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Patient information: Ear infections (otitis media) in children (Beyond the Basics)

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INTRODUCTION — Ear infections, also called otitis media, are a common problem in children. About 50 percent of infants have at least one ear infection by their first birthday. Ear infections can cause pain in the ear, fever, and temporary hearing loss and general signs such as loss of appetite and irritability. Some children get better without specific antibiotic treatment but most young infants benefit from use of an antimicrobial agent.

This topic will review the definition, causes, symptoms, diagnosis, treatment, and potential complications of ear infections in infants and children.

More detailed information about ear infections is available by subscription. (See "[Acute otitis media in children: Treatment](#)".)

WHAT IS AN EAR INFECTION? — Ear infection is also known as acute otitis media (otitis = ear, media = middle). Otitis media is an infection of the middle section of the ear.

Ear infections most often develop after a viral respiratory tract infection, such as a cold or the flu. These infections can cause swelling of the mucous membranes of the nose and throat, and diminish normal host defenses such as clearance of bacteria from the nose, increasing the amount of bacteria in the nose. Viral respiratory tract infections also can impair Eustachian tube function. Normal Eustachian tube function is important for maintaining normal pressure in the ear. Impaired Eustachian tube function changes the pressure in the middle ear (like when you are flying in an airplane). Fluid (called an effusion) may form in the middle ear and bacteria and viruses follow, resulting in inflammation in the middle ear ([figure 1](#)). The increased pressure causes the eardrum to bulge, leading to the typical symptoms of fever, pain, and fussiness in young children. (See '[Ear infection symptoms](#)' below.)

EAR INFECTION SYMPTOMS — Symptoms of an ear infection in adolescents and older children may include ear aching or pain and temporary hearing loss. These symptoms usually come on suddenly.

In infants and young children, symptoms of an ear infection can include:

- Fever (temperature higher than 100.4°F or 38°C, see the Table for how to measure a child's temperature) ([table 1](#))
- Pulling on the ear
- Fussiness or irritability

- Decreased activity
- Lack of appetite or difficulty eating
- Vomiting or diarrhea

EAR INFECTION DIAGNOSIS — If you suspect that your child has an ear infection, call your doctor or nurse to see if and when the child should be examined.

Although the exam is not painful, most infants and children do not like having their ears examined. To make the process easier, hold your child in your lap and hug your child's arms and body while the doctor or nurse uses an instrument (otoscope) to look inside the child's ear. Often cerumen (ear wax) will need to be removed so your doctor or nurse can get a good view of the ear drum.

The doctor or nurse can tell if your child has an ear infection by looking at the ear drum (tympanic membrane) for the typical features of an ear infection.

EAR INFECTION TREATMENT — Treatment of an ear infection may include:

- Antibiotics
- Medicines to treat pain and fever
- Observation
- A combination of the above

The "best" treatment depends on the child's age, history of previous infections, degree of illness, and any underlying medical problems.

Antibiotics — Antibiotics are usually given to infants who are younger than 24 months or who have high fever or infection in both ears. Children who are older than 24 months and have mild symptoms may be treated with an antibiotic or observed to see if they improve without antibiotics. (See '[Observation](#)' below.)

Antibiotics can have side effects such as diarrhea and rash, and overusing antibiotics can lead to more difficult to treat (resistant) bacteria. Resistance means that a particular antibiotic no longer works or that higher doses are needed next time.

Observation — In some cases, your child's doctor or nurse will recommend that you watch your child at home before starting antibiotics; this is called observation. Observation can help to determine whether antibiotics are needed.

Observation may be recommended in these situations:

- If the child is older than 24 months
- If ear pain and fever are not severe
- If the child is otherwise healthy

You can give pain-relieving medicines during observation to ease pain. (See '[Pain management](#)' below.)

If your child is being observed rather than treated with antibiotics, you will need to call or go back to the doctor or nurse's office after 24 hours for follow-up. If your child's pain or fever continues or worsens, antibiotics are usually recommended; observation may continue if the child is improving.

Pain management — Pain-relieving medicines, including [ibuprofen](#) (sample brand name: Motrin), [acetaminophen](#) (sample brand name: Tylenol), or ear drops (sample brand name: Auralgan) that contain a numbing medicine, may be used to reduce discomfort.

Complementary and alternative medical treatments — There are a wide variety of complementary and alternative medical (CAM) treatments advertised to treat ear infections. These may include homeopathic, naturopathic, chiropractic, and acupuncture treatments.

There are few scientific studies of CAM treatments for ear infection, and even fewer studies that show CAM treatments to be effective. As a result, these treatments are not recommended for ear infections in children.

Decongestants and antihistamines — Cough and cold medicines (which usually include a decongestant or antihistamine) have not been proven to speed healing or reduce complications of ear infections in children. In addition, these treatments have side effects that can be dangerous. Neither decongestants nor antihistamines are recommended for children with ear infections.

Follow-up — Your child's symptoms should improve within 24 to 48 hours whether or not antibiotics were prescribed. If your child does not improve after 48 hours or gets worse, call your doctor or nurse for advice. Although fever and discomfort may continue even after starting antibiotics, the child should get a little better every day. If your child appears more ill than when seen by his or her health care provider, contact the provider as soon as possible.

Children who are younger than two years and those who have language or learning problems should have a follow-up ear exam two to three months after being treated for an ear infection. These children are at risk for delays in learning to speak. This follow-up helps to ensure that the fluid collection (which can affect hearing) has resolved. (See ['Ear infection complications'](#) below.)

EAR INFECTION COMPLICATIONS

Tympanic membrane rupture — One of the common complications of an ear infection is rupture of the ear drum, also known as the tympanic membrane. The tympanic membrane can rupture when fluid presses on the membrane, reducing blood flow and causing the tissue to weaken. It does not hurt when the membrane ruptures, and many children actually feel better because pressure is released. Fortunately, the tympanic membrane usually heals quickly after rupturing, within hours to days. Rupture of the ear drum is an indication for antibiotic treatment of an ear infection.

Hearing loss — The fluid that collects behind the eardrum (called an effusion) can persist for weeks to months after the pain of an ear infection resolves. An effusion causes trouble hearing, which is usually temporary. If the fluid persists, however, it can interfere with the process of learning to speak. (See ["Otitis media with effusion \(serous otitis media\) in children: Clinical features and diagnosis"](#) and ["Otitis media with effusion \(serous otitis media\) in children: Management"](#).)

Effusions usually resolve without any treatment. However, if the effusion persists for more than three months, the child may need treatment with a surgical procedure. The decision to treat is based upon how much the effusion affects the child's hearing and the child's risk of speech problems.

Children who are not treated for an effusion should be monitored over time. This includes an ear exam and hearing testing every three to six months until the effusion goes away.

EAR INFECTION PREVENTION — Some children develop ear infections frequently. Recurrent ear infections are defined as three or more infections in six months, or four or more infections within 12 months. In addition to receiving the pneumococcal and influenza vaccines, as recommended for all children, several interventions can help reduce the risk of recurrent infections. These include avoidance of tobacco smoke, breastfeeding, continuous low dose antibiotics, and/or surgical placement of tubes in the ears. (See ["Acute otitis media in children: Prevention of recurrence"](#) and ["Patient information:](#)

[Vaccines for infants and children age 0 to 6 years \(Beyond the Basics\)".](#))

Preventive antibiotics — Children who have recurrent ear infections are sometimes treated with a preventive regimen of a daily antibiotic during the fall, winter, and early spring months. Although preventive antibiotics might help reduce the number of ear infections, it is still possible for the child to get an infection. There is also a risk that taking antibiotics for a long period of time can lead to bacteria that are resistant to standard antibiotics. Talk to your child's doctor or nurse about the potential benefits and risks of this approach.

Surgery — Some studies show that having surgery to place tympanostomy tubes in the ears helps to prevent recurrent ear infections. Other studies show no benefit of tympanostomy tubes for prevention of recurrences ([figure 2](#)). Talk to your child's doctor about the risks and benefits of surgery.

WHERE TO GET MORE INFORMATION — Your child's healthcare provider is the best source of information for questions and concerns related to your child's medical problem.

This article will be updated as needed on our web site (www.uptodate.com/patients). Related topics for patients, as well as selected articles written for healthcare professionals, are also available. Some of the most relevant are listed below.

Patient level information — UpToDate offers two types of patient education materials.

The Basics — The Basics patient education pieces answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials.

[Patient information: Ear infections \(otitis media\) \(The Basics\)](#)

[Patient information: Outer ear infection \(The Basics\)](#)

[Patient information: Eustachian tube problems \(The Basics\)](#)

[Patient information: Ear wax impaction \(The Basics\)](#)

[Patient information: Ruptured eardrum \(The Basics\)](#)

[Patient information: Ear tubes \(The Basics\)](#)

[Patient information: Secondhand smoke: Risks to children \(The Basics\)](#)

[Patient information: Tonsillectomy and adenoidectomy in children \(The Basics\)](#)

Beyond the Basics — Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed. These articles are best for patients who want in-depth information and are comfortable with some medical jargon.

[Patient information: Vaccines for infants and children age 0 to 6 years \(Beyond the Basics\)](#)

Professional level information — Professional level articles are designed to keep doctors and other health professionals up-to-date on the latest medical findings. These articles are thorough, long, and complex, and they contain multiple references to the research on which they are based. Professional level articles are best for people who are comfortable with a lot of medical terminology and who want to read the same materials their doctors are reading.

[Acute otitis media in children: Diagnosis](#)

[Acute otitis media in children: Epidemiology, microbiology, clinical manifestations, and complications](#)

[Acute otitis media in children: Prevention of recurrence](#)

[Acute otitis media in children: Treatment](#)

[Hearing impairment in children: Etiology](#)

[Otitis media with effusion \(serous otitis media\) in children: Clinical features and diagnosis](#)

[Tympanostomy tube otorrhea in children: Causes, prevention, and management](#)

[Otitis media with effusion \(serous otitis media\) in children: Management](#)

The following organizations also provide reliable health information.

- National Library of Medicine

(www.nlm.nih.gov/medlineplus/earinfections.html)

- The Nemours Foundation

(http://kidshealth.org/parent/infections/ear/otitis_media.html)

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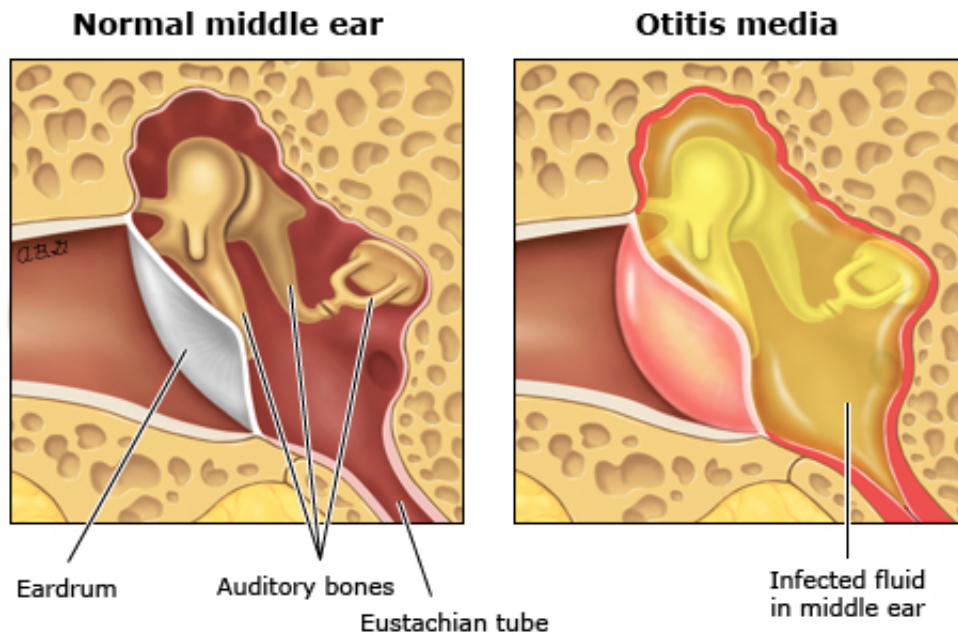
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GRAPHICS

Ear infection (otitis media)



The ear on the left is normal and does not have an infection. The ear on the right shows what an infection can look like. The infected fluid in the middle ear causes the eardrum to bulge. Normally, fluid in the middle ear drains into the throat through a tube called the "eustachian tube." But during an infection, swelling blocks off the tube, so fluid builds up.

Graphic 54739 Version 7.0

Frequently asked questions about fever in children

What is a fever?

The definition of fever depends upon the site where it is measured:

- Rectal temperature above 100.4°F (38°C)
- Oral temperature above 100°F (37.8°C)
- Axillary (armpit) temperature above 99°F (37.2°C)
- Ear temperature above 100.4°F (38°C) in rectal mode or 99.5°F (37.5°C) in oral mode
- Forehead temperature above 100.4°F (38°C)

How do I measure my child's temperature?

The best method to measure temperature depends upon several factors. In all cases, rectal temperatures are the most accurate. However, measurements of temperature in the mouth (for children older than 4 or 5 years) is accurate when done properly. Temperatures measured in the armpit, in the ear, and on the forehead are least accurate, but may be useful as a first test.

Glass thermometers are not recommended due to the potential risks of exposure to mercury, which is toxic. If another (digital) thermometer is not available, be sure to carefully "shake down" the glass thermometer before use. Instructions for disposing of glass thermometers are available online (www.epa.gov/mercury/spills/index.htm).

Measuring a rectal temperature

The child or infant should lie down on his or her stomach across an adult's lap.

Apply a small amount of petroleum jelly (sample brand name: Vaseline®) to the end of the thermometer.

Gently insert the thermometer into the child's anus. The silver tip of the thermometer should be 1/4 to 1/2 inch inside the rectum.

Hold the thermometer in place. A glass thermometer requires 2 minutes, while most digital thermometers need less than 1 minute.

Measuring an oral temperature

Clean the thermometer with cool water and soap. Rinse with water.

Do not measure the temperature in a child's mouth if he or she has consumed a hot or cold food or drink in the last 30 minutes.

Place the tip of the thermometer under the child's tongue toward the back. Ask the child to hold the thermometer with his or her lips.

Keep the lips sealed around the thermometer. A glass thermometer requires about 3 minutes, while most digital thermometers need less than 1 minute.

Measuring an armpit temperature

Place the tip of the thermometer in the child's dry armpit.

Hold the thermometer in place by holding the child's elbow against the chest for 4 to 5 minutes.

Measuring an ear temperature

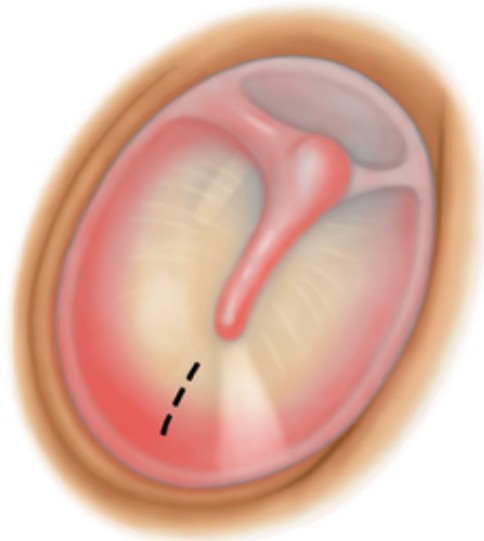
To measure temperature in the ear, the parent must pull the child's outer ear backward before inserting the thermometer.

The ear probe is held in the child's ear for about 2 seconds.

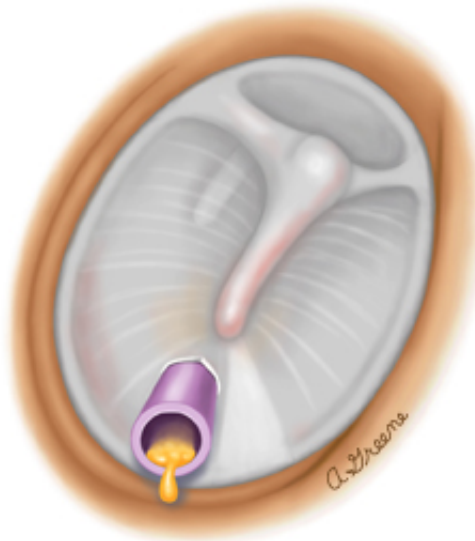
If the child has been outside on a cold day, wait 15 minutes before measuring the ear temperature.

Ear tubes and ear infections do **NOT** affect the accuracy of an ear temperature.

Surgery to treat fluid in the ear (tympanostomy tube)



Small cut made in eardrum
for tympanostomy tube



Fluid from middle ear
drains from tube

This surgery might be done when fluid in the middle ear does not go away. This treatment can also be used to prevent more ear infections in children who get them a lot. The figure on the left shows an eardrum before the tube is inserted. The figure on the right shows fluid draining from the middle ear after the tube has been placed in the eardrum.

Disclosures

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