

Children's Ear Infections, Part One

By John Heuertz, DOM

Recurrent infections help make acute otitis media (AOM) the number-one reason for visits to a family doctor or pediatrician in this country.¹ The routine treatment for AOM in the United States is oral antibiotics.² In some instances, chronic infection is even treated prophylactically with antibiotics.³ In fact, more oral antibiotics are administered to patients less than 10 years old than to any other age group.⁴ In spite of these facts, there is no clear evidence that antibiotics are beneficial for routine treatment of AOM in either short- or long-term outcomes.⁵ Traditional Chinese medicine (TCM) uses pattern identification as the basis for diagnosis.

Because a pattern is determined by a semi-mutable set of signs and symptoms occurring in concert, formulas are designed to address a complex set of issues.

Otitis media can have multiple causes, including bacterial infection, viral infection, anatomical factors, impaired immunologic status, airborne allergy, food allergy, feeding method and gastroesophageal reflux.⁶ (One study involving 456 children with AOM found that viruses caused 41 percent of those cases.⁷) The manifestations can include bulging eardrums and ear pain, moderate to high fever, blocked sinuses, cough, ear edema, headache, irritability, insomnia and restlessness, sore throat, sweating, appetite changes and even rash. Chinese medicine believes that its dynamic approach provides a safer, more inclusive and superior treatment strategy.

Pathophysiology of Acute Otitis Media

AOM is a disease affecting primarily the Eustachian tubes, but originating usually in the nasopharynx. The Eustachian tubes are lined with mucus membranes. They begin just behind the tympanic membrane (the "eardrum") and, in adults, course downward, forward and medially to communicate with the nasopharynx, where they also terminate. The total length of a tube in an adult is 3-4 centimeters. In children, the

downward aspect of the angle is less pronounced, and the total length of the tube is less than three centimeters.

Before the 1990s, the most accepted explanation for the underlying cause of AOM was underaeration of the Eustachian tube due to obstruction or blockage of the tube. More recent studies suggest the opposite is true. Rather than an obstruction, an overcompliant Eustachian tube is believed to be the underlying cause.⁸ For protection, a normally functioning tube remains closed except for brief moments of aeration during yawning or swallowing. Otitis media can begin when the pressure around the nasopharynx rises substantially above the pressure of the middle ear, allowing pre-infected nasopharyngeal secretions to infiltrate the mucosal lining of the Eustachian tube.⁹

Several factors can contribute to the change in the pressure relationship between the nasopharynx and the Eustachian tube. Most significantly, the nearly horizontal orientation of the Eustachian tube in younger children makes them more vulnerable to pressure changes, but other factors also come into play.

Adenoids consist of lymphatic tissue and are located in the nasopharynx. As part of the immune system, they are the first destination for many viruses entering the body. They also might serve as a reservoir of pathogenic bacteria.¹⁰ At the early stage of infection, the adenoids can become swollen. Swallowing causes the adenoids to elevate while simultaneously opening the Eustachian tube, thus allowing transfer of infection from the adenoids to the Eustachian tube.

TCM discusses pathogenic factors in environmental terms such as "wind," "heat," "cold," "dampness" and "dryness." Each of these has a set of associated pathological signs and symptoms. An acute case of otitis media generally is associated with wind and heat. Two of the main properties of heat are that it rises and expands. This rising and expansion can explain, in TCM terms, another mechanism by which the pressure differential between the nasopharynx and Eustachian tube shifts. As the adenoid becomes inflamed, it gives off heat. This heat rises and creates pressure at the termination point of the Eustachian tube. When enough pressure has accumulated, the Eustachian tube no longer can protect itself. A simple act of swallowing is all it takes to open the Eustachian tube, thus allowing the pressure to push the wind-heat pathogen into contact with the mucosal lining of the tube.

Antibiotics

Though utilized for a broad range of clinical complaints, the action of an antibiotic is focused and narrow. Antibiotics are designed to do one (and only one) thing: kill bacteria. And though antibiotics can occasionally improve some symptoms, especially those caused by inflammation, they possess no direct action to do anything other than kill the bacteria. They cannot relieve distress or pain, promote drainage, repair damage, prevent recurrence, or any of the other issues commonly encountered in a case of AOM.

Some studies suggest that when used for treating AOM, antibiotics actually might be harmful.¹¹ One example is the statistical evidence suggesting a connection between frequent use of antibiotics in the treatment of common ear infections and children who harbor drug-resistant bacteria during frequent illness.¹² Another example involves the interference of antibiotics with immune-system signaling in the intestinal lining.¹⁴

Before nutrients or microorganisms can enter the bloodstream from the intestinal tract, they must first pass through three layers of defense. In the outermost layer, the layer furthest from the bloodstream, lie about 400 species of bacteria - some beneficial, others dangerous. These bacteria are in a constant battle for dominance. In this battle, chemicals produced by the bacteria can make the environment antagonistic for competing species or enable another to proliferate.

The next layer closer to the bloodstream is made up of epithelial cells with TOLL receptors on their surfaces. These receptors pick up chemical signals from the battle zone to keep the immune system prepared to respond to potential transgressors.

Behind the epithelial layer directly protecting the bloodstream is a compact layer of immune cells (lymphocytes, microphages, monocytes and dendritic cells), some of which bear TOLL receptors themselves. For any potential pathogen entering the body through the intestinal tract, this signaling through the TOLL receptors is the primary mechanism for immune activation. The proximity of the compact immune cell layer to the bloodstream implies a potentially global response. Oral antibiotics profoundly influence the enteric population dynamics and therefore have a comparably profound influence on the signaling system.

Some of the effects antibiotics have on the immune system are well-understood. Many more remain insufficiently investigated. One relatively well understood effect is a form of malnutrition resulting from an over-stimulated signaling system. Over-stimulation of signaling can cause a hypersensitivity of the intestinal tract's immune response. This hypersensitivity can result in an allergic-type response to certain

foods and the nutrients they contain. Generally speaking, the more hyperactive this immune cell layer, the fewer nutrients will be properly absorbed. Suppression of this immune response is critical to avoid malnutrition.

In TCM terms, antibiotics have a very cold property, which makes them effective to clear heat and reduce inflammation. But the same cold property also damages the spleen *qi* and the digestive function in general. When applied to the intestines, the function of the spleen *qi* to "separate clear from turbid" directly translates into modern nutritional terms as the separation of nutrients from waste material. When the spleen *qi* is damaged, its ability to separate clear from turbid is impaired and "turbid" substances are allowed into circulation, while nutritive substances (clear) manage to pass through the stool. The spleen also plays a critical role in the production of *wei qi* or "defensive *qi*," which it produces through a transformation process involving "clear" substances obtained from diet. Without sufficient "clarity" in this raw material, the strength of the *wei qi* is compromised, defense against external pathogens is diminished, and chances for recurrent infection increase.

There are a number of other mechanisms by which antibiotics may adversely impact the immune system.¹⁴ Many theories still are being researched. The important facts for the present discussion are 1) the lack of evidence that antibiotics are an effective treatment for AOM; and 2) the indications that antibiotics actually might cause harm.

Part two of this article will discuss herbal treatments for AOM.

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11. A. by destroying mitochondria in WBC; B. by blocking protein synthesis in WBC (see Kimball JW, "Endosymbiosis and the Origin of Eukaryotes,"); C. by destroying the beneficial flora of the GI tract, triggering an immune response (Chin J, *Asia Pac J Clin Nutr* 2004;13[Supl]:S24-5); D. overuse of antibiotics has led to the development of resistant organisms - see Harrison CJ, et al., *Pediatr Infect Dis J* 1985;4:641-6, Faden H, et al. *Ann Orol Rhino Laryngol* 1992;101:87-91, Ford KL, et al., *J Pediatrics* 1991;119:941-4, and Reichler MR, et al., *J Infect Dis* 1992;166:1346-53.
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13. See Chin J, *Asia Pac J Clin Nutr* 2004;13(Suppl):S24-5 for a thorough discussion of the immune signaling system of the intestinal tract. The author is indebted to Dr. Chin's article for the discussion on intestinal immune response.
14. For further examples of the adverse effects antibiotics have in the context of pediatric ear infections, see Jake Paul Fratkin's article, "Pediatric Ear Infections," in the "news" section of the Fall 2004 issue of *Golden Flower*.



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