GUIDELINE

Bacterial Organisms (Selected) of Infection Control Significance

Scope (Staff):	Clinical Staff
Scope (Area):	Neonatology Service (KEMH NICU, 3B PCH, NETS WA)

Child Safe Organisation Statement of Commitment

CAHS commits to being a child safe organisation by applying the National Principles for Child Safe Organisations. This is a commitment to a strong culture supported by robust policies and procedures to reduce the likelihood of harm to children and young people.

This document should be read in conjunction with this disclaimer

Also refer to Neonatal Viral Infections (CAHS Intranet only)

Aim

To outline a consistent approach to the screening and management of bacterial organisms of ***infection control significance*** in the Neonatal Unit (NICU). This guideline has been specifically developed for the unique patient cohort, staffing and facilities of the CAHS Neonatal Units at PCH 3B and KEMH. Clinical staff caring for neonatal patients in PCH 3A and other wards may utilise this guideline at their discretion.

Risk

There is an increased risk of transmission of selected bacterial organisms to vulnerable neonates if guidelines are not adhered to.

Background

Neonatal sepsis remains a significant concern in NICUs, potentially leading to severe consequences for vulnerable infants. The incidence of sepsis in NICUs varies based on gestational age and birth weight, with preterm and very low birth weight infants at greater risk [2, 3]. The pathogens causing neonatal sepsis have evolved over time, with Group B Streptococcus and *Escherichia coli* (*E. coli*) predominating in early onset sepsis [4], while coagulase-negative Staphylococci (CoNS) becoming increasingly common as a cause of late onset sepsis in the NICU population [5].

Due to the unique vulnerabilities of premature infants, organisms which are not routinely considered of infection control significance in other hospital settings, may cause outbreaks in the NICU environment. Extended spectrum beta lactamase (ESBL) producing organisms such as *E.coli and Klebsiella pneumoniae,* pose a significant threat due to their pathogenicity and multi-drug resistance. *Serratia marcescens* has been associated with outbreaks in NICUs. *Staphylococcus capitis* NRCS-A clone has emerged globally as a NICU pathogen. All of these organisms may colonise the NICU environment [6, 7]. There is no proven patient decolonisation regimen for these organisms, and therefore no clearance protocol, whilst in the NICU. It is important to note the none of these organisms covered by this policy are routinely subject to infection prevention measures outside of the NICU environment.

ESBLs are included within the Micro Y alert for multidrug resistant gram-negative bacteria (MDRGNBs), which also includes Gentamicin-Resistant Enterobacteriaceae (GRE). GRE are important in the NICU due to empiric gentamicin containing antibiotic regimens. These patients are placed on contact precautions however outbreak investigation is not routinely performed for these organisms. This would only occur on the basis of a risk assessment. GRE are not discussed further in this document.

Effective infection control measures, including active surveillance, correct hand hygiene, management of environmental sources of infection and appropriate antibiotic use, are crucial in preventing the spread of these organisms and reducing the incidence of neonatal sepsis.

Definitions

Colonisation: presence of microorganisms without clinical signs of infection.

Infection: The invasion of microorganisms into tissues with replication of the organism. Infection is characterised by isolation of the organism accompanied by clinical signs of infection (e.g. fever, inflammation, or pus formation).

Contact Precautions: A set of infection prevention practices used to prevent transmission of infectious agents that are spread by direct or indirect contact with the patient or the patient's environment which cannot be contained by standard precautions alone. Contact precautions include the use of gloves with an apron or fluid

resistant gown (dependant on the degree of risk of contact with blood and body fluids) and other PPE as required as per standard precautions.

Close contact: neonatal patients determined to be at increased risk of colonisation due to potential exposure to a source (patient or environmental).

Multi-resistant organisms: MROs include bacteria, fungi and viruses that have developed resistance to one or more critical classes of antimicrobial and antiviral agents.

Key points

- Where a maternal MRO is in place, the infant(s) admitted to the NICU are required to be screened for that MRO and appropriate transmission-based precautions implemented.
    - *See Micro Alerts and Multi-Resistant Organisms for management of Methicillin-resistant Staphylococcus aureus (MRSA), Vancomycin-resistant Enterococci (VRE), Carbapenemase-producing Organisms (CPO), Gentamicin-resistant Enterobacterales (GRE), Extended spectrum beta-lactamase (ESBL) positive organisms, Candida auris (C. auris).*
- MROs and other organisms of concern in the NICU may be detected on neonatal septic screens (ear swab/gastric aspirate) performed on admission to the NICU or on subsequent clinical specimens.
- Standard and transmission-based precautions must be followed. This includes strict adherence to the 5 moments for hand hygiene (HH), use of personal protective equipment (PPE), and appropriate environmental cleaning.
- Antibiotic stewardship programs should be in place to limit unnecessary antibiotic use.
- Clear communication with parents and caregivers is essential, including education on the organisms and its implications. HealthFact sheets have been developed for some of these organisms (MRO's) can be found here.
- Close contact identification and management:
    - A risk assessment is required when assessing close contacts and their management with consideration of organism, host, environmental, and clinical factors. Specific factors requiring consideration include duration of exposure (e.g. ≥24 hours however transmission may occur over shorter time periods), site of infection, corrected gestational age, expected admission duration in NICU and nursing allocation of patients. The risk assessment needs to consider siblings in the case of multiple births.
    - Initial screening will usually be limited to contacts identified around the time of new bacterial identification (patient or environmental). Identification and screening of more historical contacts may be required for neonates with prolonged hospital stays depending on results of initial screen.

Management of Specific Organisms

1. ***Serratia marcescens***
2. **ESBLs (Extended Spectrum Beta-Lactamases)**
3. ***Staphylococcus capitis*** **(NRCS-A clone)**

For comprehensive information/management on OTHER infections see CAHS IPC Manual – Transmissible Diseases Index.

Serratia marcescens [8, 9]	
Description	Serratia species are commonly found in the environment (e.g. water, soil), can colonise the human gastrointestinal tract, and can survive in moist nosocomial environments. *Serratia marcescens* is the most common species associated with clinical disease. It is not considered part of the normal early intestinal flora of neonates. It may cause asymptomatic colonisation of neonates but may also be associated with unit outbreaks and clinical disease such as conjunctivitis, urinary tract infection (UTI), pneumonia, bacteraemia, and meningitis.
Source	Colonised neonates or environmental sources (particularly sinks) are often the primary source in the setting of a transmission event or outbreak.
Incubation period	Time from exposure to colonisation is likely short, however asymptomatic colonisation may occur for a prolonged period prior to clinical disease.
Mode of transmission	• Contaminated equipment/hospital environment resulting in transmission has been well described, especially from sinks • Vertical - neonates may become colonised at the time of delivery if maternal colonisation present. • Contaminated hands of healthcare workers (and possibly parents) may be a mode of transmission from a source within the neonatal unit.
Patient risk factors for acquisition and infection	Low birth weight, prematurity, skin integrity, use of invasive devices, maternal infection prior to delivery, prolonged NICU stay, use of broad- spectrum antibiotics.
Risk factors for transmission	Compliance with standard transmission-based precautions and hand hygiene is important in reducing transmission risk. The NICU water safety plan aims to mitigate environmental risks from contaminated sinks.

Case definition	Isolation of *Serratia marcescens* from clinical sample or screening sample.	
Transmission based precautions (TBP)	**Contact Precautions**	
Duration of TBP	Precautions to remain whilst patient is in the NICU.	
Case clearance	No micro alert exists for this organism. No procedure for clearance.	
Close contact definition	• Patients residing in the same pod / multi bed area, as an identified case prior to implementation of transmission-based precautions, as directed by Infection prevention/microbiology • Patients residing in the pod / multi bed area of an identified environmental source (e.g. sink) or known exposure to another identifiable source. • Neonates of birthing parent with recent detection of *Serratia marcescens* (e.g. growth in urine specimen at time of delivery)	
Management of contacts	*Identification of contacts and coordination of screening will be performed by Infection Prevention team in consultation with Clinical Microbiology.* A risk assessment will be done to determine if patients require contact precautions pending screening results. Screen contacts, and if appropriate place on transmission-based precautions pending screening results. If multiple contacts are identified, cohorting may be required and will be undertaken in consultation with Infection Prevention / Clinical Microbiology.	
Screening test	Sample type	Request
	Throat and rectal swab – Charcoal swabs (pre moisten with sterile water)	'Serratia screening' on pathology request form.
Contact clearance	A single screen is usually sufficient and if negative, contacts can be removed from transmission-based precautions – discuss with Infection Prevention prior.	
Visitors	No restriction on visitors. Parents with recent Serratia detections in clinical samples are not excluded from visiting their babies in the NICU.	

Environmental testing	Environmental testing may be indicated following detection of a clinical case and will be guided by the Infection Prevention team in consultation with Clinical Microbiology. Testing of the sink adjacent to a case is routine part of management.
Environmental remediation	If an environmental source is identified (e.g. sink) remediation by facilities management may be required. Post remediation environmental testing may be required as directed my microbiology/ infection prevention
Transmission event and outbreak management	A potential outbreak is defined as 2 or more cases over a specific period. 2 or more unexplained cases without epidemiological link over a short period is often of more concern. In the instance of multiple clinical and/or environmental detections typing of isolates may be used to identify relatedness (most commonly by whole genome sequencing).
Patient information sheets	*In development*

ESBL (Extended Spectrum Beta-Lactamases) [10]

Description	Gram-negative bacteria producing beta-lactamase enzymes, leading to resistance to penicillins, cephalosporins, beta-lactam/beta-lactamase inhibitor combinations (e.g. Piperacillin/Tazobactam) as well as aztreonam, but not carbapenems. These organisms can colonise the body and environment. ESBL organisms often harbour additional resistance mechanisms to other antibiotics e.g. gentamicin. ESBLs are of particular concern in the NICU due to restricted therapeutic options, the vulnerable population and risk of transmission between contacts within the NICU. Further information on ESBLs can be found in the CAHS Micro Alerts and Multi-Resistant Organisms policy
Incubation Period	Time from exposure to colonisation is likely short, however asymptomatic colonisation may occur for a prolonged period prior to clinical disease.

Mode of Transmission	• Direct contact (hands, equipment). • Vertical transmission from colonised /infected mother • Less commonly, environmental contamination	
Risk factors for acquisition and infection	Low birth weight, prematurity, skin integrity, use of invasive devices, maternal colonisation/ infection prior to delivery, and prolonged NICU stay.	
Risk factors for transmission	Certain ESBL positive patients are more likely to contaminate the hands of HCWs and the environment. These include those: with diarrhoea or ESBL colonisation of endotracheal tubes	
Transmission based precautions (TBP)	**Contact Precautions** Micro Alert code: **Micro Y**	
Duration of TBP	Precautions to remain for the duration of NICU admission or when accommodated on PCH 3A. A risk assessment is performed for patients on other wards as per Micro Alerts and Multi-Resistant Organisms policy.	
Close contact definition	• Patients in the same pod / neighbouring area as a confirmed case before transmission-based precautions were implemented. • Patients in a pod linked to an environmental source or known exposure to a confirmed case. • Neonates born to a birthing parent with known ESBL colonisation (Micro-Y alert).	
Management of contacts	Identification of contacts and co-ordination of screening will be performed by Infection Prevention team in consultation with Clinical Microbiology. A risk assessment will determine the need for contact precautions while awaiting screening results. Screen identified contacts and, if indicated, implement transmission-based precautions pending results. If multiple contacts are identified, cohorting may be necessary.	
Diagnostic testing	Sample type	Request
	Stool specimen (brown top container) or rectal swab (charcoal swab – pre moisten with sterile	ESBL screen

	water) is required. If ETT, catheter, drain or wound is present specimen is also required.	
Contact clearance	A single screen is generally sufficient. If the result is negative, transmission-based precautions may be discontinued after consultation with the infection control team. If the screening result is positive, the neonate should remain under contact precautions for the entire duration of their admission. Further screening is not required in this case. For neonates born to mothers colonised with ESBL: • Transmission-based precautions may be discontinued following an initial negative screen. • Weekly screening should continue for the duration of the neonate's stay in the nursery.	
Visitor management	• Encourage all visitors to practice strict hand hygiene and use PPE as appropriate. • No visitor restrictions are in place. • Parents with recent ESBL-positive clinical samples are not excluded from visiting their babies in the NICU.	
Patient information	• Provide verbal education and a written information leaflet to patients and families. • An ESBL patient brochure is available from the Infection Prevention Team or on SharePoint here.	

NRCS-A clone of *Staphylococcus capitis* (1, 6, 7, 11)

Description	*Staphylococcus capitis*, a coagulase-negative staphylococcus, is a skin commensal. In NICUs, a multidrug-resistant clone (NRCS-A) has emerged as a significant pathogen, primarily affecting extremely preterm and low birth weight infants. While it can asymptomatically colonise the skin or gut of neonates, it can cause sepsis. Treatment is challenging due to its reduced susceptibility to vancomycin and certain antiseptics.
Source	Common sources in outbreaks include colonised neonates, caregiver hands, environmental reservoirs such as incubators, incubator mattresses, and shared medical equipment.

Incubation period	There is an absence of data however time from exposure to colonisation is likely short. Asymptomatic colonisation may occur for a prolonged period prior to clinical disease.
Mode of transmission	• Transmission by contaminated shared equipment especially incubators have been observed. • Contaminated hands of healthcare workers thought to be a potential source of transmission
Risk factors for acquisition and infection	Premature neonates, invasive mechanical ventilation, extended stays in the NICU, and the use of broad-spectrum antibiotics
Risk factors for transmission	Contact with contaminated inadequately disinfected surfaces including incubators, medical equipment, and care giver hands.
Case definition	Isolation of *Staphylococcus capitis* with a Vancomycin MIC≥2mg/L from clinical sample is highly suggestive or, when available, whole genome sequencing (WGS) confirming NRCS-A clone
Transmission based precautions	**Contact Precautions**
Duration of TBP	Precautions to remain whilst patient is in the Neonatal Intensive Care Unit or 3A, regardless of hospital location.
Case clearance	No micro alert exists for this organism. No procedure exists for clearance.
Close contact definition	• Patients in the adjacent incubator as the index case • Use of medical equipment that has been in contact with a colonized or infected neonate in the past 3 days, such as ventilators, incubators.
Management of contacts	Close contacts should be identified and noted for the remainder of their admission. No additional precautions or screening are required for close contacts unless otherwise advised.
Visitors	No restriction on visitors
Environmental testing	Environmental testing may be indicated following detection of a transmission event and will be guided by the Infection Prevention team in consultation with Clinical Microbiology.

Environmental remediation	Incubators, including mattresses, and shared equipment used by the case should be flagged for high-risk incubator cleaning.
Outbreak management	A potential outbreak is defined as the identification of two or more cases of *Staphylococcus capitis* presumed or confirmed NRCS-A clone isolated during the same admission that are potentially epidemiology linked. In such cases, isolates should be stored and considered for whole genome sequencing (WGS). The identification of contacts and coordination of any required patient and environment screening will be managed by the Infection Control team in consultation with Clinical Microbiology.
Patient information	Verbal education will be provided by the treating team. *Parent information in development.*

Related CAHS internal policies, procedures and guidelines

Micro Alerts and Multi-Resistant Organisms

Hand Hygiene

Transmissible Diseases Index

Water Safety in the NICU KEMH

PCH Facility Water Safety Plan

References and related external legislation, policies, and guidelines

1.Thorn LM, Ussher JE, Broadbent RS, Manning JM, Sharples KJ, Crump JA. Risk factors for Staphylococcus capitis pulsotype NRCS-A colonisation among premature neonates in the neonatal intensive care unit of a tertiary-care hospital: a retrospective case-control study. Infect Prev Pract. 2020;2(2):100057.
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8.Cristina ML, Sartini M, Spagnolo AM. Serratia marcescens Infections in Neonatal Intensive Care Units (NICUs). Int J Environ Res Public Health. 2019;16(4).
9.Muyldermans A, Crombé F, Bosmans P, Cools F, Piérard D, Wybo I. Serratia marcescens outbreak in a neonatal intensive care unit and the potential of whole-genome sequencing. J Hosp Infect. 2021;111:148-54.
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Useful resources (including related forms)

Guidelines for the Screening and Management of Multi-resistant Organisms in Healthcare Facilities

This document can be made available in alternative formats on request.

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