



# TREATMENT AND PREVENTION OF BACTERIAL TRACHEITIS IN CHILDREN

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## ABSTRACT

Bacterial tracheitis is a serious infection of the trachea primarily affecting children. The bacterial infection, which is most often caused by *Staphylococcus aureus*, causes subglottic edema, exudate, mucopurulent secretions, and airway obstruction and often occurs after viral damage to the upper respiratory tract. The exudate may narrow or block the airway, causing reduced oxygenation and a high-pitched, wheezing sound during inhalation. Laboratory tests, such as a complete blood count, show neutrophilic leukocytosis. In severe cases of bacterial tracheitis, the patient may require airway surgery. Treatment includes endotracheal intubation, endoscopic removal of pseudomembranes from the tracheal lumen, and broad-spectrum antibiotic therapy. In regards to antibiotic therapy, the combination of oxacillin and ceftriaxone appears to give satisfactory results. Vaccination against *Haemophilus influenzae* type B and *Streptococcus pneumoniae* helps prevent some of the infections that precede or complicate this bacterial infection. Bacterial tracheitis requires prompt treatment to prevent serious complications that can be life-threatening.

**KEYWORDS:** *Bacterial tracheitis, Staphylococcus aureus, pediatrics, bacteria, pathogen, infection*

## INTRODUCTION

Bacterial tracheitis, which is also known as bacterial laryngotracheobronchitis or pseudomembranous croup, was first described in detail by Jones et al. in 1979 (1). Bacterial tracheitis is a serious infection of the trachea primarily affecting children (2). It is a bacterial infection that causes inflammation which may lead to airway obstruction (3). This is a rare disease with a peak incidence during the fall and winter months that occurs predominantly in children between the ages of six months and eight years with a mean age of 5 years. Bacterial tracheitis is characterized by marked subglottic edema and inflammatory exudate with typical mucopurulent secretions that are responsible for the name "pseudomembranous" (4).

## DISCUSSION

The most common pathogen responsible for bacterial tracheitis is *Staphylococcus aureus*, although many other pathogens have been isolated, including *Haemophilus influenzae*, beta-*Haemolytic streptococcus*, *Pneumococcus*, and *Moraxella catarrhalis* (5). These bacteria colonize damaged tracheal tissue, often following a viral upper respiratory infection, such as influenza or parainfluenza (6). The viral infection damages the tracheal mucosa, making it more susceptible to bacterial invasion (7). Transmission of the infection can be spread through respiratory droplets from coughing or sneezing and secondary bacterial infection can occur after a viral upper respiratory tract infection (8).

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The immune response to the pathogens causes an inflammatory reaction of the tracheal mucosa (9). This causes swelling, redness, and increased mucus production (10). Immune cells such as neutrophils infiltrate the site of infection, mediating the formation of pus, which may combine with mucus and necrotic tissue to form thick, crusted secretions. In bacterial tracheitis, the inflamed mucosa becomes swollen and edematous and produces thick, purulent secretions, which contribute to narrowing of the tracheal lumen (11). The presence of thick exudates and detached tissue can further block the airway, leading to varying degrees of respiratory obstruction (12). As the tracheal lumen narrows, it becomes increasingly difficult for the child to breathe. A high-pitched, wheezing sound is often heard during inhalation, and severe obstruction can lead to inadequate oxygenation with respiratory failure (13).

The clinical presentation of bacterial tracheitis is generally more insidious than that of epiglottitis. The patient initially exhibits symptoms of a viral upper respiratory tract infection with moderate fever, cough, and stridor (14). A period of rapid deterioration follows in which the patient develops a high fever, a toxic appearance, and displays signs of airway obstruction. These patients generally have a somewhat toxic state compared to those with laryngotracheitis, and unlike those with epiglottitis, they have a cough, can lie flat, and do not have sialorrhea.

Laboratory findings suggest a neutrophilic leukocytosis in the complete blood count. Radiographically, bacterial tracheitis may be indistinguishable from laryngotracheitis, as the neck radiograph also shows a narrowing of the subglottic region (15). In some cases, the air passing through the trachea may appear inhomogeneous because of multiple intraluminal irregularities represented by pseudomembranes detaching from the soft tissues. Patients with evidence of severe respiratory distress should be taken to the operating room, as should those with epiglottitis (16). The gold standard for the diagnosis of bacterial tracheitis is the endoscopic finding of subglottic edema with ulceration, erythema, and pseudomembrane formation in the trachea, along with a positive bacterial culture.

Treatment includes endotracheal intubation to ensure a patency of the airway, endoscopic removal of pseudomembranes from the tracheal lumen, and broad-spectrum antibiotic therapy, considering the need for coverage against *Staphylococcus aureus* (17) (Table I). Oxacillin and ceftriaxone are a reasonable initial combination, although definitive antibiotic coverage should be guided by culture results (18). Antibiotic treatment is usually continued for 10 to 14 days, and intubation is usually required for 3 to 7 days (19). The decision to extubate should be based on clinical improvement, as suggested by defervescence decreased airway secretions, and the development of an air leak around the endotracheal tube.

**Table I.** *Diagnosis and Treatment of bacterial tracheitis.*

<i>Diagnosis</i>	Clinical Evaluation:	Based on history, physical examinations, and presenting symptoms.
	Radiography:	Lateral neck X-rays may show subglottic narrowing and irregular tracheal margins.
	Endoscopy:	Direct visualization with bronchoscopy confirms the diagnosis and assesses the severity of the obstruction.
	Microbiological Testing:	Cultures from tracheal secretions or blood can identify the causative organism.
<i>Treatment</i>	Airway Management:	Ensuring a patent airway is critical. This may involve intubation or tracheostomy in severe cases.
	Antibiotics:	Broad-spectrum antibiotics are initiated and later tailored based on culture results.
	Supportive Care:	Oxygen therapy, fluid management, and other supportive measures as needed.

Prevention includes vaccination with vaccines against *Haemophilus influenzae* type B and *Streptococcus pneumoniae*, which can help prevent some of the infections that precede or complicate bacterial tracheitis (20). Practicing good personal hygiene and avoiding close contact with infected individuals can reduce the risk of transmission.

## CONCLUSIONS

Bacterial tracheitis is an infection of the trachea that primarily affects children between the ages of 3 to 8. It is a medical emergency that can develop as a complication of a viral upper respiratory infection, such as influenza or the common cold, and requires immediate treatment to prevent more serious complications that can be life-threatening. Prompt recognition and treatment of bacterial tracheitis are crucial to prevent serious complications, and empiric intravenous antibiotic therapy should be started as soon as possible.

*Conflict of interest*

The author declares that they have no conflict of interest.

**REFERENCES**

1. Jones R. Bacterial Tracheitis. *JAMA: The Journal of the American Medical Association*. 1979;242(8):721. doi:<https://doi.org/10.1001/jama.1979.03300080019018>
2. Kuo CY, Parikh SR. Bacterial Tracheitis. *Pediatrics in Review*. 2014;35(11):497-499. doi:<https://doi.org/10.1542/pir.35-11-497>
3. Nseir S, Ader F, Marquette CH. Nosocomial tracheobronchitis. *Current Opinion in Infectious Diseases*. 2009;22(2):148-153. doi:<https://doi.org/10.1097/qco.0b013e3283229fdb>
4. Liston SL, Gehrz RC, Jarvis CW. Bacterial Tracheitis. *Archives of Otolaryngology - Head and Neck Surgery*. 1981;107(9):561-564. doi:<https://doi.org/10.1001/archotol.1981.00790450037012>
5. Casazza G, Graham ME, Nelson D, Chaulk D, Sandweiss D, Meier J. Pediatric Bacterial Tracheitis—A Variable Entity: Case Series with Literature Review. *Otolaryngology–Head and Neck Surgery*. 2018;160(3):546-549. doi:<https://doi.org/10.1177/0194599818808774>
6. Kuiken T, Taubenberger JK. Pathology of human influenza revisited. *Vaccine*. 2008;26:D59-D66. doi:<https://doi.org/10.1016/j.vaccine.2008.07.025>
7. Tebruegge M, Pantazidou A, Thorburn K, et al. Bacterial tracheitis: A multi-centre perspective. *Scandinavian journal of infectious diseases*. 2009;41(8):548-557. doi:<https://doi.org/10.1080/00365540902913478>
8. Catania S, Gobbo F, Ramirez AS, et al. Laboratory investigations into the origin of Mycoplasma synoviae isolated from a lesser flamingo (Phoeniconaias minor). *BMC Veterinary Research*. 2016;12(1). doi:<https://doi.org/10.1186/s12917-016-0680-1>
9. Weerts EAWS, Matthijs MGR, Bonhof J, et al. The contribution of the immune response to enhanced colibacillosis upon preceding viral respiratory infection in broiler chicken in a dual infection model. *Veterinary Immunology and Immunopathology*. 2021;238:110276-110276. doi:<https://doi.org/10.1016/j.vetimm.2021.110276>
10. Kitano M, Ishinaga H, Shimizu T, Takeuchi K, Majima Y. Effects of Clarithromycin and Dexamethasone on Mucus Production in Isografted Rat Trachea. *Pharmacology*. 2011;87(1-2):56-62. doi:<https://doi.org/10.1159/000322837>
11. Miranda AD, Valdez TA, Pereira KD. Bacterial Tracheitis. *Pediatric Emergency Care*. 2011;27(10):950-953. doi:<https://doi.org/10.1097/pec.0b013e3182309d45>
12. Lacasse C, Gamble KC. Tracheitis associated with bordetella bronchiseptica in a polar bear (ursus maritimus). *Journal of Zoo and Wildlife Medicine*. 2006;37(2):190-192. doi:<https://doi.org/10.1638/05-055.1>
13. Sasidaran K, Bansal A, Singhi S. Acute Upper Airway Obstruction. *The Indian Journal of Pediatrics*. 2011;78(10):1256-1261. doi:<https://doi.org/10.1007/s12098-011-0414-0>
14. Riedler J. Respiratorische Notfälle im Kindes- und Jugendalter. *Monatsschrift Kinderheilkunde*. 2011;159(10):938-947. doi:<https://doi.org/10.1007/s00112-011-2420-8>
15. Somenek M, Le M, Walner DL. Membranous laryngitis in a child. *International Journal of Pediatric Otorhinolaryngology*. 2010;74(6):704-706. doi:<https://doi.org/10.1016/j.ijporl.2010.03.020>
16. Liston SL. Bacterial Tracheitis. *Archives of Pediatrics & Adolescent Medicine*. 1983;137(8):764. doi:<https://doi.org/10.1001/archpedi.1983.02140340044012>
17. Friedman EM, Jorgensen K, McGill TJI, Healy GB. Bacterial Tracheitis - Two-year Experience. *The Laryngoscope*. 1985;95(1):97-111. doi:<https://doi.org/10.1288/00005537-198501000-00005>
18. Graf J, Stein F. Tracheitis in Pediatric Patients. *Seminars in Pediatric Infectious Diseases*. 2006;17(1):11-13. doi:<https://doi.org/10.1053/j.spid.2005.11.004>
19. Craven DE, Hudcova J, Craven KA, Scopa C, Lei Y. Antibiotic treatment of ventilator-associated tracheobronchitis. *Current Opinion in Critical Care*. 2014;20(5):532-541. doi:<https://doi.org/10.1097/mcc.0000000000000130>
20. Noormohammadi AH, Whithear KG. Comparison of the short-term and long-term efficacies of the *Mycoplasma gallisepticum* vaccines ts-11 and 6/85. *Avian Pathology*. 2019;48(3):238-244. doi:<https://doi.org/10.1080/03079457.2019.1572103>