



1. Description

Enterobacteriaceae, e.g. *Escherichia coli* (*E coli*), *Klebsiella*, *Enterobacter*, *Proteus* produce many different beta-lactamase enzymes. Some have activity against only penicillins & 1st & 2nd generation cephalosporins. However in recent year's beta-lactamase enzymes capable of hydrolysing extended-spectrum cephalosporins, e.g., cefotaxime, ceftriaxone, ceftazidime and the monobactam aztreonam have been detected in numerous countries. These organisms frequently carry genes encoding resistance to other classes of antibiotics, e.g. aminoglycosides, quinolones and co-trimoxazole, which limit treatment options.

These are classified as multi-drug-resistant-organisms (**MDROs**).

The resistance gene is carried on a plasmid that can be passed to other gram negative bacilli (GNB). Infections caused by ESBL-producing GNB include urinary tract infection, wound infection, blood stream infection, meningitis, endocarditis, ventilator-associated-pneumonia, osteomyelitis & septic arthritis.

2. Causative agents

ESBLs have been found in most species belonging to the family of *Enterobacteriaceae*, however they are most commonly found among *Klebsiella pneumoniae*, *Escherichia coli* (*E coli*) and *Enterobacter cloacae*.

3. Epidemiology

- ESBL producing GNB are usually associated with wide-spread use of broad-spectrum antibiotics (in particular third generation cephalosporin's) and the resulting selection pressure.
- They have been identified as a cause of health-care-associated infection around the world.
- Infections occur more frequently in hospitalised, severely ill patients.
- Mortality and morbidity are increased with infection with these organisms.

4. Risk factors for colonisation or infection

- Inadequate health care worker compliance with hand decontamination, asepsis and appropriate use of Personal Protective Equipment.(PPE)
- Prolonged length of hospital stay.
- Admission to a high risk unit, e.g. ICU, burns unit
- Severe underlying disease.
- Exposure to antibiotics.
- Presence of invasive medical devices (in particular in-dwelling urinary catheters).
- Inadequate environmental cleaning, and implementation of specific transmission-based precautions (Isolation of infected or colonised patients and patient-dedicated equipment)
- Exposure to contaminated respiratory equipment.



Reservoir

- Humans; GNB reside on the skin, in the upper respiratory tract, genito-urinary tract and intestinal tract.
- Environmental reservoirs (e.g. contaminated liquids, respiratory equipment). Most GNB survive in damp, moist environments.

Transmission

- Transmission most often occurs from person-to-person on the hands of the health care personnel who have been transiently contaminated by contact with infected or colonised patients, or equipment contaminated with these organisms.
- Hand hygiene is one of the most important measures in preventing spread of multi-resistant organisms, including ESBL-producing GNB, in hospitals.
- Hands should be decontaminated, either by hand washing or using an alcohol-based hand gel, after contact with any patient (i.e., this includes those recognised and not yet recognised to be colonised with ESBLs).

Prevention

- Judicious antibiotic prescribing practices.
- Compliance with standard precautions, particularly handwashing or using an alcohol-based gel before and after patient contact, and attention to aseptic technique.
- Contact precautions will be required for patients colonised or infected with ESBL producing GNB.
- Increased cleaning of the environment and removal/control of environmental reservoirs and sources (terminal cleaning required for rooms, toilets and showers for Contact Isolation).

Treatment

- Antibiotics need only to be prescribed if the ESBL-producing GNB is contributing to an infection, e.g., UTI, bacteraemia.
- Therapeutic options are usually limited. Please discuss treatment with Infection Diseases and Clinical Microbiology Team.
- Colonisation (or carriage) with ESBL producing GNB should not be treated with antibiotics. This would expose the patient to additional, unnecessary broad-spectrum antibiotic therapy.
- It may not be possible to clear colonising ESBL-producing GNB from a patient.

Isolation requirements

- ESBL positive patients (either colonised or infected) require **Contact Isolation**
- Masks may be required however this should be determined on the basis of the individual organism and the characteristics and the site of the infection.
- For information on contact isolation policy at West Coast District Health Board refer to the WCDHB Standard Precautions Procedure located on the Intranet or discuss with the Infection Control Nurse.



8. References

- **Canada Communicable Disease Report.** Variation in approach to ESBL. *Enterobacteriaceae*
- **Canada Communicable Disease Report.** Variation in approach to ESBL *Enterobacteriaceae* among Infection Control Practitioners: results of an Ontario-wide survey.
- **Canada Communicable Disease Report.** 2003 antimicrobial resistance: a deadly burden no country can afford to ignore. Vol29-18, 15 September.
- **Farkosh MS.** 2003. Extended-spectrum beta-lactamase Producing Gram Negative bacilli. *John Hopkins Infectious Diseases.*
- **Gomersall C.** www.aic.cuhk.edu.hk. ESBL
- **Livermore DM.** 2001 Beta-lactamases and beyond beta-lactamases. ISAAR.
- **Ministry of Health Malaysia.** Academy of Medicine of Malaysia, Malaysian Society of Infectious Diseases and Chemotherapy. 2001 Consensus guidelines for the management of infections by ESBL-producing bacteria
- **Multi-resistant gram negative bacteria** (ESBL, Acinetobacter spp). 2001
- Infectious diseases in the healthcare setting. Infection Control Guidelines, Queensland health, November
- **Sturenburg E, Mack D.** 2003. Extended-spectrum beta-lactamases: implications for the clinical microbiology laboratory, therapy, and infection control. *Journal of Infection* 47:273-95.
- **Waterer GW, Wunderink RG.** 2001. Increasing threat of Gram-negative bacteria. *Critical Care Medicine* 29 (4), April
- **Australian Guidelines for the Prevention and Control of Infection in Healthcare. 2010** <http://www.nhmrc.gov.au>

9. Related Documents

West Coast District Health Board Infection Control Manual 20011

10. Guidelines

Guidelines for the Control of Multidrug-resistant Organisms in New Zealand
Ministry of Health, 2007 pg 65-67 -68-69

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