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Sep 2006 "*Upper Respiratory Tract Infections*" 707-000-06-009-H01

THIS MONTH
"Upper Respiratory Tract Infections"

RENEWAL STATEMENTS FOR NEXT YEAR HAVE BEEN MAILED. SEND THEM BACK DURING SEPTEMBER & SAVE.

ALL STATEMENTS OF CREDIT FOR 2006 WILL BE MAILED NEAR THE END OF THE YEAR. IF YOU HAVE SPECIAL REQUIREMENTS, CONTACT US & WE WILL ACCOMMODATE YOUR NEEDS.

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HAVE YOU RECENTLY MOVED? PLEASE NOTIFY US.

As we face the upcoming flu season, it seems appropriate to review upper respiratory tract infections. We like to update this topic every few years. It's one of those subjects that are high on the list that are recommended by participants. Our goals are to describe URTIs and their prevention. This lesson provides 1.25 hours (0.125 CEUs) of credit, and is intended for pharmacists in all practice settings.

The program ID # for this lesson is 707-000-06-009-H01.
Pharmacists completing this lesson by September 30, 2009 may receive full credit.

To obtain continuing education credit for this lesson, you must answer the questions on the quiz (70% correct required), and return the quiz. Should you score less than 70%, you will be asked to repeat the quiz. Computerized records are maintained for each participant.

If you have any comments, suggestions or questions, contact us at the above address, or call toll free 1-800-323-4305. (In Alaska and Hawaii phone 1-847-945-8050). **Please write your ID Number (the number that is on the top of the mailing label) in the indicated space on the quiz page** (for continuous participants only).

The objectives of this lesson are such that upon completion the participant will be able to:

1. List & describe the parts of the upper respiratory tract
2. Describe the clinical manifestations of URTIs
3. Discuss the treatment of URTIs
4. Differentiate between the symptoms of pharyngitis & laryngitis
5. List the strains of influenza viruses
6. Comment upon the efficiency of prophylactic treatment of influenza

ANATOMY AND PHYSIOLOGY

The respiratory tract consists of the nasal cavities, sinuses, the pharynx, the larynx, the trachea, the bronchi, including the bronchioles, and the lungs.

The nose is the gateway to the nasal cavities. The internal portion is lined with mucous membranes. The nasal mucosa is supplied with a vast blood vessel network that keeps inhaled air warm. The total blood flow in the nasal mucosa is higher than that in the muscles, brain and liver. The two nasal cavities are separated by the nasal septum which continues posterior to the nasal portion of the pharynx. Immediately behind the nostrils is the vestibule that is lined with skin that contains sebaceous and sweat glands as well as hair follicles. The hair at the entrance of the nose acts to block inhalation of large particles such as dust. The roof of the nasal cavity consists of bones of the skull, while the floor contains the palate. Ciliated epithelium containing goblet cells consist of mucous and serous glands. These glands provide the area with mucus containing lysozyme and an antibacterial enzyme. The first agent serves to trap dust and debris. The latter chemically destroys bacteria. The ciliated cells constantly move debris and mucus backward toward the throat where it is swallowed. When the cilia movement becomes slow, such as during cold weather, a portion of the mucus fails to move backward. Instead it dribbles toward the nostrils. As a result a person may experience a runny nose.

The paranasal sinuses surround the nasal cavity and are located in the frontal, sphenoid, ethmoid, and maxillary bones. The sinuses produce mucus that drains into the nasal cavity.

The pharynx is a funnel-shaped musculomembranous tube about 5 inches long. It is located between the base of the skull and the level of the sixth cervical vertebra. It functions as a passageway for air from the nasal cavities to the larynx and for food from the mouth to the esophagus. The nasopharynx is located in the upper portion of the pharynx and is lined with ciliated epithelium. It has openings to the eustachian tube. The posterior wall of the pharynx contains the pharyngeal tonsils. These are masses of lymphatic tissue that eliminate pathogens entering the nasopharynx from the air.

The larynx, also known as the voice box, is a musculocartilaginous structure located at the upper part of the trachea. It is lined with ciliated mucous membranes. Its main functions are to provide an opening to the airway, to route air and food into the proper passages, and to produce sounds with assistance of the vocal cords.

The trachea, also known as the windpipe, is a cylindrical, cartilaginous tube about 4 to 5 inches long and one inch in diameter. It connects the larynx with the bronchi. It extends from the sixth cervical to the fifth thoracic vertebra where it branches into the right and left bronchi. The trachea is covered with a ciliated epithelium that sweeps mucus, debris and microorganisms upward to the throat where it is either swallowed or expelled.

At the level of the sternal angle, the trachea branches to form the left and right bronchi, both of which enter the lungs. Once the bronchi enter the lungs, they subdivide further and eventually form the bronchioles.

The lungs consist of fibrous elastic connective tissue and are suspended in the pleural cavity by vascular and bronchial attachments. Each lung contains millions of alveoli. These are small chambers located at the end of the bronchial tree.

CE PRN® (ISSN 0199-5006) is owned and published by W-F Professional Associates, Inc.
400 Lake Cook Road, Suite 207, Deerfield, Illinois 60015.
William J. Feinberg, President
CE PRN® is published eleven times per year, monthly, January through November.
Subscription rate is $99.00 per year. Second-Class Postage paid at Deerfield, Illinois 60015
and at additional mailing offices.

POSTMASTER: Send all address changes to W-F Professional Associates, Inc., 400 Lake Cook Road, Suite 207, Deerfield, IL 60015.
September 2006

COMMON UPPER RESPIRATORY TRACT INFECTIONS

Infections of the Nose

The common cold is an acute infection of any or all parts of the nasal cavity. It is a very common respiratory ailment and the most common infectious disease in the US. It causes more loss of work and school time than any other disorder. The common cold is a collective term for a group of illnesses caused by one or more than 200 antigenically distinct viruses from 8 different genes. These viruses include rhinoviruses, adenoviruses, coronaviruses, coxsackieviruses, parainfluenza viruses, and respiratory cyncytial viruses. Children from one to five years old are the most vulnerable group. The greatest incidence of common colds occurs in the fall, winter, and spring. Each one of those outbreaks is usually associated with a certain type of virus. Fatigue, emotional stress, allergic rhinitis, and malnutrition may contribute to increased susceptibility. Chilling of the body surface does not result in common cold as many people believe. The sneezing and runny nose that follows exposure to wetness or cold weather is due to irritation caused by a drop in nasal mucosal temperature. These changes in the nasal cavity tend to enhance the susceptibility to infection, but do not induce the common cold. Common colds are contagious, and spread usually through direct contact with contaminated nasal secretions deposited on the hands during sneezing, coughing or blowing the nose. The contagious period occurs prior to onset of symptoms.

Severity of symptoms depends on the virus responsible for the cold, age, and general health of the individual. Symptoms begin abruptly at the end of an incubation period (usually ranges from one to three days). Such manifestations may include headache, scratchy throat, and burning sensation in the nose, followed by sneezing, rhinorrhea, excessive lacrimation, hoarseness, nasal congestion and coughing. Although the uncomplicated common cold is afebrile, slight fever accompanied by chills may be experienced, particularly in children. In the early stages, the nasal discharge is watery, but within 2 days it thickens and becomes mucopurulent. Cough and expectoration may last from 7 to 10 days. Uncomplicated common colds should resolve within one week without sequela. However, complications caused by bacterial infection may occur.

There is no specific treatment available for the common cold. Staying home in a warm, but not overheated, environment is recommended. Such measures allow the patients, particularly children and those with fever, to rest and avoid spreading the infection. The use of analgesics and/or antipyretics such as acetaminophen and aspirin are helpful in reducing headache and muscular pain. Sufficient intake of fluids is recommended to prevent dehydration. Patients under 18 years of age should refrain from taking salicylates because such medications have been implicated with causing Reye's Syndrome. Nasal congestion may be relieved by using oral decongestants or topical decongestants (nose drops, sprays or inhalers). Steam inhalations help loosen mucus, moisten nasal passages, and relieve chest pain. Elevating the humidity of the room and increasing fluid intake are recommended. Cough may be alleviated by using antitussives. If symptoms continue for more than 10 days, or if the patient complains of earache, pain around the eyes, fever, wheezing, difficulty in breathing or hoarseness, a physician should be consulted. Antibiotics are usually not used for treating colds because they have no antiviral activity. However, such medications may be used to prevent secondary bacterial infection.

Influenza is a common upper respiratory tract viral infection. It may occur in isolated cases or in epidemics or endemics. It is contagious and caused by serologically distinct strains of myxoviruses designated as Types A, B, C and D. Type A strains of influenza virus, which is responsible for pandemics, is capable of exhibiting wide genetic changes (subtypes). This capability explains why outbreaks of influenza occur in communities or countries that have previously been exposed to other subtypes. Type B virus undergoes minor genetic changes, but cross-relationships exist among the various strains of this type. Influenza B viruses usually cause limited epidemics that may occur at 4 to 5 year cycles. Type C virus appears to undergo no genetic changes, is less prevalent than Types A and B, and causes endemics that result in mild sporadic cases of influenza. Influenza occurs throughout the year, but it is more prevalent in late fall, winter, and spring. It affects persons of all ages, but the susceptibility to severe infections are particularly high in young children 5 to 9 years of age, the elderly, the infirm, pregnant women in the third trimester and individuals with chronic pulmonary or cardiac diseases. Transmission of influenza occurs by direct contact between a healthy individual and an infected patient via inhaling airborne droplets of contaminated nasal discharges. The virus

enters the upper respiratory tract where replication occurs. Symptoms appear following an incubation period of from 1 to 4 days.

The onset of symptoms of influenza caused by Type A and B viruses are abrupt. The early symptoms include chills, fever that may reach 103° F, headache, muscular pain, sore throat, sneezing and non-productive cough. Later on, the patient experiences profuse nasal discharge and productive cough that can be severe. The face is flushed and warm. The eyes may be reddened and water easily. These acute symptoms usually last for 3 to 4 days. In the absence of complications, full recovery occurs within 1 to 2 weeks. Complications of influenza include necroses of the respiratory epithelium, which may result in bacterial infection, pneumonia, sinusitis, otitis media and bronchitis. Pneumonia is rarely caused by the virus, but may be due to secondary pneumococcal or staphylococcal infections.

Influenza may be prevented through immunization. Persons such as young children, the aged, the infirm, those with diabetes, renal, cardiovascular, and pulmonary diseases and immunodeficiency are vulnerable to complications of influenza. The U. S. Public Health Services recommend that such high-risk individuals should be vaccinated against influenza. Likewise, persons who provide care for such groups of patients should receive the vaccine in order to reduce the risk of transmission of the disease. One dose of vaccine that includes the most prevalent strains of influenza viruses should be administered prior to the outbreak of the influenza season, preferably early in the fall. In order to sustain immunity against new, currently circulating influenza viruses, a second dose containing the new strain is recommended to be administered at least 1 month apart from the first dose. Immunity is usually achieved two weeks following vaccination. Within 24 hours of administration of the influenza vaccine, some individuals may experience systemic symptoms such as headache, low grade fever, and myalgia. The antiviral and antiparkinson agent amantadine hydrochloride has been shown to be sufficiently effective in preventing infections caused by strains of type A influenza viruses. It is usually reserved for short-term prophylaxis for high-risk individuals who have not received a vaccine or when the vaccine becomes ineffective due to antigenic changes in the virus. In such cases, amantadine is used as an adjunct to immunization. Vaccination may be mitigated while the person is taking amantadine. Since protection response occurs two weeks after vaccination, amantadine administration should be discontinued in three weeks. The recommended dose is 200 mg daily. Adverse reactions to amantadine include urinary retention, irritability, nausea, and dry mouth. The drug does not prevent other types of influenza or other viral infections. Analgesics and antipyretics such as acetaminophen or salicylates may be used to relieve headache, fever and myalgia. As with common colds, patients under 18 years of age should not take salicylates because of the association with Reye's Syndrome. Preparations containing dextromethorphan or codeine may be used to suppress annoying cough. Nasal decongestants as well as steam inhalations may be used to relieve congestion. The use of antibiotics is indicated in the presence of secondary bacterial infections. The patient should remain fully rested and maintain adequate hydration at least during the acute stages of the infection. Uncomplicated cases usually last from 1 to 7 days, and the prognosis is excellent.

Parainfluenza viruses consist mainly of four members of the genus Paramyxovirus. They are categorized as types 1, 2, 3, and 4. The first three viruses are the most commonly encountered, and cause acute upper respiratory infections, especially in children. Most children have been infected by age eight as they show antibodies to types 1, 2, and 3. Epidemics of types 1 and 2 usually occur in the fall, whereas those of type 3 occur throughout the year.

Children are the most vulnerable group affected by parainfluenza. The primary symptoms are fever, coryza, sore throat, dry cough, and hoarseness. In uncomplicated cases, recovery occurs within 2 days. In older children and adults the symptoms are much milder than those of influenza. Symptomatic therapy similar to that stated in treating the common cold is recommended. Currently, no effective vaccine is available.

Sinusitis, which is inflammation of the mucous membranes of the paranasal sinuses, may be acute or chronic. Acute sinusitis is characterized by congestion and profuse nasal discharge, headache, facial pain, and tenderness. It may be caused by viral and bacterial infections, or by allergy. It is known as frontal, maxillary or ethmoid sinusitis, depending on the sinus involved. The frontal and maxillary sinuses are the most affected. The causative viruses are rhinoviruses, adenoviruses, and influenza viruses; whereas the bacteria include streptococci, pneumococci, *Hemophilus influenza* and staphylococci. Chronic sinusitis may be due to

allergic reactions or, as in the case of maxillary sinusitis, dental infections.

Clinical manifestations of acute sinusitis usually occur within a few days after the onset of the upper respiratory infection. The patient may experience obstruction of the nasal cavity, fever, secondary anosmia (loss of the sense of smell), tenderness over the involved sinuses, nasal purulent discharge and headache, which frequently can be severe. Frontal sinusitis precipitates frontal headache, whereas ethmoid sinusitis can cause pain between the eyes. The cheeks become painful when maxillary sinuses are affected. The inflamed nasal mucous membrane is usually swollen, and the passages between the nose and sinuses become blocked. As a result, nasal congestion intensifies, and the oxygen entrapped in the sinus involved is absorbed into the blood stream, causing a painful negative pressure. Continuation of the negative pressure may lead to seepage of the exudates from the sinus mucosa. Such exudates serve as a medium for bacteria. Eventually the bacteria fill the obstructed sinus to cause painful positive pressure. The main complication of sinusitis is osteomyelitis of the facial or frontal bone.

Bed rest and intake of fluid are recommended for acute sinusitis. Topical and systemic nasal decongestants are useful in reducing swelling of the mucous membranes and in restoring proper drainage. Penicillin and other antibiotics are often used. In chronic sinusitis antibiotic may be used. The duration of therapy is from 4 to 6 weeks. Steam inhalation and humidification of the environment are helpful in alleviating pain and congestion. Vigorous and continuous blowing of the nose should be avoided, as it may aggravate the condition.

Infections of the Pharynx

Pharyngitis is an inflammation of the pharynx that may involve the lymphatic tissue. This condition is often referred to as a "sore throat". It may be part of an infection that involves the nose, sinuses, larynx and/or trachea. Pharyngitis may be acute or chronic. Acute pharyngitis is usually due to a viral or bacterial infection. The infective bacteria include group A B-hemolytic streptococci, staphylococci, pneumococci or corynebacterium.

Streptococcal pharyngitis is more common among children aged 5 to 15 years. The infection is contagious, and transmission usually occurs directly from infected persons or healthy carriers to susceptible persons. The incubation period is 2 to 4 days, after which symptoms appear abruptly. Streptococcal pharyngitis may lead to suppurative complications such as acute otitis media, peritonsillar abscess and acute sinusitis, and to delayed nonsuppurative sequela such a rheumatic fever. The inflammatory process in rheumatic fever primarily involves the heart, joints, CNS, and subcutaneous tissue. It is not known how the microorganisms initiate the inflammatory reactions. Streptococcus induced autoimmunity and tissue injuries caused by streptococcal toxins are unproven but accepted theories for the causation of rheumatic fever.

Chronic pharyngitis usually occurs as a result of persistent infections of the nose, sinuses, or tonsils. It produces a few symptoms such as dry throat, sticky mucus, cough and pain.

Sore throat and pain on swallowing are the hallmark of pharyngitis. The throat is inflamed and may be covered with exudates. The patient may feel feverish and complain of headache and malaise. Abdominal pain and nausea may occur, especially in children. Symptoms of rheumatic fever appear several days or weeks after the acute phase of streptococcal pharyngitis, and usually include carditis, polyarthritis, transient erythema marginatum (pink rash), Sydenham's chorea (a CNS condition characterized by sudden aimless, irregular movement and muscle weakness), subcutaneous nodule and fever.

The use of analgesics and/or antipyretics is recommended to relieve fever and aches. Warm, nonirritating gargle may help sooth the throat. Penicillins or cephalosporins may be used in treating simple acute pharyngitis. The use of a specific antibiotic for streptococcal pharyngitis is usually initiated following bacteriologic confirmation. Swabs rubbed over the infected tonsils or nasopharynx should be streaked on sheep's blood agar plates to allow determination of the number of colonies of hemolytic streptococci. The appearance of a few colonies does not constitute a positive confirmation of streptococcal infection, since a small segment of the healthy population carry these microorganisms in their nasopharynx. In vivo bacitracin susceptibility of hemolytic streptococci may be attempted in order to determine the group and type of microorganisms. Group A hemolytic streptococci are susceptible to the discs containing 0.02 units of bacitracin. Immunologic diagnosis of streptococcal infection may be attempted. Presently there are tests that enable the clinician to detect group A antigen directly from throat swabs within one hour. A major objective of proper

treatment of streptococcal pharyngitis is to prevent rheumatic fever and its recurrence. To achieve this, a streptococcal infection should be prevented. If it occurs, it should be treated promptly and aggressively with the proper antibiotics. Eradication of streptococci from the nasopharynx may be achieved by administering penicillin for at least 10 days. At the end of the 10 day period, antistreptococcal prophylaxis should be initiated. The continuous prophylaxis method of choice is benzethine penicillin. Duration of the prophylaxis varies from one patient to another, but a minimum of 5 years is recommended. One medical measure includes the use of aspirin to reduce both fever and joint pain. Corticosteroids may be used to minimize heart damage. In chronic pharyngitis, it is essential to eliminate the underlying cause of the infection.

Tonsillitis: The tonsils are almond shaped organs that consist of lymphatic tissue. They are located in the mucous membrane of the pharynx and base of the tongue. The exterior portions of the tonsils contain stratified squamous epithelium which leads to indentations or crypts. Tonsillitis is an inflammation of the tonsils, a condition occurring mainly in children, but occasionally in adults. Inflammation of the tonsils happens during upper respiratory infections caused by viruses, B-hemolytic streptococci and less often by *Staph*. *aureus*. The infection may occur as a primary or secondary infection. Tonsillitis is contagious, and can be transmitted by inhaling infected particles or via intake of infected food or water. While infected, the tonsils are swollen, inflamed, and tend to have yellowish inflammatory exudates that often adhere well to the surface of the tonsils. Repeated infections may result in permanently enlarged tonsils. In some cases it is recommended that the tonsils be surgically removed (tonsillectomy). Rheumatic fever may develop following frequent streptococcal infections.

Eustachitis is inflammation of the eustachian tube which connects the nasopharynx with the middle ear. This condition is a complication that may occur following pharyngitis. Generally both diseases are caused by the same microorganisms. The tube is hyperemic, swollen and painful. Eustachitis may lead to otitis media, which is inflammation of the middle ear. Otitis media is commonly caused by viral or bacterial infection. The infection develops when the causative microorganisms spread from the nasopharynx to the eustachian tube and to the middle ear. It may occur as a result of allergic rhinitis.

Hemophilus influenza, *Streptococcus pneumonia*, *Streptococcus aureus* and Group A B-*Hemolytic streptococci* are the most common causative bacteria. Acute otitis media is common in children particularly from the ages of 3 months to 4 years. This frequent occurrence is due to the rather high incidence of upper respiratory infection in children.

The initial symptom of acute otitis media is a severe, stabbing pain in the ear which may interfere with sleep. Other symptoms include a feeling of fullness in the ear, hearing loss, and purulent otorrhea which occurs following perforation of the tympanic membrane due to the pressure created by accumulation of discharge in the middle ear. The flow of the discharge is usually accompanied by relief of pain. Otoscopic examination reveals an inflamed tympanic membrane that may bulge in severe cases. Penicillin and cephalosporin may be used for treatment. The treatment should last for 10 to 14 days. Other antibiotics may be used depending on the culture sensitivity of the causative microorganisms. Erythromycin and trimethoprim-sulfamethoxazole may be used in cases of sensitivity to penicillin. In resistant infections accompanied by bulging tympanic membrane, myringotomy (incision in the tympanic membrane) may be necessary. However, this is rather drastic. A ventilating tube may be inserted for drainage. Oral decongestants may be used to help normalize the eustachian tube. Antihistamines are utilized in the presence of allergy.

Laryngitis

Laryngitis is an inflammation of the laryngeal mucosa due to bacterial or viral infections. It may occur above or in the course of other disorders such as bronchitis, pharyngitis, common colds, influenza, pneumonia, diphtheria, and measles. Inhalation of irritants, excessive use of the voice, or allergy may contribute to laryngitis.

Hoarseness or aphonia (inability to produce speech sounds), that may be accompanied by pain and an urge to clear the throat are the main symptoms. Fever and dyspnea due to marked laryngeal edemas may be experienced in severe infections.

Treatment of laryngitis is symptomatic and includes voice rest. Treatment recommendations include administration of analgesics, steam inhalation, and avoidance of smoking tobacco. Treatment of the underlying respiratory infection is essential. Bacterial laryngitis may be treated with antibiotics.

SUMMARY

Upper respiratory tract infections (URTIs) such as the common cold, influenza, parainfluenza, sinusitis, pharyngitis, tonsillitis, eustachitis, and laryngitis are common conditions that affect people of all ages. However, some of these infections are more common among children than adults. If left untreated or treated improperly, URTIs can cause complications, some of which are serious. Antibiotics are ineffective in treating infections caused by viruses, but are effective against bacterial infections.

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LESSON EVALUATION

Please fill-out this section as a means of evaluating this lesson. The information will aid us in improving future efforts. Either circle the appropriate evaluation answer, or rate the item from 1 to 7 (1 is the lowest rating; 7 is the highest).

1. Does the program meet the learning objectives?

List & describe the parts of the upper respiratory tract	Yes	No
Describe the clinical manifestations of URTIs	Yes	No
Discuss the treatment of URTIs	Yes	No
Differentiate between the symptoms of pharyngitis & laryngitis	Yes	No
List the strains of influenza viruses	Yes	No
Comment upon the efficiency of prophylactic treatment of influenza	Yes	No

2. Was the program independent & non-commercial? Yes No

	Poor			Average			Excellent
3. Relevance of topic to your practice	1	2	3	4	5	6	7

4. What did you like most about this lesson?_____

5. What did you like least about this lesson?_____

(WATCH OUR WEBSITE FOR RESULTS OF PARTICIPANT EVALUATIONS)

Quiz—Please Select the Most Correct Answer

1. Which statement is incorrect?
   A. Nasal mucosa is abundantly supplied with blood vessels
   B. The vestibule is devoid of any glands
   C. The ciliated cells covering the epithelium of the respiratory tract is moving constantly to remove debris
   D. The larynx is known as the voice box
2. Which of these may not contribute to a common cold?
   A. Gender
   B. Malnutrition
   C. Fatigue
   D. Allergic Rhinitis
3. The common cold:
   A. Can be cured
   B. Is treated with antibiotics
   C. Is a bacterial infection
   D. Affects the nasal cavity
4. The primary symptom of laryngitis is:
   A. Dizziness
   B. Nausea & vomiting
   C. Hoarseness
   D. Bitter taste in the mouth
5. Symptoms of influenza caused by Type A & B viruses:
   A. Are not noticeable
   B. Appear after the acute infection stage
   C. Are abrupt
   D. Are slow developing
6. Amantadine is ineffective against influenza caused by the Type A virus.
   A. True B. False
7. Sinusitis:
   A. Seldom causes headache
   B. May be caused by viral or bacterial infections, or allergies
   C. Causes anosmia
   D. Always results in hoarseness
8. Which statement is incorrect regarding pharyngitis?
   A. Streptococcal pharyngitis is more common among children than adults
   B. Rheumatic fever may follow streptococcal pharyngitis
   C. Group A B-hemolytic streptococci may cause pharyngitis
   D. Pharyngitis is inflammation of the voice box
9. Type A strain of influenza virus causes mild sporadic cases.
   A. True
   B. False
10. Which statement is incorrect regarding acute otitis media?
    A. Usually secondary to URTIs
    B. Hearing loss & fever are common
    C. Seldom occurs in children
    D. Myringotomy may be performed in bulging tympanic membrane

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This lesson furnishes 1.25 hours (0.125 CEUs) of credit.

Program ID #707-000-06-009-H01.

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