The new MRSA?

James Beaves, of Thermo Fisher Scientific, sheds light on the challenge of ESBLs, what makes the infection different, and how costs and lives can be saved...

The issue of infections that are resistant to antibiotics is on the radar of every hospital in the world. In the UK, as reported levels of MRSA begin to decline, other problems are emerging that are potentially even more challenging to healthcare professionals. One such problem is Extended Spectrum Beta-Lactamases (ESBLs), produced by a family of micro-organisms (the Enterobacteriaceae), which are a significant cause of hospital and community acquired infections.

The Enterobacteriaceae family contains more than 100 species of bacteria, which are typically found in the intestines of humans and animals. Enterobacteriaceae include many well-known bacteria, such as *Escherichia coli* and *Klebsiella*, and are responsible for a wide range of common infections, from wound and urinary tract infections to pneumonia, meningitis and septicaemia. *E. coli* is the most frequent cause of bacteraemia voluntarily reported to the HPA.[1]

Normally, these types of infection would be easily treated with a short course of a β-lactam antibiotic, such as a cephalosporin. However, ESBLs confer resistance to these compounds, eliminating them as a therapeutic option. Worse still, the genes encoding these ESBLs are transmissible, meaning that they can be passed from one bacterium to another. Often ESBL bacteria carry more than one resistance gene at a time, further limiting antibiotic treatment options.

In recent months, ESBLs have also been widely reported in livestock, as many of the same β-lactam antibiotics are used to treat infections in animals as in humans. In fact, antibiotic consumption by livestock dwarfs that used in human healthcare, as whole herds are treated collectively rather than individual animals.

Because of their association with livestock, they may well be present in food sources, so it is likely that many of the population carry ESBLs. So, like MRSA, ESBLs are found both in the community and healthcare settings. Carriage in a healthy individual does not represent a significant risk. However, if a patient harbouring an ESBL receives traditional empirical antibiotic therapy, their normal flora can be replaced by the resistant ESBL bacteria. This can lead to treatment failure, so other antibiotics, usually carbapenems, would have to be used. This delay in appropriate treatment associated with ESBL infections leads to increasing morbidity, mortality[2], longer stays in hospital, and increased risk of picking up additional infections or passing an ESBL infection on to others.

The good news is that with the recent advent of chromogenic screening media for ESBLs, it is now possible to screen for these challenging bacteria in much the same way that hospitals across England and Wales currently screen for MRSA. The speed and convenience of ESBL screening media enable healthcare professionals to quickly and decisively initiate appropriate patient care and infection control procedures. Screening for ESBLs using chromogenic media, as well as rapidly identifying patients at risk for ESBLs, will also detect many of the rarer and even more difficult to treat Carbapenem-Resistant Enterobacteriaceae (CRE). If CRE are detected, the patient must be isolated to prevent the spread of this incredibly challenging new threat.

In summary, the dwindling number of treatment options, combined with the alarming rate at which they have spread in both healthcare and community settings, make ESBLs a significant threat to global public health. Therefore, it is vitally important that microbiologists have reliable and easily accessible tools to detect ESBLs as quickly and accurately as possible. This will ensure that appropriate treatment and effective infection control procedures are initiated promptly, helping to slow the spread of both ESBL and CRE.

[1] HPA (2008) Escherichia coli bacteraemia epidemiological data 2007 www.hpa.org.uk/servlet

[2] Livermore D M, Woodford N (2004), HPA Guidance to Diagnostic Laboratories: Laboratory Detection & Reporting of Bacteria with Extended-Spectrum ß-Lactamases. www.bsac.org.uk/_db/_ documents/HPA_ESBLs.pdf

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