

# A simple guide to MRSA



This guide explains what MRSA is, how it developed and ways in which it can cause infection.

## About MRSA

**Methicillin resistant *Staphylococcus aureus*** is the full name for MRSA (sometimes referred to as the "superbug"). It belongs to the *Staphylococcus aureus* family of germs.

*Staphylococcus aureus* is a very common cause of bacterial infections such as boils, carbuncles, infected wounds, deep abscesses and bloodstream infection (or bacteraemia). It was first described in the 1880s when doctors realised it was the most common cause of infected surgical wounds.

Most strains of *S. aureus* were sensitive to penicillin when it was introduced in the 1940s. Before the development of penicillin these infections could cause serious or sometimes fatal disease. When penicillin was used to treat infections, some strains of *S. aureus* that were able to make an enzyme called penicillinase (that broke down the penicillin and protected the bacteria) became much more common. They had become resistant to the antibiotic.

By 1959 about 90-95% of *S.aureus* strains isolated from patients with clinical infections were resistant to penicillin. The bacteria causing the infection had evolved so that penicillin was no longer effective for treating the infections.

"Methicillin" was therefore developed from penicillin to treat these *S.aureus* infections. It was made to counteract the breakdown of the antibiotic by the enzyme (penicillinase), ensuring that the penicillin-resistant *S.aureus* would still be treatable by the new drug. Within a year of the introduction of methicillin, the first MRSA was reported in England. MRSA therefore has adapted so that the target normally attacked by penicillin or methicillin has become resistant.

MRSA was relatively uncommon through the 1960s and 1970s. A few more appeared in the 1980s, but the problem exploded in the mid-1990s when particular 'epidemic' strains of MRSA became established in hospitals throughout the UK. These strains are easily transmissible (passing between and colonising both patients and hospital staff easily) and have the capacity to cause serious disease. These strains now represent over 40% of the *S.aureus* causing bloodstream infections in England.

## The Staphylococcal family

*S.aureus* is just one of a family of staphylococcal bacteria. Their normal home is on human skin. The commonest non-*S.aureus* staphylococcus on human skin is *S.epidermidis*. This is generally harmless and is called part of the 'normal commensal flora' of the human body. Many *S.epidermidis* are resistant to antibiotics including methicillin and they have the same resistance mechanism (the altered target) as MRSA and therefore are referred to as MRSE.

Although present harmlessly on the skin of everyone, *S.epidermidis* can cause significant infections if it enters wounds on medical devices such as artificial hip joints or heart valves, or when staff use intravenous catheters to access the bloodstream. This is especially so for severely ill patients such as those in intensive care units or those undergoing cancer chemotherapy.

## What does MRSA cause in patients?

*Staphylococcus aureus* (including those that are MRSA) causes a wide range of infections from asymptomatic colonisation (where the MRSA is doing no damage but is still capable of causing clinical infections) to fatal septicaemia (the most severe form of blood stream infection).

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## What do we mean by colonisation?

About 30% of the general population are colonised by *S.aureus*. In hospitals the percentage is higher because of more likely contact with infected cases. *S.aureus* carriage is more likely to be MRSA in hospital populations (patients and staff) than in the community. This is because antibiotic-resistant bacteria are selected out by the use of antibiotics to treat a range of infections in hospital.

Carriage sites are most commonly the nose and the skin, especially folds such as axilla (armpit) or groin. A carrier can be a source of infection for themselves (e.g. they can infect themselves if they have a wound).

In high risk situations (e.g. patients for major surgery like a hip replacement or heart surgery) if pre-screening shows MRSA carriage, decontamination with skin and nose treatment is recommended before they are operated on.

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## Different types of infections

There is no specific 'MRSA disease' like with tuberculosis or typhoid. *S.aureus* infects a range of tissues and body systems (like those mentioned below) giving general often ambiguous symptoms that are common to different infections caused by other bacteria.

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## Wound infections

*S.aureus* / MRSA is the commonest cause of wound infection - either after accidental injury or surgery. This shows as a red, inflamed wound with yellow pus seeping from it. The wound may break open or fail to heal and a wound abscess could develop.

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## Superficial ulcers

Pressure ulcers, varicose ulcers and diabetic ulcers (all due to poor blood supply and superficial skin damage) are often sites of MRSA infection.

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## Intravenous line infections

MRSA may infect the entry site of an intravenous line causing local inflammation with pus from which the MRSA can enter the blood stream to cause a bacteraemia (blood stream infection).

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## Deep abscesses

If MRSA (or any *S.aureus*) spreads from a local site into the blood stream it can lodge at various sites in the body (e.g. lungs, kidneys, bones, liver, spleen) and cause one or more deep abscesses distant from the original site. These can be painful with high fever, a high white cell count in the blood and signs of inflammation near the infection. The patient will be very unwell and may have rigors (shivers) and low blood pressure (shock). Over a period, the body enters a catabolic state with breakdown of tissue, loss of weight and failure of essential organs. This is usually linked with an associated septicaemia.

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## Lung infections

MRSA / *S.aureus* is a rare cause of lung infection except in Intensive Care Units. There, the patient is on a ventilator with a tube in the trachea, bypassing the defences of the nose and throat. MRSA can gain entry to the lungs via the tube and cause pneumonia which may be fatal.

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## Bacteraemia / septicaemia

MRSA / *S.aureus* can enter the normally sterile blood stream either from a local site of infection (wound, ulcer, abscess) or via an intravenous catheter (placed there for their medical care). Bacteraemia describes the presence of MRSA / *S.aureus* in the blood. Septicaemia can follow and is the clinical term for a severe illness caused by the bacteria in the blood stream. The symptoms are not specific to MRSA and can be the same for other bacteria that cause septicaemia. Typically symptoms can include high fever; raised white cell count; rigors (shaking); disturbance of blood clotting with a tendency to bleed and failure of vital organs This is the kind of MRSA infection that has the highest death rate.

Further copies of this Simple Guide to MRSA can be downloaded from [www.dh.gov.uk/reducingmrsa](http://www.dh.gov.uk/reducingmrsa)