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Staphylococcus xylosus Isolation of Conjunctival Secretions in an 8-Year-Old Child at Sikasso Hospital (Mali): About a Case

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Abstract

Staphylococcus xylosus is a species of bacteria belonging to the genus Staphylococcus. This genus currently includes several species and subspecies. We distinguish between 2 groups: the group of coagulase-positive staphylococci (CoPS) and coagulase-negative staphylococci (CoNS), a larger group that includes more than forty species and subspecies. Among the CoNS, *Staphylococcus xylosus* occupies a special place because it is frequently isolated from meats, dairy products, and agricultural environments. It is commonly used in fermentation due to its primary role in the flavor and color development of fermented products. It is a commensal bacterium of the skin of small mammals and farm animals, where it constitutes the majority of flora. In this species, there are a large number of strains, including phenotypes and genotypes. Although *S. xylosus* is actually a recognized non-pathogenic species, a few strains can be potentially dangerous. They can thus be responsible for mastitis and dermatitis in cattle. With the multiplicity of breeding farms, the consumption of livestock products and the increasingly frequent contact of humans with animals a few rare cases of human opportunistic infections have also been reported in the literature. These include pyelonephritis, endocarditis, urinary, lymphatic, and lymph node infections, contamination of orthopedic materials and catheters. Thereby, we report the case of a lingering and chronic infection of the lacrimal tract by *Staphylococcus xylosus* in an 8-year-old child in the Ophthalmology Department of Sikasso hospital in Mali.

Keywords

Staphylococcus xylosus, Infection, Sikasso Hospital, Mali

1. Introduction [1] [2] [3] [4]

Staphylococcus xylosus is a species of bacteria belonging to the genus Staphylococcus. This genus currently includes more than 40 species and 24 subspecies. The presence of a coagulase, an enzyme that coagulates blood plasma, has allowed the distinction of 2 groups: the group of coagulase-positive staphylococci (CoPS) which includes *Staphylococcus aureus*, *S. delphini*, *S. hyicus*, *S. intermedius*, *S. lutrae*, *S. pseudointermedius*, *S. schleiferi* subsp. coagulans, and coagulase-negative staphylococci (CoNS), a larger group that includes more than forty species and subspecies [1] [2].

Within CoNS, the species *Staphylococcus xylosus* holds a special place because it is frequently isolated from meat and dairy products and from agri-food environments. *S. xylosus* is commonly used as ferment for its major role in the flavor and color development of fermented products. Via its lipolytic activity and its ability to catabolize amino acids, especially those with branched chains (leucine, valine, isoleucine), *S. xylosus* influences the composition of volatile and non-volatile aromatic compounds. On the other hand, its antioxidant properties make it possible to limit rancidity [3] [4].

Like many other species of the genus Staphylococcus, *S. xylosus* is a commensal species of the epithelium and mucous membranes of animals and more particularly of mammals. *S. xylosus* is one of three species frequently isolated from naturally fermented meat and dairy products. It is used as ferment in meat for its role in the flavor and color of these products. Regarding the flavor, it catabolizes in particular leucine into 3-methyl butanoic acid which gives an aromatic cheese note. It limits the oxidation of unsaturated fatty acids via its antioxidant properties resulting in particular from the activities of superoxide dismutase and catalase A as has been described in the strain *S. xylosus* C2a [3] [4].

Its ability to form biofilms on non-living surfaces may explain its persistence in these environments. In this species, there are a large number of strains, including phenotypes and genotypes. Although *S. xylosus* is actually a recognized non-pathogenic species, a few strains can be potentially dangerous.

Animal pathologies and a few rare cases of human opportunistic infections have been reported in the literature. Human cases have generally been reported in patients with immune failure. These are pyelonephritis, endocarditis, urinary, lymphatic and lymph node infections. Other cases such as nosocomial infections, surgical wound infections, orthopedic materials and catheters... have also been written [1]. These increasingly growing and interesting human attacks on various organs must attract our attention, especially in a context of chronic and trailing infection. Thus, we report the case of a lingering and chronic infection of

the lacrimal tract by *staphylococcus xylosus* in an 8-year-old child.

2. Patient and Comments

An 8-year-old male child was consulted in our department for recurrent and unilateral purulent conjunctival secretion evolving since birth.

The child would have made the rounds of several ophthalmological centers with each time batch of treatment without noticeable improvement. These would be eye drops and ophthalmic ointments not specified by the parents.

The examination at the entrance, in our structure, had found a visual acuity of 10/10 in both eyes. The anterior and posterior segment of the right eye was unremarkable. In the left eye, purulent secretions were observed. Pressure from the lacrimal sac region causes reflux of more abundant secretion from the orifice of the inferior lacrimal canaliculus (lacrimal punctum) (**Figure 1**) and the rest of the clinical examination was unremarkable.

In view of this symptomatology, the diagnostic hypothesis of chronic infectious dacryocystitis was posed. The general examination was unremarkable. A cytobacteriological examination of the secretions was requested as well as an antibiogram for the search for a pathogenic agent. Thus, a strain of *Staphylococcus xylosus* was isolated.

The search for cohabitation or breeding of domestic and other animals was not found. The search for the concept of immunosuppression syndrome was negative.

This strain was sensitive to antibiotics and to the following standard dosage: Gentamycin; Erythromycin; Ciprofloxacin; Levofloxacin and Vancomycin. A prescription of ciprofloxacin eye drops and oral erythromycin associated with eyewashes of the antiseptic solution was administered to the patient. After 10 days of monitoring and treatment, significant regression of secretions was observed. After a follow-up of 6 months, we note the complete disappearance of the secretion.

3. Discussion

According to the literature, *S. xylosus* is a commensal bacterium of the skin of small mammals and farm animals, where it constitutes the majority of flora. This species is also found on human skin but its occurrence remains low. *S. xylosus* is found naturally in raw materials of animal origin and colonizes the environment of agro-food workshops [1].

Although *S. xylosus* is actually a recognized non-pathogenic species, a few

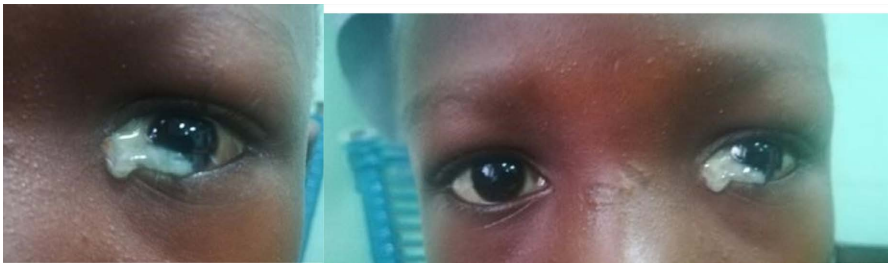

Figure 1. Reflux of purulent secretion from the lower lacrimal point of the left eye.

strains can be potentially dangerous. Some involve animal pathology, and some are isolated from food and produce enterotoxins. A few rare cases of human opportunistic infections are also caused by this species [1].

Infections due to this germ, particularly in bovine mammaries, have been reported in the literature. It was isolated in 2.2% of cases in bovine mammary infections [4]. According to the literature, it is the species mainly found in the milk of goats with mastitis and that of healthy cows or cows with mastitis [5] [6].

In 2001, Almeida *et al.* observed the adhesion and internalization of *S. xylosus*, S. epidermidis and *S. hyicus* on bovine mammary epithelial cells of the MAC-T type (Bovine mammary alveolar cell line). They demonstrated that *S. xylosus* adhered much better than *S. epidermidis* and *S. hyicus* to monolayer MAC-T epithelial cells, and also internalized much better in these cells (**Figure 2**) [7].

In immunocompromised mice, it has been isolated from dermatitis-like lesions, which had proven to be very lethal [8] [9] (**Figure 3**). In 2003, Thomton *et al.* [10]

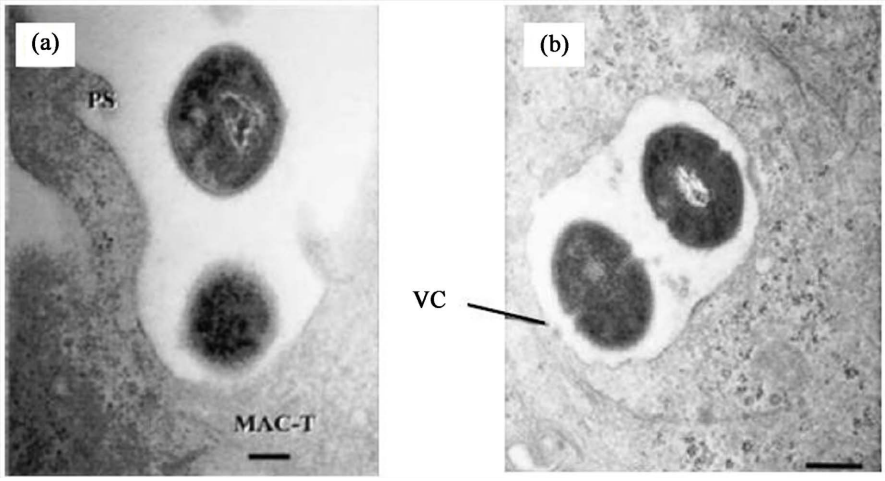

Figure 2. Interaction between MAC-T cells(Bovine mammary alveolar cell line)and *S. xylosus* observed by transmission electron microscopy according to Almeida & Oliver (2001) [6]. (a) Adhesion of *S. xylosus* to cells with formation of pseudopodia (PS); (b) Internalization of 2 shells of *S. xylosus* in a vacuole (VC).

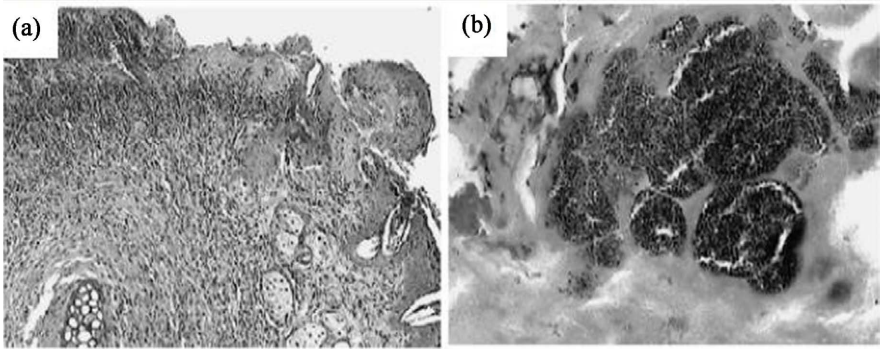

Figure 3. Light microscopy images of the epidermis of mice with dermatitis (Won *et al.*, 2002) [8]. (a) Granular dermatitis on the skin around the ears. Dermal lesions include pustules, necroses, and accumulations of neutrophils and macrophages. (b) Colonies of *S. xylosus* on the skin of a mouse with dermatitis.

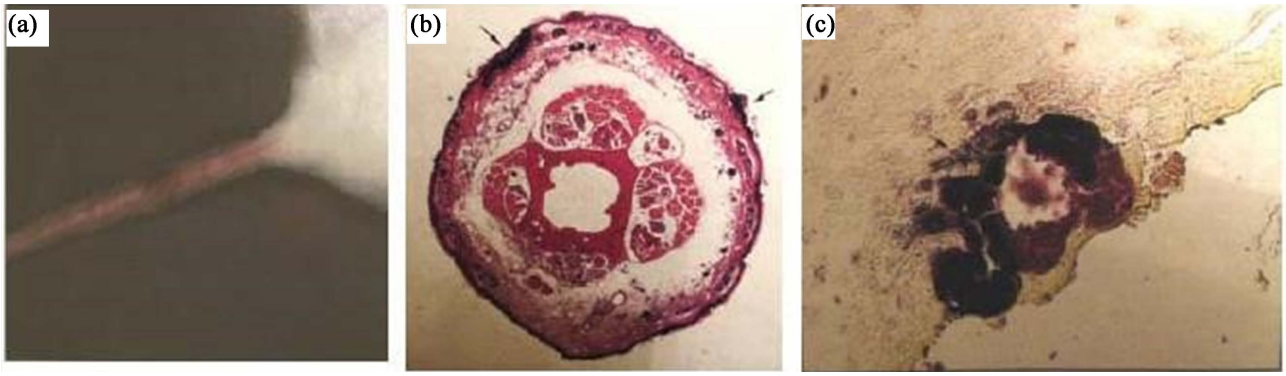

Figure 4. Dermatological lesion of a mouse tail inoculated with *S. xylosus* (Thornton *et al.*, 2003) [9]. (a) Tail lesion. The lesions extend focal to multifocal with erythema, hyperthemia, edema, ulcerative dermatitis, and scar tissue formation, all of which are located on the dorsal tail exposure. (b) Magnification (×2) of a cross section of the infected tail. Histopathological changes in the inoculated group of mice ranged from mild edema with hyperkeratosis and hyperplasia of the full-thickness epidermis to more severe lesions including ulcerative and suppurative dermatitis with multifocal hemorrhage and formation of serocellular crusts. (c) Magnification (×100) of the microorganisms responsible for the infection. Many Gram-positive coccoid bacteria and *S. xylosus*, colonize the superficial epidermis.

observed dermatological lesions in a mouse tail inoculated with *S. xylosus* (**Figure 4**). Also observed in nasal infections in gerbils [1].

If human involvement is rare, with the multiplicity of breeding farms, the consumption of livestock products and the increasingly frequent contact of humans with animals, we are seeing a few cases of infections in humans. These opportunistic infections would only affect patients whose immune function is weakened [1].

Thus, Tselenis-Kotsowillis *et al.* [11] in 1982 reported a case of pyelonephritis. In parallel to the same year, Gemmel *et al.* [12] isolated strains of *S. xylosus* in cases of endocarditis and urinary tract infections. In Africa, in Benin, in 1994, it was associated with an infection of a surgical wound [13]. The colonization of catheters by this bacterium was reported by Carrillo *et al.* [14].

The species was isolated from orthopedic implants during Arciola infections in 2006 [15].

Other cases of infections were also reported by the literature, in particular that of the lymph and the lymph nodes as well as cases of urinary, corneal or dental infections by various authors [16] [17] [18].

In 2004, Tompkins *et al.* observed a case of endocarditis in a cancer patient [19]. The species has been observed in cases of nosocomial infection particularly in newborns in 1.8% of cases and also associated with pneumonia and septicemia by Cunha Mde *et al.*, in 2002 [20]. In 2008, eye injuries were reported including the evolution marked by the occurrence of mucopurulent keratoconjunctivitis caused by *staphylococcus xylosus [21]*.

Most of the genetic data of the *S. xylosus* species is obtained from the model strain *S. xylosus* C2a which is commensal to human skin [1].

According to these authors, the strains of *S. xylosus* isolated from human skin correspond more to contamination by domestic animals than to true coloniza-

tion. This would be explained by the difficulty of the bacterium to develop in an acid medium with a pH lower than 5.3, yet the pH of human skin is 5 whereas that of animal skin is 7. Our case, like data from the literature, shows that *S. xylosus* can present an infectious risk for humans. It illustrates and shows that the visual organ is not spared by this infection. When it occurs in a context of chronicity despite the various therapies, do not hesitate to request a cytobacteriological examination of the secretions for the identification of the germ and the strain and also an antibiogram for a well-adapted therapy.

4. Conclusion

Staphylococcus xylosus is a commensal bacterium of human and animal skin. This microorganism widely used in the food industry is increasingly associated with pathologies involving coagulase-negative staphylococci. Some of these strains are pathogenic for animals and others can also be for humans, which must be considered in the face of any lingering infections.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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