

A 5-year-old boy is brought to the emergency department for a worsening cough. Two weeks ago, he developed rhinorrhea, congestion, and a mild cough. Since then, the cough has worsened to the point that he often vomits after coughing. The cough is worse at night, during exercise, and with showering. He has taken over-the-counter antitussive medications with no relief. The boy is on a delayed immunization schedule per parental preference and has received the measles-mumps-rubella vaccination. His temperature is 37.2 C (99 F), blood pressure is 90/60 mm Hg, pulse is 98/min, and respirations are 20/min. Pulse oximetry shows an oxygen saturation of 98%. Physical examination shows an alert and well-appearing child. He has bilateral subconjunctival hemorrhages and periorbital petechiae. The lungs are clear to auscultation. Which organism is the most likely cause of this child's illness?

- ☐ A. Adenovirus
- ☐ B. *Bordetella pertussis*
- ☐ C. *Chlamydophila pneumoniae*
- ☐ D. *Mycobacterium tuberculosis*
- ☐ E. *Mycoplasma pneumoniae*
- ☐ F. Nontypeable *Haemophilus influenzae*
- ☐ G. Parainfluenza virus
- ☐ H. Respiratory syncytial virus
- ☐ I. *Streptococcus pneumoniae*

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- ☐ A. Adenovirus [6%]
- ☒ B. *Bordetella pertussis* [79%]
- ☐ C. *Chlamydomphila pneumoniae* [1%]
- ☐ D. *Mycobacterium tuberculosis* [0%]
- ☐ E. *Mycoplasma pneumoniae* [1%]
- ☐ F. Nontypeable *Haemophilus influenzae* [3%]
- ☐ G. Parainfluenza virus [3%]
- ☐ H. Respiratory syncytial virus [4%]
- ☐ I. *Streptococcus pneumoniae* [1%]

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Explanation:

User Id: [REDACTED]

Pertussis	
Clinical phases*	<ul style="list-style-type: none">• Catarrhal (1-2 weeks): Mild cough, rhinitis• Paroxysmal (2-6 weeks): Cough with inspiratory "whoop," posttussive emesis• Convalescent (weeks to months): Symptoms resolve gradually

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Diagnosis	<ul style="list-style-type: none">• Pertussis culture or PCR• Lymphocyte-predominant leukocytosis
Treatment	<ul style="list-style-type: none">• Macrolides
Prevention	<ul style="list-style-type: none">• Acellular pertussis vaccine

*Infants may present with apnea.

PCR = polymerase chain reaction.

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Bordetella pertussis is a Gram-negative coccobacillus that causes "whooping cough" ("100-day cough"), a highly contagious illnesses characterized by paroxysms of coughing. The illness begins with a mild catarrhal phase that resembles the common cold. This is followed by the paroxysmal phase in which severe, periodic coughing bouts can last up to 30 minutes. Each coughing episode often starts with a "whoop" caused by forced inspiration. Forceful coughing often triggers posttussive emesis, which may result in weight loss. Symptoms tend to worsen at night or with laughing, exercise, or exposure to steam or smoke. Patients can appear remarkably well between coughing spells. Infants **age <6 months** are at substantial risk for life-threatening **apnea** and death.

Initial laboratory and x-ray findings may be normal, but patients can develop marked **lymphocytosis**. **Macrolides** reduce symptom severity and contagiousness and are the first-line treatment. Over-the-counter antitussive medications should be avoided due to lack of proven efficacy and risk of toxicity, especially in children age <6 years.

(Choice A) Adenovirus is a common upper respiratory infection in children and is often accompanied by fever, pharyngitis, rhinitis, conjunctivitis, and diarrhea. Coughing paroxysms and posttussive emesis are not typically seen.

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(Choices C and E) *Chlamydomphila pneumoniae* and *Mycoplasma pneumoniae* cause atypical pneumonias, which present with a gradual onset of symptoms, mild cough, and low-grade fevers.

(Choice D) *Mycobacterium tuberculosis* causes tuberculosis, a serious illness that presents with prolonged fever, night sweats, chronic cough, and weight loss. This child does not have systemic symptoms.

(Choice F) Nontypeable *Haemophilus influenzae* is a common cause of community-acquired pneumonia. *H influenzae* does not cause paroxysmal coughing.

(Choice G) Parainfluenza is a very common cause of laryngotracheobronchitis (croup) in children. Croup presents with fever, a "barky" cough, and inspiratory stridor, none of which are present in this patient.

(Choice H) Respiratory syncytial virus is the most common cause of bronchiolitis in children age <2 years. It presents with fever, rhinorrhea, cough, and mild respiratory distress.

(Choice I) *Streptococcus pneumoniae* is the most common cause of community-acquired pneumonia in children and presents with fever, cough, and tachypnea. Paroxysms of coughing are typically not seen.

Educational objective:

Bordetella pertussis causes "whooping cough," which has 3 phases: catarrhal, paroxysmal, and convalescent. The paroxysmal phase is characterized by severe paroxysms of coughing and posttussive emesis. Macrolide antibiotics are the first-line treatment.

References:

1. Clinical presentation of pertussis in unvaccinated and vaccinated children in the first six years of life.
2. Whooping cough in school age children with persistent cough: prospective cohort study in primary care.
3. Recommended antimicrobial agents for the treatment and postexposure prophylaxis of pertussis: 2005 CDC guidelines.