

**A Review Study On Antibacterial Activity Of *Bifidobacterium longum* And
Lactobacillus casei Against Conjunctivitis Associated Beta Hemolytic Strains Of
Staphylococcus aureus
Ophthalmic Infections And *Staphylococcus aureus***

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Abstract

Eye infections have become a highly widespread medical issue in recent years, maybe in part because more people are wearing contact lenses. Conditions such as trachoma, keratitis, corneal ulcer, and conjunctivitis (pinkish or red eye) are becoming more common worldwide. The months of December through April are when cases of bacterial conjunctivitis surge. Around the globe, it is estimated that there are 5 million cases of infectious conjunctivitis in newborns each year. Conjunctivitis, often known as pink or red eyes, can cause a number of symptoms, including pain in the eyes, redness, sensitivity to light, blurred vision, and watery eyes. The most common pathogenic bacteria responsible for conjunctivitis are *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Coagulase-negative Staphylococcus*. Certain antibiotics, including novobiocin, norfloxacin, vancomycin, fluoroquinolones, ofloxacin, levofloxacin and ciprofloxacin are frequently used to treat bacterial infections causing conjunctivitis. However, in recent years, antibiotic

resistance has alarmingly increased and cause a significant risk to global public health as it may result in severe health issues. Antimicrobial drugs play an essential part in decreasing the impact of infectious diseases. However, their effectiveness reduces as resistant organisms spread and grow. Many times, virulence factors work directly with the tissues of the host or cover the bacterial surface from the host's defense systems. Recognition of infection linked virulent genes from antibiotic resistant

Author Details

Keywords: Conjunctivitis, Antibacterial Activity, Keratitis Corneal Ulcer, Bacterial Pathogens, Antibiotic Resistance

Received on 01 Oct 2025

Accepted on 01 Nov 2025

Published on 04 Nov 2025

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conjunctivitis linked bacteria; *Staphylococcus aureus* will be help to define the risk influence for infections.

Objectives: The objective of this review article to understand the basic and major causes of conjunctivitis Review will also help out the researchers to find different methods to treat conjunctivitis.

Introduction

The most sensitive organ in the human body is the eye. Eye infections have become a highly prevalent medical issue in recent years, maybe in part because more people are wearing contact lenses. All age groups of people are susceptible to bacterial conjunctivitis that is a common kind of eye infections. The bacterial species that induce an infection of the conjunctiva and subsequent development of pus are the cause of the disease. Bacterial infections can result from bloodstream-borne internal bacteria or from exposure to external pathogens [25]. Acute and chronic types of bacterial conjunctivitis are often distinguished depending on the illness's duration and severity. The majority of incidences of acute conjunctivitis are caused by allergic problems. Acute conjunctivitis is generally defined as conjunctivitis with symptoms that last less than three to four weeks. The incidence of bacterial conjunctivitis peaks between December and April. Approximately 5 million cases of infectious conjunctivitis in newborns are reported each year [26]. 1–4% of cases with acute red eyes occur in the developed world, and the most common source of disease is acute bacterial conjunctivitis. Many studies show that bacterial infections are responsible for 50–75% of acute conjunctivitis cases in young children. According to reports, patients in long-term care facilities and nursing homes are more susceptible to methicillin-resistant *Staphylococcus aureus*-induced conjunctivitis.

Clinical Symptoms and Manifestations:

Conjunctivitis (red eye or pinkish), has many different symptoms like redness of the eyes, eye's pain, blurring vision, light sensitivity watery eyes [8]. Pinkish eyes, tears, pain and itching are the most well-known symptoms of eye infections, and the inflammation of surface of eye is most common. It is essential to evaluate the infection pathologically and morphologically in order to identify the infection and recommend the appropriate course of action [2]. Bacterial agents are known to cause external ocular infections, including keratitis, conjunctivitis, blepharitis, and dacryocystitis. Globally, there is a rise in morbidity and blindness, which can be related to these diseases. Conjunctivitis is a common cause of eye redness and can be found in emergency rooms, health care medical facilities and urgent care centers, Individuals of all ages, socioeconomic backgrounds, and demographic classes can be affected [21]. Conjunctivitis is may be due to inflammation of the conjunctival tissue, ocular discharge, and vascular enlargement. It might be infectious, chronic, or both [11]. Bacterial conjunctivitis is may be reason of purulent discharge, the red eye, and chemosis and sticky eyes (Figures 1-4) [4, 20].



Fig 1. Sticky eye
the inferior fornix

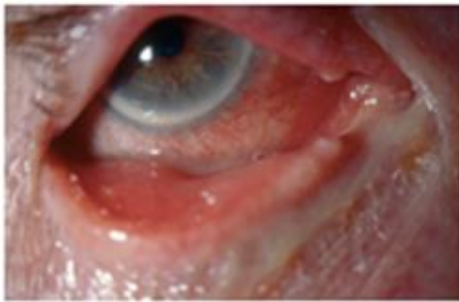


Fig 2. Thick, yellow discharge in

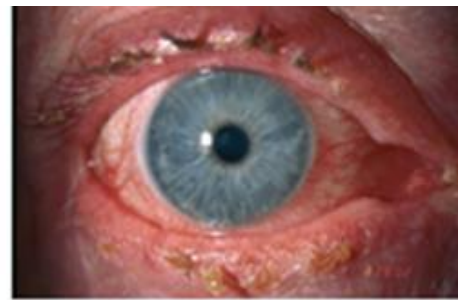


Fig 3. Mucopurulent discharge, the red eye
incrustations on the eye lid margins

Fig 4. Dry, yellow

Causes:

Conjunctivitis is a broad term used to describe the inflammation of the conjunctiva resulting from various infectious agents (such as viruses, bacteria or fungi) as well as non-infectious factors (including allergies, chemical irritants, and mechanical trauma). The specific pathogens responsible for bacterial conjunctivitis often vary depending on the age of the patient (see TABLE 1).

Haemophilus influenzae, Staphylococcus aureus, Coagulase-negative Staphylococcus and

Streptococcus pneumoniae are the major bacterial infections that cause conjunctivitis [25]. Staphylococcus aureus is considered as the major reason of conjunctivitis in adults whereas H.influenzae and S. pneumoniae are common reasons of the illness in children. The current investigation in Egyptian clinical discovered the bacterial causes of conjunctivitis and studied that the isolated bacterial pathogens exhibited resistance to frequently -used [7].

Table 1: Common causes of bacterial conjunctivitis [21]

Neonates
Chlamydia trachomatis
Haemophilus influenzae
Staphylococcus aureus
Streptococcus pneumoniae
Childern
H influenzae
S aureus
S pneumoniae
Adults
S aureus
S pneumoniae
H influenzae
Coagulase-negative Staphylococcus organisms

Antibiotics:

Medication that is "time-warped" includes antibiotics. They are only used rarely and for a few distinct objectives [23]. The high prevalence of antibiotic resistance in

current Years shows a serious risk to public health worldwide since it can lead to serious health problems [12]. Antibiotic resistance represents a severe global public health challenge, leading to at least 1.27 million deaths worldwide, with approximately 5 million fatalities occurring in 2019. Certain antibiotics, such as levofloxacin, fluoroquinolones, ofloxacin, norfloxacin, vancomycin, novobiocin and ciprofloxacin are frequently used to treat bacterial infections that cause conjunctivitis [19].

Antimicrobial agents:

Antimicrobial drugs play an essential part in decreasing the impact of infectious diseases. However, their effectiveness reduces as resistant organisms spread and grow. This type of bacterial resistance to antimicrobial drugs poses a significant threat to public health, with resistance rates increasing worldwide for all antibiotics, including the critical last-resort medications. Consequently, the urgent need for alternative antimicrobial strategies has led to a reassessment of the therapeutic use of traditional medicines [15]. Different studies showed that *Lactobacillus casei* is used as antibacterial agent for conjunctivitis related bacterial pathogens, *Staphylococcus aureus* as compared to traditional antibiotics [16]. As a natural antibacterial agent, *Bifidobacterium longum* works well against the majority of *Staphylococcus aureus* bacteria that cause conjunctivitis.

Virulent Factors:

Many times, virulence factors interact directly with the host tissues or work to hide the surface of the bacteria from the mechanisms of host defense. Different studies explain that the virulent genes for *Staphylococcus aureus* are sea gene that is followed by hla (37.3%), icaA (49.2%) and fnbA (13.6%). Among MRSA isolates, sea is thought to have the highest frequency of virulence genes (72.2%). It will be helpful to find out the risk factor for pathogenic infections. Multidrug-resistant *Staphylococcus aureus* (MRSA) is a type of bacteria that shows resistance to multiple drug. The pure cultures of the *Lactobacillus* strains are *Lb. casei* LBC80R and *Lb. acidophilus* CL1285s [14].

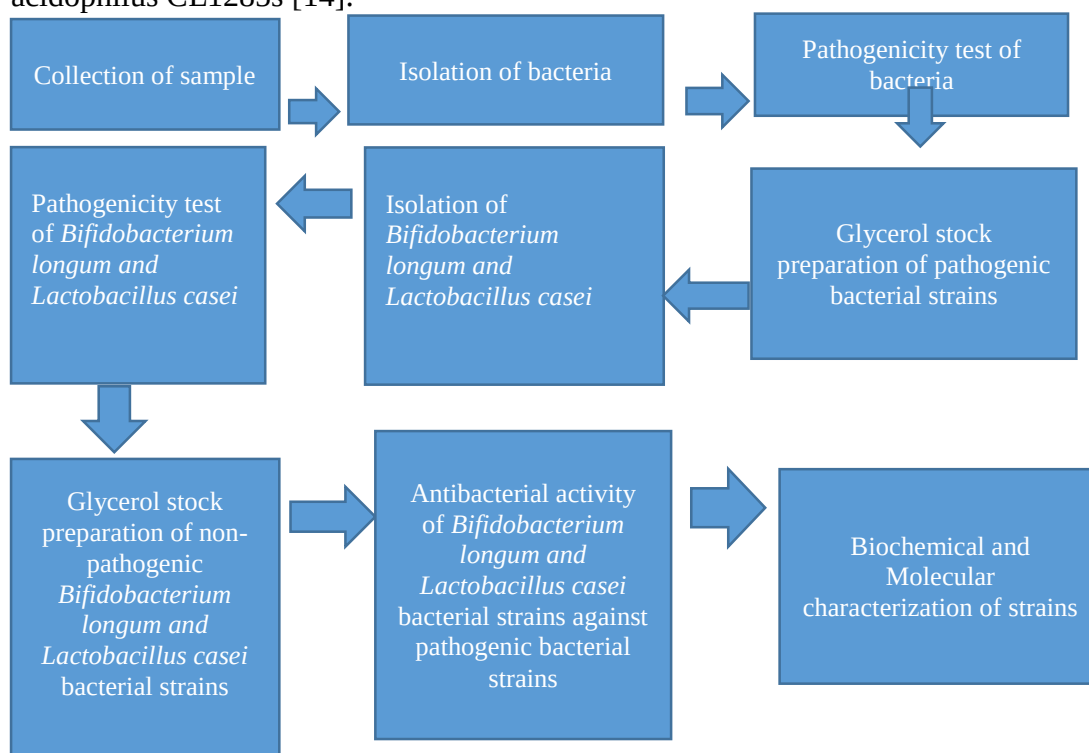


Fig.5 Flow chart to show methodology for research work relating to eye infections and antibacterial agents

Treatment:

Systemic therapy is required for chlamydial or gonococcal infections. The U.S. Centers for Disease Control and Prevention suggested administering ceftriaxone (Rocephin) 1g as a single intramuscular injection to treat gonococcal conjunctivitis, along with a topical saline eye wash. It is essential to refer the patient's sexual partners for treatment and evaluation, as well as the mothers of affected neonates and the sexual partners of those mothers. Chlamydial conjunctivitis is managed with most common antibiotics. For neonates, the treatment is same as for pneumonia caused by *C. trachomatis*, consisting of 14 days of oral erythromycin. In adults, a single oral dose of 1g azithromycin (Zithromax) is an effective treatment option. Additionally, some experts suggest that *H. influenzae* conjunctivitis should be treated with systemic antibiotics [5, 10].

Different studies indicated that over 70% of bacterial conjunctivitis cases clear up within 8 days. Nevertheless, using antibacterial treatments results in more rapid clinical and microbiological recovery and lessens the chances of rare complications and the spread of the infection. Several antibiotics are effective for managing bacterial conjunctivitis (see TABLE 2), yet there is no definitive guideline on which one to choose, as no significant variations in clinical outcomes have been identified among different medications. Factors like cost, local resistance patterns, and potential side effects should be taken into account; however, there is currently no research available regarding the cost-effectiveness of treating bacterial conjunctivitis [4, 20].

Table 2: Topical antibiotics used to treat bacterial conjunctivitis [4, 20]

Ofloxacin (Ocuflox) Polymyxin B
Levofloxacin (Quixin)
Gatifloxacin (Zymar)
Neomycin (Neosporin)
Ciprofloxacin (Ciloxan)
Sulfacetamide (Cetamide, Ocusulf-10)
Gentamicin (Gentak, Gentasol)
Trimethoprim (Polytrim)
Moxifloxacin (Vigamox)
Tobramycin (AK-Tob, Tobrex)
Bacitracin (Ak-Tracin, Bacticin)

Discussion:

The term "conjunctivitis" relates to the inflammation of the conjunctiva, which can be triggered by several non-infectious factors (like allergies, chemicals, or physical irritants) as well as infectious agents (including bacteria, viruses, or fungi). All age

groups of people are susceptible to bacterial conjunctivitis (BC), a prevalent form of infectious conjunctivitis. The bacterial species that induce the inflammation of the conjunctiva and subsequent development of pus are the cause of the disease. Bacterial infections can result from internal bacterial invasion or external bacterial exposure carried by the bloodstream [17]. Various reports indicate that bacterial infections account for 50 to 75 percent of acute conjunctivitis cases in young children. Additionally, individuals in long-term care facilities and nursing homes are especially at risk for conjunctivitis caused by methicillin-resistant *Staphylococcus aureus* [14]. The bacteria that cause bacterial conjunctivitis typically vary depending on the patient's age.

The most frequent organism that causes conjunctivitis in newborns is *Chlamydia trachomatis*. Chlamydial pneumonitis frequently develops in newborns with chlamydial conjunctivitis. About 50% of these infants will either display conjunctivitis simultaneously or have experienced it shortly before. Other bacterial pathogens that may lead to conjunctivitis in newborns include *Haemophilus influenzae*, *Streptococcus pneumoniae* and *Staphylococcus aureus* [24].

A prospective study carried out in Israel found that *H. influenzae* and *S. pneumoniae* are the most common causes of conjunctivitis in children, responsible for 29% and 20% of cases, respectively, in newborns [6]. *Staphylococcus aureus* and *Haemophilus influenzae* are the most common bacterial agents responsible for conjunctivitis in adults. Conjunctivitis caused by *S. aureus* often recurs and is associated with chronic Blepharoconjunctivitis, characterized by inflammation of the conjunctiva and eyelids. In healthy individuals, *S. aureus* colonizes the conjunctiva in approximately 3.8% to 6.3% of cases [18].

The most common symptoms of eye infections include pinkish eyes, tears, pain and itching. Morphologically and pathologically analyzing the infection is essential to diagnosing the infection and determining the appropriate course of treatment [2]. Eye redness is a common symptom of conjunctivitis and it is also considered as a most common issue in urgent care centers, emergency rooms and health care institutions [9, 22]. It could be acute or chronic [11]. Certain antibiotics, such as levofloxacin, novobiocin, vancomycin, fluoroquinolones, ofloxacin norfloxacin and ciprofloxacin are frequently used to treat bacterial infections that cause conjunctivitis [19].

According to Ung et al., [25] coagulase-negative *Staphylococcus*, *Haemophilus influenzae*, *Streptococcus pneumoniae*, and *Staphylococcus aureus* are the major bacterial infections that cause conjunctivitis.

Cronau et al., [7] also concluded that *S. pneumoniae* and *H. influenzae* are main reasons of eye infections in children whereas *Staphylococcus aureus* is considered as the major problem of infection in adults. The present study aimed to identify the bacterial agents responsible for conjunctivitis in clinical settings across Egypt. The bacteria that were isolated demonstrated resistance to commonly used antibiotics.

Hovding et al., [13] observed that the effects of bacterial associated conjunctivitis is most common in young children than adults. Adults are often affected with *Staphylococcus* species, most commonly followed by *S. aureus*, *S. pneumoniae* and *Haemophilus influenzae*. However, in children, the sickness is more often caused by *H. influenzae*, *S. pneumoniae*.

Medication that is "time-warped" includes antibiotics. They serve only a few distinct functions and are only used for definite purposes [23]. Since antibiotic resistance causes major health problems, it poses a serious danger to public health worldwide and has become alarmingly widespread in recent years [12].

The health of the public is in significant threatened due to the growing bacterial resistance to antimicrobial treatments, so this situation has led to an urgent demand for new antibacterial approaches, which has promoted a reassessment of the

therapeutic potential of traditional remedies [15]. Compared to conventional antibiotics, *Lactobacillus casei* is used as an antibacterial agent against the pathogen *Staphylococcus aureus*, which is linked to conjunctivitis [16].

Identification of pathogenic genes linked to infectious diseases in *Staphylococcus aureus*, a germ linked to antibiotic-resistant conjunctivitis. *Sea* gene is the most pathogenic gene found in *Staphylococcus aureus*, followed by *hla* (37.3%), *icaA* (49.2%) and *fnbA* (13.6%). Among MRSA isolates, *sea* is considered as the commonest virulence gene with the ratio of (72.2%). It will be useful to find out the infection risk factor [14].

Conclusion:

From all of these discussions, it is concluded that there are many causes of bacterial conjunctivitis but most common cause is *Staphylococcus aureus*. Different antibacterial agents such as *Bifidobacterium longum* and *Lactobacillus casei* are considered useful for the treatment of eye infections rather than traditional antibiotics.

Expected Results:

This research work will be helpful for research and planning of control strategies for conjunctivitis bacterial infections.

Novelty and Future Perspective;

In Pakistan, very less research study has been conducted on this issue. Mostly case studies have been done.

To treat the native Pathogenic bacteria, *Bifidobacterium longum* and *Lactobacillus casei* may be considered as potential Antibacterial agent as the miss use and over use of antibiotics is resulting in high antibiotic resistance in bacteria. It will play role in scientific community and help to drive further research and advancements in conjunctivitis.

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