Antibiotic use aids MRSA spread in hospital and infection control measures do little to prevent it

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The use of a commonly prescribed antibiotic is a major contributor to the spread of infection in hospitals by the 'superbug' MRSA, according to new research. The study also found that increasing measures to prevent infection – such as improved hygiene and hand washing – appeared to have only a small effect on reducing MRSA infection rates during the period studied.

MRSA – methicillin-resistant Staphylococcus aureus – is a bacteria that causes hospital-acquired infection and is resistant to all of the penicillin-type antibiotics frequently used in hospitals to prevent and treat infection. It can cause serious infections of the skin, blood, lungs and bones.

The researchers – led by St George's, University of London – tracked MRSA infection over 10 years from 1999 to 2009 at St George's Hospital, looking at how it has adapted to survive in a hospital environment and at factors that affected its prevalence. They found that a significant drop in MRSA rates coincided with a reduction in hospital prescriptions of ciprofloxacin, the most commonly prescribed antibiotic of the fluoroquinolone family.

Over a short period of the study, ciprofloxacin prescriptions fell from 70-100 daily doses for every thousand occupied beds to about 30 doses. In the same period, the number of patients identified by the laboratory to

be infected with MRSA fell by half, from an average of about 120 a month to about 60. Following this, over the last two years of the study both the drug prescription level and MRSA rates remained at these reduced levels. Symptoms of MRSA infection can range from very mild to severe, but it is not known how many of the cases examined in the study were serious.

The study – published in the *Journal of Antimicrobial* Chemotherapy – looked at whether other factors such as improved infection control measures may have contributed to this decrease in infection. However, during a four-year period when more stringent infection control policies were introduced – including improved cleaning and hand washing, and screening patients for MRSA on arrival at hospital – the only major reduction in MRSA infection rates coincided with the reduction in ciprofloxacin prescriptions.

Lead author Dr Jodi Lindsay, a reader in microbial pathogenesis at St George's, University of London, said: "Surprisingly, it wasn't hygiene and hand washing that were the main factors responsible for the decrease in MRSA in the hospital. Rather, it seemed to be a change in the use of a particular group of antibiotics. Hand washing and infection control are important, but they were not enough to cause the decrease in MRSA we saw."

Dr Lindsay said the study suggested that MRSA relies on ciprofloxacin – and fluoroquinolones in general – to thrive in hospitals, as well as penicillin-type drugs, which was already assumed. The fluoroquinolone group of antibiotics have a similar enough mechanism of action to assume that the effect would be the same for them all.

She added that the findings suggest the most effective way to control MRSA and other hospital-based superbugs is to continue finding alternative ways to use antibiotics, rather than simply focusing on

infection control techniques.

As well as identifying factors that influenced prevalence, the researchers identified the strain of MRSA that has become dominant. This strain – CC22 – has thrived by developing and maintaining multi-drug resistance, and becoming more fit to survive on hospital surfaces than other strains.

Dr Tim Planche, consultant microbiologist at St George's Healthcare NHS Trust and one of the co-authors of the study, said: "The Trust currently has infection rates among the lowest in London, having successfully driven acquisitions down over the past five or six years using a combination of both tough hygiene regimes and careful selective use of antibiotics. These findings, however, provide valuable insight and certainly warrant further investigation, which could lead to the development of even more effective infection control strategies in future."

Dr Lindsay said that studying the dynamic of how MRSA bacteria strains continue to evolve in hospitals in response to changing practice and interventions, such as infection control and antibiotic prescribing, will be essential to determine which interventions work, which are cost effective, and which are likely to have the best long-term outcomes.

She added: "But it seems that we now have an excellent opportunity to control superbugs in hospitals by re-examining how we prescribe antibiotics and ensuring we're using them in the most effective way possible."

More information: J. Antimicrob. Chemother. (2012) 67 (10): 2514-2522. doi: 10.1093/jac/dks245
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