORTANT TERMS AND CONCEPTS

Endemic: *'a disease or condition regularly found among particular individuals or within a specific geographical area'.*

Reservoir: *'any person, animal, plant or substance in which an infectious agent normally lives and multiplies. The reservoir harbours the infectious agent and serves as a source from which other individuals can be infected'.*

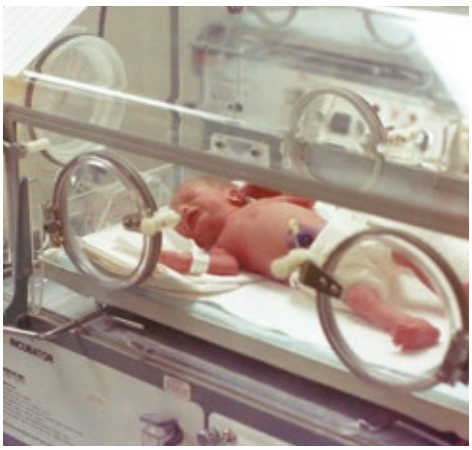
Colonisation: *refers to the 'presence of microorganisms in or on the body, but they are not causing any harm' (i.e. infection or disease).*

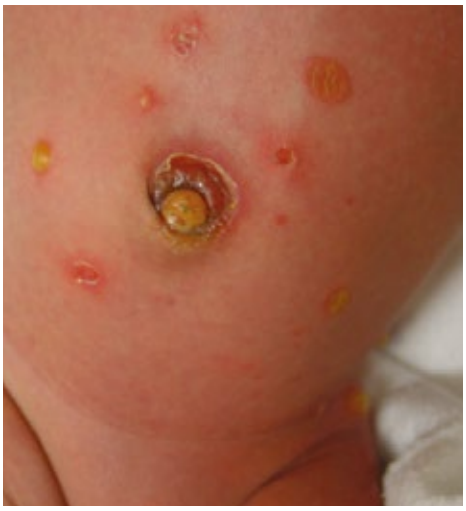
Outbreak: Outbreaks of healthcare associated infection (HAIs) are usually more frequent than are identified and/or reported. An outbreak is defined as *'an increase in the occurrence of a disease with reference to a recorded baseline infection rate for that microorganism'*. In real time, an outbreak should be suspected when there are infections caused by the identical pathogen (as per the laboratory culture report and antibiogram) in two or more patients in the same unit.

Methicillin resistance: The 'mecA' gene for methicillin resistance is transferred between *S. aureus* bacteria by plasmids, and enables strains of *S. aureus* to produce an enzyme called beta-lactamase, which damages the molecular structure of the beta-lactam antibiotics (penicillin derivatives, cephalosporins, monobactams and carbapenems), making them ineffective for treating infections caused by MRSA.

CLINICAL RELEVANCE

***S. aureus* transmission - the link between colonisation and the subsequent development of infection**: Neonates may acquire *S. aureus* as part of their normal developing microbiome; however, *colonisation predisposes to secondary invasive infection*. In a typical NICU, exposure to the environment, including direct (hands) and indirect transmission (via contaminated equipment and surfaces) from healthcare personnel and other critically ill infants may exacerbate the burden of *S. aureus* colonisation and infection. Importantly, parents are a known reservoir from which neonates can acquire *S. aureus* colonisation, and health education strategies to interrupt transmission, such as hand hygiene education and nasal decolonisation, may prevent neonatal *S. aureus* disease.





S. *aureus* and/or MRSA decolonisation: Decolonisation strategies aim to decrease the patient's bacterial burden to prevent transmission and infection. These treatment strategies are indicated for patients who have been screened for specific pathogens. If they are found to carry these pathogens (e.g., *Staph. aureus)*, they undergo decolonisation to prevent both endogenous and exogenous infections. Intranasal mupirocin remains the gold standard agent for *S. aureus* nasal decolonisation, but with the increasing incidence of mupirocin resistance, alternative agents are needed. Naseptin® nasal cream (chlorhexidine dihydrochloride and neomycin sulfate) is an option, however studies have indicated that it is less effective than mupirocin, especially for preventing recolonisation. Chlorhexidine gluconate (e.g., Bioscrub® 4% liquid soap) is used for decolonisation of the skin, however its use in infants under 2 months is controversial.

Note: decolonisation therapy is inappropriate while patients still have an an active infection with *Staphylococcus aureus*

LESSONS LEARNED FOR INFECTION PREVENTION AND CONTROL [1,2,3,4]

The new CDC guideline is intended for use by infection prevention personnel, healthcare epidemiologists and administrators, NICU nurses and neonatologists, and those responsible for developing, implementing, and evaluating infection prevention and control programs for NICUs. It should also be noted that the updated document supplements the existing CDC Healthcare Infection Control Practices Advisory Committee (HICPAC) guidelines, and makes specific recommendations about interventions to implement in NICUs when there is:

- ✓ evidence of ongoing *S. aureus* transmission
- ✓ an increased number of new *S. aureus* infections (referred to as 'clusters')
- ✓ an outbreak of infection

The evidence review was guided by these Key Questions:

- ? What are effective strategies for preventing *S. aureus* transmission from colonised or infected NICU patients to other patients; and do these strategies differ between MRSA and MSSA or in the setting of an outbreak?
- ? If screening is conducted, which anatomic sampling sites and laboratory methods most effectively identify *S. aureus* colonisation in NICU patients?
- ? What are the risk factors and indicators for *S. aureus* **colonisation** vs. **infection** in NICU patients, and do these factors differ between MRSA and MSSA, or in the setting of an outbreak?

Evaluation criteria included 'supporting evidence', 'level of confidence in the evidence', 'value judgements', 'benefits vs. risks and harms', and the impact of these measures on the use of available 'resources'. Readers wishing to examine the primary evidence underlying the recommendations are referred to the Evidence Review[2] and if necessary, to the GRADE Tables in the Appendix[3] to the document, which collectively review the overall strength and direction of the clinical evidence.

Unfortunately, space constraints only permit a summary of the main recommendations, however the updated CDC guidelines and SHEA companion White Paper can be found at: https://www.cdc.gov/infectioncontrol/guidelines/NICU-saureus/ https://doi.org/10.1017/ice.2020.51

Recommendation 1.

Surveillance

a Perform active surveillance testing for *S. aureus* colonisation in NICU patients when there is an increased incidence of *S. aureus* infection or in an outbreak setting.

b Perform active surveillance testing for methicillin-resistant *S. aureus* (MRSA) colonisation in NICU patients when there is evidence of ongoing healthcare-associated transmission within the unit.

c The use of routine surveillance testing for methicillin-susceptible *S. aureus* (MSSA) colonisation in NICU patients to detect ongoing healthcare-associated MSSA transmission is an unresolved issue. (i.e., **No Recommendation**)

d If routine surveillance testing for *S. aureus* colonisation is implemented for NICU patients, test at regular intervals to promptly identify newly colonised patients.

e If routine surveillance testing for *S. aureus* colonisation in NICU patients is implemented, consider testing all infants admitted or transferred from other units/hospitals to promptly identify newly admitted colonised patients. (**Conditional Recommendation**)

f If active surveillance for *S. aureus* colonisation in NICU patients is performed, either culture-based or polymerase chain reaction (PCR) detection methods are acceptable.

g Collect samples from at least the anterior nares of the neonates. (The anterior nares have the highest yield for identifying *S. aureus* colonisation. Collecting samples from additional sites such as the axilla, rectum, and umbilicus may increase the yield and sensitivity during outbreaks with a highly virulent strain.)

Recommendation 2.

Decolonisation

a Consider targeted decolonisation for *Staph. aureus-colonised* NICU patients in addition to the implementation of, and adherence to, appropriate infection prevention and control measures in an outbreak setting, or when there is ongoing healthcare-associated transmission, or an increase in the incidence of infection. (**Conditional Recommendation**)

b The use of universal decolonisation for *Staph. aureus*-colonised NICU patients is an unresolved issue. (**No Recommendation**)

c The optimal decolonisation agent or combination of agents remains an unresolved issue. (**No Recommendation**).

Note: The safety and efficacy of intranasal mupirocin is not established in patients aged less than 12 years. Additionally, in neonates and premature infants, systemic absorption occurs following intranasal administration, but it remains uncertain whether this absorption causes adverse health consequences. *S. aureus* may exhibit resistance to mupirocin, so increased use of the agent may contribute to antimicrobial resistance. The application of a nasal ointment is technically challenging in a very low birthweight infant and there could be minor patient discomfort from the application of intranasal ointment, which could also partially occlude small nares and accumulate in the prongs of nasal cannula used to deliver oxygen.

Recommendation 3.

Wear gloves, gowns, and masks at the right times.

a Appropriate procedures to allow discontinuation of Contact Precautions for individual NICU patients who have a history of colonisation or infection with methicillin- resistant *Staph. aureus* (MRSA) is an unresolved issue. (**No Recommendation**).

b For infants with a history of S. aureus colonisation or infection, continuing Contact Precautions for the duration of hospitalisation can prevent transmission of *S. aureus* from patients with recurrent colonisation. Even after decolonisation, neonates can have recurrent *S. aureus* colonisation.

c Premature discontinuation of Contact Precautions for patients with a history of colonisation or infection could contribute to increased transmission of *S. aureus*.

However, the implementation/continuation of Contact Precautions could also negatively impact infant-family bonding, skin-to-skin or 'kangaroo care and breast feeding.'

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1) Stanirowski J, Bizon M, Cendrowski K, et al (2016b) Randomized controlled trial evaluating dialkylcarbomyl chloride impregnated dressings for the prevention of surgical site infections in adult women undergoing caesarean section. Surg Infect (Larchmt) 17(4): 427-35
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3) Cutting K, Maguire J (2015) Safe bioburden management. A clinical review of DACC technology. Journal of Wound Care Vol 24, No 5

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