

# PRACTICE ALERT

Public health issues influencing your practice

## Pertussis: A disease re-emerges

**T**he incidence of pertussis in the United States<sup>1</sup> declined dramatically after the introduction of pertussis vaccine in the 1940s. Before that, an average of 160,000 cases of pertussis (150/100,000 population) occurred each year, resulting in 5000 deaths. **FIGURE 1** shows how pertussis incidence declined steadily through 3 decades to reach a low of 1010 cases in 1976.

While other vaccine-preventable diseases such as polio, measles, rubella, diphtheria, and tetanus have been eradicated or have declined to only a few cases each year, pertussis has made a slight comeback. The number of cases began increasing in the 1980s and reached a level of 7000 to 8000 cases annually between 1996 and 2000 (see insert in **FIGURE 1**). There were 11,647 cases in 2003.

While these numbers are small compared with all cases that occurred in the prevaccine era, the increase is cause for public health concern.

### ■ Unique features of this rebound

The recent rise of pertussis displays several notable trends:

- Disease incidence now ebbs and flows in 3- to 4-year cycles
- The proportion of cases occurring among adolescents and young adults has increased. **TABLE 1** shows the age breakdown of reported pertussis cases for 2001. Infants still account for the highest proportion of cases (29%) and the high-

est attack rates (55 cases per 100,000); but half of reported cases now appear in those age 10 years and older

- Nonimmunized or incompletely immunized infants are usually exposed to the disease by older household members, and not by same-age cohorts
- Since the disease presents as nonspecific cough in adolescents, it is often not diagnosed. The incidence is probably much higher than the reported number of cases would indicate.

### ■ Why the increase in cases?

Several possible causes could account for the increased incidence in reported pertussis. For one, the efficacy of the vaccine wanes with time after vaccination. Adolescents and young adults are left susceptible because, until recently, no vaccine has been available for persons after their 7th birthday. This, however, has been true for decades and does not explain recent increases.

The *Bordetella pertussis* bacteria may have genetically drifted to become less susceptible to vaccine-induced antibodies, or the apparent increase in cases could actually be just an increase in case detection.

It is also possible that the recent emphasis on avoiding unnecessary antibiotic use for respiratory infections has had the unanticipated consequence of decreasing previously fortuitous treatment of undiagnosed pertussis among older age groups.

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**TABLE 1**

**Pertussis-related hospitalizations, complications, and deaths, by age group—United States, 1997–2000**

AGE GROUP	NO. WITH PERTUSSIS	HOSITALIZED NO. (%)	COMPLICATIONS			DEATHS NO. (%)
			PNEUMONIA* NO. (%)	SEIZURES NO. (%)	ENCEPHALOPHTHY NO. (%)	
< 6 mo	7203	4543 (63.1)	847 (11.8)	103 (1.4)	15 (0.2)	56 (0.8)
6–11 mo	1073	301 (28.1)	92 (8.6)	7 (0.7)	1 (0.1)	1 (0.1)
1–4 years	3137	324 (10.3)	168 (5.4)	36 (1.2)	3 (0.1)	1 (<0.1)
5–9 years	2756	86 (3.1)	68 (2.5)	13 (0.5)	0	2 (0.1)
10–19 years	8273	174 (2.1)	155 (1.9)	25 (0.3)	4 (0.1)	0
≥20 years	5745	202 (3.5)	147 (2.6)	32 (0.6)	3 (0.1)	2 (<0.1)
<b>Total</b>	<b>28,187†</b>	<b>5630 (20.0)</b>	<b>1477 (5.2)</b>	<b>216‡ (0.8)</b>	<b>26 (0.1)</b>	<b>62 (0.2)</b>

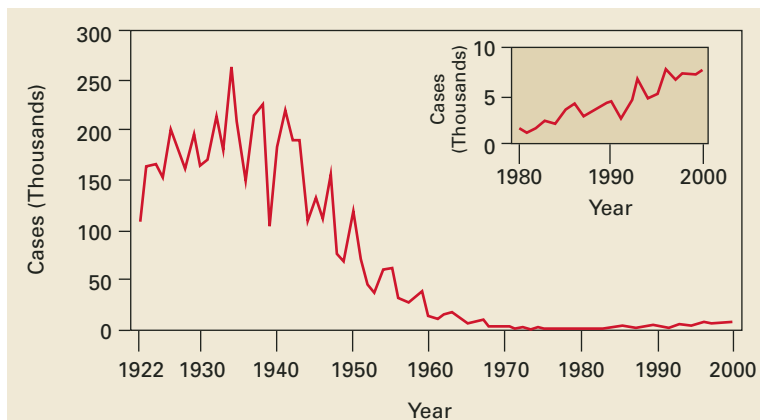
\*Radiographically confirmed.

†Excludes 92 (0.3%) persons of unknown age with pertussis.

‡Excludes one person of unknown age with seizures.

Source: Pertussis—United States, 1997–2000. *MMWR Morb Mortal Wkly Rpt* 2002; 51:73–76.

**FIGURE 1** Number of reported pertussis cases, by year—1922–2000



Source: Pertussis—United States, 1997–2000. *MMWR Morb Mortal Wkly Rpt* 2002; 51:73–76.

to 18 years, and ADACEL (Sanofi Pasteur) is for those aged 11 to 64 years.

The Advisory Committee on Immunization Practice of the Centers for Disease Control and Prevention (CDC) has recommended Tdap for universal use among adolescents aged 11 to 12 years, and may in the future recommend its use periodically for all adults.

**■ Rethink your approach to older patients**

Clinical presentation of pertussis in an adolescent and adult is nonspecific. After an incubation period of 1 to 3 weeks, pertussis infection appears as a mild respiratory infection or the common cold.

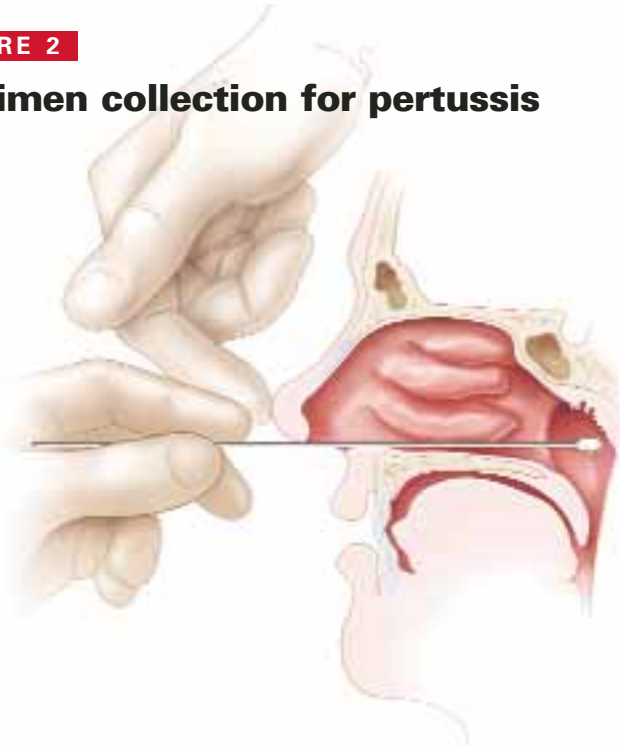
After 1 to 2 weeks, the nonproductive cough can evolve into paroxysms of severe coughing (causing apnea), a post-tussive inspiratory whoop, and vomiting. The inspiratory whoop and apnea are usually absent in previously immunized adults and adolescents. The cough gradually diminishes but can persist for up to 3 months.

**■ New tool in fight against pertussis now available**

Two products with tetanus toxoid—reduced diphtheria toxoid and acellular pertussis vaccines adsorbed (Tdap)—have been licensed for active booster immunization against tetanus, diphtheria, and pertussis as a single dose. BOOSTRIX (GlaxoSmithKline) is for persons aged 10

FIGURE 2

## Specimen collection for pertussis



To collect a *Bordella pertussis* specimen, a nasopharyngeal swab should be performed in both nares. Insert the swab gently through the nostril toward the posterior nasopharynx; leave it there 15 to 30 seconds, then rotate it and remove. The sample should be put in an appropriate transport medium or immediately onto agar. (Choose shipping conditions based on how long the sample will be in transit; the laboratory will provide specific swab and transport medium requirements). Cotton swabs are not recommended because cotton is harmful to *B pertussis*. Cultures are usually incubated 10 to 14 days, but results are often available in 7 to 10 days.

ILLUSTRATION BY: RICH LaROCCO

*Suspect pertussis in any adolescent or adult who has had a cough for 2 weeks or longer, even if the paroxysms and posttussive symptoms are absent.*

Infants exhibit more severe symptoms and suffer higher rates of complications, including severe apnea, hospitalization, seizures, secondary pneumonia, and death (TABLE 1).

### ■ Required laboratory confirmation

For any patient with suspected pertussis, obtain an aspirate of the posterior nasopharyngeal region or swab it for culture. The specimen can be collected by inserting a Dacron nasopharyngeal swab into the nostril to reach the posterior nares and leaving it in place for 10 seconds (FIGURE 2). If the specimen cannot be streaked onto a special enriched culture medium, place it in a special transport medium and refrigerate it until sent to the laboratory. Local or state health departments can often assist with obtaining the transport medium.

Polymerase chain reaction can be used

to make a presumptive diagnosis but should be followed by culture confirmation. Direct fluorescent antibody testing of nasopharyngeal specimens and serologic testing for antibodies are not currently recommended as diagnostic tests by the CDC.

### ■ Four antibiotics available for treatment of pertussis

The CDC's recommended medications, doses, and duration of treatment are listed in TABLE 2.

Treatment, if started within the first 2 to 3 weeks, can reduce symptoms and clear *B pertussis* from the nasopharynx, thus reducing transmission to others. The CDC recommends initiating treatment as soon as pertussis is suspected.

Erythromycin is the agent with the longest history of use and most evidence for effectiveness. Due to its duration of therapy, however, and to the incidence of gastrointestinal side effects, it is less attractive to patients and physicians than other options.

New outcome studies of other macrolides are promising. Most authorities believe azithromycin and clarithromycin

### FAST TRACK

**Suspect pertussis in anyone who has had a cough for 2 weeks or longer, even without paroxysms and posttussive symptoms**

**TABLE 2**

**Antibiotic treatment and chemoprophylaxis for pertussis**

AGE	AZITHROMYCIN (5-DAY COURSE)	ERYTHROMYCIN (14-DAY COURSE)	CLARITHROMYCIN (7-DAY COURSE)
<1 month	Recommended in this age group. 10 mg/kg/d in a single dose for 5 days	Not preferred due to association with pyloric stenosis. If used dose is 40–50 mg/kg/d divided in 4 doses for 14 days	Not recommended
1–5 months	10 mg/kg/d in a single dose for 5 days	40–50 mg/kg/day divided in 4 doses for 14 days	15 mg/kg/d in 2 divided doses (maximum 500 mg/dose for 7 days)
≥6 months	10 mg/kg/d in a single dose on day 1 then 5 mg/kg/d on days 2–5	40–50 mg/kg/d divided in 4 doses for 14 days	15 mg/kg/d in 2 divided doses (maximum 500 mg/dose for 7 days)
Adults	500 mg single dose on day 1 then 250 mg on days 2–5	2 g/d in 4 divided doses for 14 days	500 mg twice a day for 7 days

**FAST TRACK**

**If started within the first 2 to 3 weeks, treatment can reduce symptoms and help prevent transmission to others**

are acceptable alternatives and should achieve the same results as erythromycin.

Trimethoprim-sulfamethoxazole can be used for those older than 2 months, for those allergic to, or intolerant of, macrolides. The dose for children is 8 mg/40 mg per day in 2 divided doses for 14 days; for adults it is 320 mg/1200 mg per day in 2 divided doses for 14 days.

**■ Preventing infection in family members and close contacts**

Those with pertussis are most infectious in the first 3 weeks of symptoms. The CDC recommends initiating chemoprophylaxis for all household and close contacts of those in whom pertussis is highly suspected or confirmed, regardless of the contacts' age and vaccination status.

Close contacts are those with direct face-to-face contact with a symptomatic patient, or those who share a confined space for a prolonged period with the patient. Chemoprophylaxis is especially important for high-risk contacts: those under 1 year of age and those with chronic conditions that make them susceptible to complications from pertussis (eg, immune deficiencies,

chronic lung disease, or cystic fibrosis).

Chemoprophylaxis has limited benefit if started beyond 3 weeks after exposure. The same antibiotics, doses, and treatment durations are recommended for chemoprophylaxis as for treatment.

Completion of a 4-dose series of pertussis-containing vaccine is also recommended for close contacts. This recommendation has historically pertained only to those before their seventh birthday. With the licensure of Tdap for adolescents and adults, this recommendation may soon include contacts through age 18 and could be expanded to include adults through age 64 in the near future.

**■ Preventing the spread of pertussis in your community**

Schools, day care centers, and health care facilities are all potential foci of spread of infection. During outbreaks the local public health department may implement guidelines at schools and day care centers that refer symptomatic staff and students to a physician for evaluation.

If you examine such a patient, perform a nasopharyngeal culture and initiate

treatment for those who are symptomatic and for all high-risk contacts. Symptomatic persons should not attend school until either pertussis is ruled out or they have completed 5 days of antibiotic therapy, regardless of their vaccination history. If they refuse treatment, they should be barred from attending school for 21 days from onset of cough.

In health care settings, staff should receive chemoprophylaxis if they have had close exposure to a person with confirmed pertussis, or have had contact with nasal, respiratory, or oral secretions of such a person. Staff members who refuse chemoprophylaxis should be closely observed for symptoms of pertussis; if they become symptomatic, they should be treated and allowed to return to work after 5 days of treatment.

### ■ Take-home message

Awareness of local infectious disease epidemiology and knowing when pertussis is circulating and increasing will ensure that you serve the most valuable public health role possible.

Consider pertussis when an adolescent or adult has had a cough for 2 weeks or longer, and collect nasopharyngeal specimens for culture on all patients with suspected pertussis.

Initiate treatment when pertussis is suspected, report suspected and confirmed pertussis to the local public health department, and begin chemoprophylaxis for family members and contacts as indicated.

Implement systems that insure all patients are vaccinated according to CDC recommendations. Institute policies and procedures to insure that respiratory hygiene is practiced in the clinic waiting areas and that staff practice infectious disease precautions and are managed appropriately if they are exposed.

Finally, collaborate with schools and local public health departments to evaluate symptomatic close contacts from schools and day care centers with outbreaks. This includes taking nasopharyngeal specimens

**TABLE 3**

### Important public health functions for physicians in control of pertussis

Be aware of the local infectious disease epidemiology and know when pertussis is circulating and increasing.

Think of the potential for pertussis in adults with a cough of two weeks duration or greater.

Collect nasopharyngeal specimens for culture on all patients with suspected pertussis.

Begin treatment when pertussis is suspected.

Report suspect and confirmed pertussis to the local public health department.

When pertussis is highly suspected or confirmed, begin chemoprophylaxis for family members.

Insure that respiratory hygiene is practiced in the clinic waiting areas.

Implement systems to insure that all patients are vaccinated according to CDC recommendations.

Insure that all clinic staff who have been exposed are given chemoprophylaxis and that symptomatic staff are excluded from work until after 5 days of treatment or until 21 days after cough onset if treatment is refused.

Collaborate with schools and local public health departments to evaluate symptomatic close contacts from schools and day care centers with outbreaks. This includes taking nasopharyngeal specimens for culture and initiating treatment if pertussis is suspected.

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Some of these procedures may become unnecessary in the future if the new pertussis vaccine products for adolescents and adults are successful in turning pertussis into another member of an expanding list of rarely encountered, vaccine-preventable diseases. ■

### FAST TRACK

**Report any suspected cases to the local public health department; begin prophylaxis for family members and all close contacts**