

Staphylococcus - Symptoms and Treatment

Golden staph is the common name for the **Staphylococcus aureus bacterium**. Microscopic slides reveal staphylococcus **bacteria** as **resembling grape clusters**, which is where their name originates (Greek staphile = cluster; coccus = grain). The suffix aureus (Latin for golden) the bacterium obtained due its **yellow pigment** that is not always visible.

Resistance to Antibiotics

What makes this bacterium unique are the numerous mechanisms of antibiotic resistance. That is to say, the bacterium has created numerous ways to **counteract antibiotic action**, which creates problems in treatment.

One of the **defense mechanisms** is the **production of beta-lactamase enzymes** that break down beta-lactam antibiotics (penicillins, cephalosporins, carbapenems, monobactams). Beta-lactamases differ in their specificity for the inactivation of certain types of beta-lactams – that is how we **differentiate between penicillinase, cephalosporinase or carbapenemase**.

Another important way in which the bacteria create resistance is changing the target area of antibiotic activity. *S. aureus* that has no developed resistance mechanism of this kind has a penicillin-binding protein (PBP) which is followed by inactivating cell wall synthesis of the bacterium cell, subsequently to what the bacterium dies.

Some strains have a different type of protein, PBP2a, which does not show affinity for binding to antibiotics but continues to synthesize the bacterial cell wall and thus allows the bacteria to live. Such resistance mechanism is characteristic of **MRSA strains** - the most common cause of nosocomial infections.

Carrier State

S. aureus often **colonizes the organism of a newborn** immediately after birth in the area of **the umbilical cord, skin, nose, and sometimes the gastrointestinal system**.

Colonization signifies the arrival of bacteria at a certain area, but without causing infection and thus without triggering the symptoms of the disease. It is important to note that **colonization is a condition** rather than a disease and it **is not to be treated**. Colonization of a newborn may cease but it may also become part of a person's normal skin and mucous flora. We call this person a **carrier**.

Approximately **20-40% of adults are considered to be *S. aureus* carriers**, carrying the bacteria primarily in the **vestibulus of the nose and on the skin**. This percentage varies depending on the season and epidemiological conditions. In children, this percentage can reach up to 60% in

newborns and infants, with the percentage of carriers decreasing through aging.

"Carriers are not to be treated! Giving antibiotics to remove the bacteria that make us carriers, but are part of our normal flora can have many unwanted effects.

This **includes allergic and toxic reactions caused by antibiotics, diarrhea** caused by antibiotics and **multiplication of fungi** on the surface of mucous membranes (often in the vagina, but also in the gut and intestines).

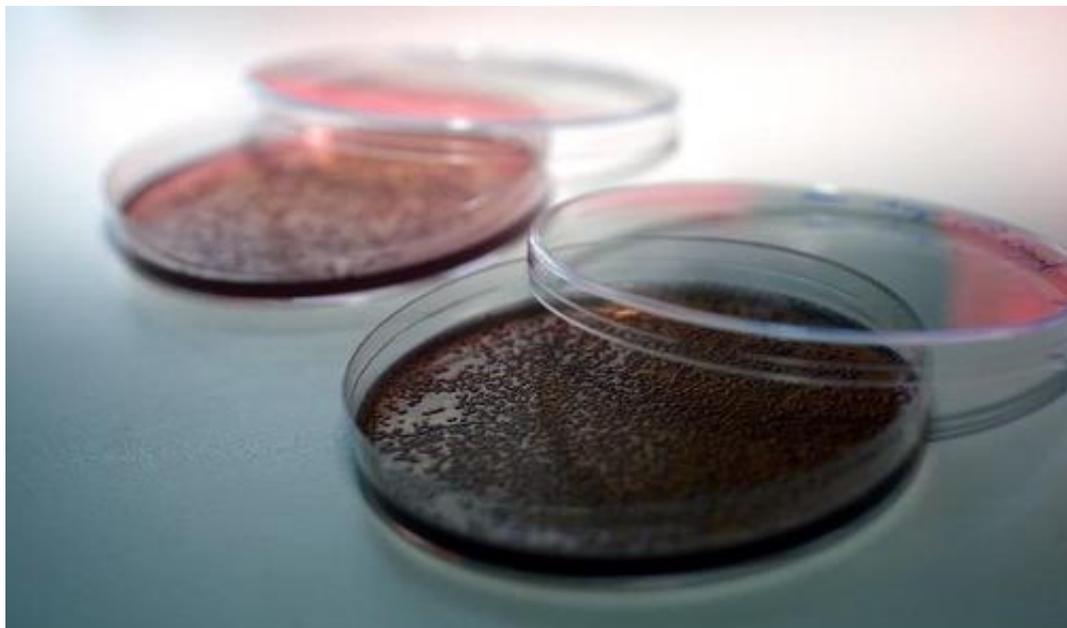
One of the undesirable effects of antibiotics (which is more common if antibiotics are more commonly used in an area) is the development of resistance. **Resistance means** that the **bacteria ceases to be sensitive to certain** (or even to entire groups of) **antibiotics**. It is a major problem if a person falls really ill later on, having previously developed a high resistance to numerous antibiotics due to attempts to "treat" the carrier state.

Staphylococcus colonizes the skin and mucous membranes, which when undamaged make a good barrier for the passing bacteria, thus stopping the possibility of local and general infection. That being said, the moral of the battle against staphylococcus should be to preserve the integrity of the mucous membranes and the skin so as to prevent infection, not try to destroy the bacteria that are part of the normal flora with antibiotics.

MRSA Carrier State

MRSA is the **abbreviation for methicillin-resistant S. aureus**. The name is a result of the discovery that this bacterium is **resistant to treatment with the antibiotic called methicillin**. It was later discovered that *S. aureus* is resistant to all beta-lactam antibiotics (penicillin, cephalosporin, carbapenem, monobactam), not only methicillin.

Because of the small number of medications that affect it, it has created many problems in the treatment of nosocomial infections it causes. **MRSA carrier state** is a bigger problem than the carrier state caused by the "regular" *S. aureus*, especially among health workers. This is so because certain strains are difficult to control when it comes to epidemics.



Likewise, it has a strong affinity for causing severe infections in immunosuppressed people and is **difficult to treat** because it is **sensitive to a small number of antibiotics**. Thus, MRSA carrier state is **not a problem for an immunocompetent person carrying this bacterium**, for example in a vestibulus of the nose, but it becomes dangerous if the carrier is near a person with a weakened immune system, whom he or she can infect with MRSA.

For this reason, hospitals require treatment of MRSA carrier state in health workers. If **bacteria** are found in the **vestibulus of the nose**, it is **treated with mupirocin cream**.

Carrier state on the skin is treated with **antiseptic baths**. **Eradication of carrier state with systemic antibiotics** is carried out in exceptional situations.

Infections Caused by Golden Staph

We have already stated that Golden staph shows a strong affinity for the skin and mucous membranes. A damage to the integrity of these surfaces leads to local and systemic infections. The primary local lesion is skin abrasion. It should be borne in mind that all, even the most common localized infections, can become the cause of endocarditis, meningitis...

Here is a list of skin infections connected to the matter:

- **Folliculitis** - the most benign form of infection defined as skin fungus involving the hair follicles and surrounding skin
- **Furunculate** - a more serious inflammatory process involving hair follicles, sebaceous

glands, and part of the surrounding tissue

- **Carbuncle** – it is formed by the fusion of a number of sore hair follicles deep in the hard, non-elastic skin of the cervix or back
- **Impetigo** - a highly contagious skin condition which usually occurs on the face and arms of children. It starts as a regular redness of the skin, which later turns into a raised formation surrounded by redness that pops and finally turns into a scab

Golden staph can also **cause acne, sebaceous or sweat gland infection** and **breast infections in nursing mothers**. Occasionally, the clinical picture may show a large amount of **extracellular toxins** which are characteristic of **food poisoning, scalded skin syndrome** or **toxic shock syndrome**:

- **Staphylococcal food poisoning** is characterized by a brief incubation period (symptoms of bacterial infection are noticeable very soon) lasting only one or two hours
- **Scalded skin syndrome** most commonly affects newborns and children; it begins on the skin, but soon reaches the systemic circulation, and due to the loss of fluid and electrolytes it can lead to death
- **The toxic shock syndrome** is a very difficult but rare condition that most frequently affects women who use tampons, diaphragm as contraception, and women who have had an abortion... Symptoms include muscle pain, high temperature, vomiting and diarrhea, and it is necessary to remove foreign bodies as soon as possible (if there are any)

Staphylococcal infections also show **affinity for systemic spread**. Hence they are often the **cause of endocarditis, meningitis, pneumonia, osteomyelitis, and sepsis**.