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Editorial

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This being the last issue of the Journal for the year 2010, it gives us immense pleasure to introduce to you the various informative topics, that are not only applicable to the health industry, but are also beneficial to every individual due to its broad spectrum relevance.

The Mini Review briefs the reader on Common Respiratory Tract Infections and various symptoms and treatment available to allay the symptoms. By definition, Respiratory tract infection is said to occur when pathological bacteria are present in the respiratory tract and are producing the symptoms of an infection. Respiratory tract infections, usually cause, a build-up of pus and fluid (mucus) and the airways become swollen, making it difficult for one to breathe.

Current Trends sheds light on the use of Antiseptics in Sitz bath; which is a form of hydrotherapy – use of hot/cold water/steam/ice – to increase blood flow to the pelvic and abdominal area and help reduce inflammation and other variety of problems. Sitz baths are commonly used in conjunction with other pharmacological therapies such as analgesics, stool softeners, fiber supplements and antibiotics in managing anorectal disorders. For various ailments, different temperatures are used, and minerals or medications are also added to the water.

Christiaan Eijkman discovered that the real cause of beriberi was the deficiency of some vital substance in the staple food of the natives, which is located in the so-called "silver skin" (pericarpium) of the rice. This discovery has led to the concept of vitamins. This important achievement earned him the Nobel Prize in Physiology or Medicine in 1929, and Eijkman is In Profile for this issue.

Bug of the Month encompasses the different aspects of Pneumococci; Pneumococci are normal inhabitants of the upper respiratory tract of humans and are the most prevalent single bacterial agent in pneumonia and in otitis media in children. They can also be the cause of sinusitis, bronchitis, bacteraemia, meningitis and other infections.

Did You Know, What are Fomites? well this issue of the Journal takes a peek at Fomites which are basically inanimate objects that carry disease-causing germs that spread infections. These are one of the most common ways that kids get sick. However infections which are related to fomites are also significant in cases of adults and geriatric individuals.

The section on Best Practices delves into Microbiological Lab: Health and Safety. The potential risks in a microbiology course are enormous. Persons who work in a microbiology lab may handle infectious agents in addition to other hazardous materials such as chemicals and radioactive materials. Therefore it is a unique environment that requires special practices and containment facilities in order to properly protect persons working with microorganisms. Safety in the laboratory is of primary concern. The three main elements of safe containment of microorganisms are (1) good laboratory practices and technique, (2) safety equipment, and (3) facility design.

A buffet is never complete without dessert and so it is for relaxing the mind after a lot of pressing facts have transpired...therefore ease your mind...relax your mood.

On retrospection hope that this year has been a fulfilling year, both professionally as well as personally. And as we look forward to the year ahead with hope and enthusiasm lets remember that a fulfilling climax is always the result of much hard work and toil. So let us continue to do our part well and be assured of the best in the future....

Common Respiratory Tract Infections

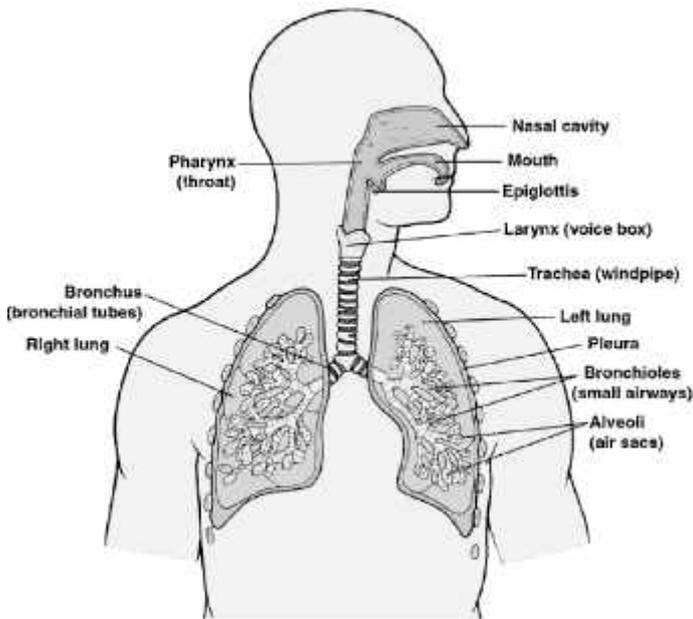
The majority of the organisms on earth are called aerobes because their cells require oxygen for respiration. Cellular respiration involves utilization of oxygen for the oxidation of food materials and for the production of energy for biological activities.

In multicellular organisms which have many organ systems in the body, all the cells of the body are not in contact with the environment. In this case, certain tissues exchange respiratory gases with the environment and the gases are transported in the body to and from the tissues and organs by way of a transport medium, blood or body fluids. Oxygen from the respiratory surface is transported to the cells and carbon dioxide from the tissues is transported to the respiratory surface where gaseous exchange takes place. Therefore, all, except the smallest animals, require transport systems for distributing oxygen, food, wastes and other materials from one part of the body to the other.

By definition, Respiratory tract infection is said to occur when pathological bacteria are present in the respiratory tract and are producing the symptoms of an infection. Respiratory tract infections include conditions such as bronchitis, diphtheria, influenza (flu), colds, croup, pneumonia, sinusitis, legionnaires' disease, and tuberculosis. There is, usually, a build-up of pus and fluid (mucus) and the airways become swollen, making it difficult for one to breathe.

Respiration in humans is achieved through the mouth, nose, trachea, lungs, and diaphragm.

Respiratory tract



1. **Nasal cavity:** Oxygen enters the respiratory system through the nose. The nose is supported by cartilage plates. The respiratory passage is divided into two chambers by a median partition. The nasal passage opens to the outside through external nostrils. It opens inside by internal nostrils at the pharynx.
2. **Pharynx:** Air passes into the pharynx (which has the epiglottis that prevents food from entering the trachea). It is a common

pathway that opens into the oesophagus of the alimentary canal and larynx of the respiratory system.

The pharynx has three regions, namely the nasopharynx, the oropharynx and the laryngopharynx. The nasopharynx extends from the internal nostril to the region of the uvula. The uvula is a soft outgrowth hanging in between the posterior part of the oral cavity and the pharynx. It prevents the entry of food into the nasal cavity. The oropharynx remains between the uvula and the epiglottis. The oral cavity opens into the oropharynx. Near the opening of the oral cavity 2 sets of palatine tonsils and lingual tonsils are present. The laryngopharynx extends in between the epiglottis and the oesophagus.

3. **Larynx:** The upper part of the trachea contains the larynx. The vocal cords are two bands of tissue that extend across the opening of the larynx. The larynx is seen just behind the pharynx and the buccal cavity. This region is surrounded by cartilages (3 unpaired and 6 paired). These are interconnected by muscles and ligaments.

The unpaired cartilages are the thyroid, cricoid and epiglottis. The thyroid cartilage is the largest. It is also known as the Adam's apple. The cricoid cartilage forms the base of the larynx. The other cartilages are placed above the cricoid.

The ligaments inside the larynx form the vocal folds or vocal cords. These are called the vocal cords and are involved with sound production. The air moving past the vocal cords make them vibrate. Louder sounds are made by increasing the amplitude of vibrations. Frequency of the vibrations can be altered by changing the length of the vibrating segments of the vocal cords.

4. **Trachea:** The trachea after entering the thoracic cavity divides into branches called bronchi. One bronchus extends into each lung and subdivides into countless small bronchial tubes. The bronchial tubes again divide into many fine tubes called bronchioles. Bronchi branch into smaller and smaller tubes known as bronchioles. Bronchioles terminate in grape-like sac clusters known as alveoli. The average adult's lungs contain about 600 million of these spongy, air-filled sacs that are surrounded by capillaries. Only about 0.2 μm separate the alveoli from the capillaries due to the extremely thin walls of both structures.

The passage of air from outside to the lungs is as follows:
Nose----Pharynx----Trachea----Bronchi----Bronchioles----Alveolus of the lungs.

5. **Lungs:** The lungs are a pair of conical hollow organs, the right one being larger than the left one. The lower surfaces of the lungs are concave to accommodate the diaphragm which divides the body cavity into the thoracic and abdominal cavities. The lungs are enclosed in a double layered membrane called pleura. The lungs are well protected in the body case consisting of the breast bone on the front (ventral side) and the ribs on the sides (lateral sides) and the vertebral column on the back (dorsal side). Thin sheets of epithelium (pleura) separate the inside of the chest cavity from the outer surface of the lungs. The region in between the two lungs is named as the

mediastinum. It is a midline partition, being occupied by the heart, trachea and oesophagus.

Here primary bronchi, blood vessel and nerve enter or exit at certain region of the lung referred to as the as the hilum. The primary bronchi on entering into each lung divide further into secondary bronchi. There are two secondary bronchi in the left lung and three in the right lung. The secondary bronchi in turn give rise to tertiary bronchi. They divide still further and finally give rise to bronchioles. The diameter of the bronchioles is less than 1 mm. These bronchioles divide several times to become still smaller terminal bronchioles.

6. **Thoracic wall and muscles of respiration:** Several muscles are involved in the process of respiration. These are called the muscles of inspiration and expiration. These muscles are the diaphragm, external and internal intercostal muscles between the ribs, pectorals and scalene.

Common Respiratory Tract Infections (common types in brief):

Bronchitis

Bronchitis is an acute inflammation of the air passages within the lungs. It occurs when the trachea (windpipe) and the large and small bronchi (airways) within the lungs become inflamed because of infection or other causes.

(1) The thin mucous lining of these airways can become irritated and swollen. (2) The cells that make up this lining may leak fluids in response to the inflammation. (3) Coughing is a reflex that works to clear secretions from the lungs. Often the discomfort of a severe cough leads you to seek medical treatment. (4) Both adults and children can get bronchitis. Symptoms are similar for both. (5) Infants usually get bronchiolitis, which involves the smaller airways and causes symptoms similar to asthma.

Bronchitis causes

Bronchitis occurs most often during the cold and flu season, usually coupled with an upper respiratory infection.

(1) Several viruses cause bronchitis, including influenza A and B, commonly referred to as "the flu." (2) A number of bacteria are also known to cause bronchitis, such as *Mycoplasma pneumoniae*, which causes so-called walking pneumonia. (3) Bronchitis also can occur when you inhale irritating fumes or dusts. Chemical solvents and smoke, including tobacco smoke, have been linked to acute bronchitis. (4) People at increased risk both of getting bronchitis and of having more severe symptoms include the elderly, those with weakened immune systems, smokers, and anyone with repeated exposure to lung irritants.

Bronchitis symptoms

Acute bronchitis most commonly occurs after an upper respiratory infection such as the common cold or a sinus infection. You may see symptoms such as fever with chills, muscle aches, nasal congestion, and sore throat.

(1) Cough is a common symptom of bronchitis. The cough may be dry or may produce phlegm. Significant phlegm production suggests that the lower respiratory tract and the lung itself may be infected, and you may have pneumonia. (2) The cough may last for more than two weeks. Continued forceful coughing may make your chest and abdominal muscles sore. Coughing can be severe enough at times to injure the chest wall or even cause you to pass out. (3) Wheezing may occur because of the inflammation of the airways. This may leave you short of breath.

Bronchitis treatment

Self care at home: By far, the majority of cases of bronchitis stem from viral infections. This means that most cases of bronchitis are short-term and require nothing more than treatment of symptoms to relieve discomfort.

(1) Antibiotics will not cure a viral illness. Experts in the field of infectious diseases have been warning for years that overuse of antibiotics is allowing many bacteria to become resistant to the antibiotics available. (2) Doctors often prescribe antibiotics because they feel pressured by people's expectations to receive them. This expectation has been fueled by both misinformation in the media and marketing by drug companies. Don't expect to receive a prescription for an antibiotic if your infection is caused by a virus. (3) Acetaminophen, aspirin, or ibuprofen will help with fever and muscle aches. (4) Drinking fluids is very important because fever causes the body to lose fluid faster. Lung secretions will be thinner and easier to clear when the patient is well hydrated. (5) A cool mist vaporizer or humidifier can help decrease bronchial irritation. (6) Over-the-counter cough suppressant may be helpful. Preparations with guaifenesin will loosen secretions; dextromethorphan-the "DM" in most over the counter medications suppresses cough.

Medical treatment: Treatment of bronchitis can differ depending on the suspected cause.

Medications to help suppress the cough or loosen and clear secretions may be helpful. If the patient has severe coughing spells they cannot control, see the doctor for prescription strength cough suppressants. In some cases only these stronger cough suppressants can stop a vicious cycle of coughing leading to more irritation of the bronchial tubes, which in turn causes more coughing.

Bronchodilator inhalers will help open airways and decrease wheezing.

Though antibiotics play a limited role in treating bronchitis, they become necessary in some situations. In particular, if the doctor suspects a bacterial infection, antibiotics will be prescribed. People with chronic lung problems also usually are treated with antibiotics.

In rare cases, the patient may be hospitalized, if they experience breathing difficulty that doesn't respond to treatment. This usually occurs because of a complication of bronchitis, not bronchitis itself.

Common cold

The common cold, also known as a viral upper respiratory tract infection, is a self-limited contagious illness that can be caused by a number of different types of viruses. More than 200 different types of viruses are known to cause the common cold. Because so many different viruses can cause a cold and because new cold viruses constantly develop, the body never builds up resistance against all of them. For this reason, colds are a frequent and recurring problem. In fact, children in preschool and elementary school can have three to 12 colds per year while adolescents and adults typically have two to four colds per year. The common cold is the most frequently occurring illness in the world.

Common cold symptoms

Symptoms of the common cold include nasal stuffiness or drainage, sore or scratchy throat, sneezing, hoarseness, cough, and perhaps a fever and headache. Many people with a cold feel tired and achy. These symptoms will typically last anywhere from three to 10 days.

Common cold spread

The common cold is usually spread by direct hand-to-hand contact with infected secretions or from contaminated surfaces. For example, if a person with a cold blows or touches their nose and then touches someone else, that person can subsequently become infected with the virus. Additionally, a cold virus can live on objects such as pens, books, telephones, computer keyboards, and coffee cups for several hours and can thus be acquired from contact with these objects.

Common cold treatment

There is no cure for the common cold. Home treatment is directed at alleviating the symptoms associated with the common cold and allowing this self-limiting illness to run its course.

Supportive measures for the common cold include rest and drinking plenty of fluids. Over-the-counter medications such as throat lozenges, throat sprays, cough drops, and cough syrups may also help bring relief. Decongestants such as pseudoephedrine or antihistamines may be used for nasal symptoms. Saline sprays and a humidifier may also be beneficial.

Acetaminophen and ibuprofen can help with fever, sore throat, and body aches.

(1) The common cold is caused by many different viruses. (2) Being in cold weather does not cause the common cold. (3) There are effective over-the-counter medications for treatment of the common cold. (4) Antibiotics do not help treat common cold. (5) The common cold can generally be managed at home.

Croup

Croup is a common childhood viral illness that is easily recognized because of the distinctive characteristics that children have when they become infected. Like most viral illnesses, there is no cure for croup, but there are many symptomatic treatments that can help your child to feel better faster.

Croup also called laryngotracheobronchitis, most commonly affects children between the ages of six months and three years.

Croup Symptoms

Symptoms, which often include a runny nose and a brassy cough, develop about 2-6 days after being exposed to someone with croup.

One of the distinctive characteristics of croup is the abrupt or sudden onset of symptoms. Children will usually be well when they went to bed, and will then wake up in the middle of the night with a croupy cough and trouble breathing. The cough that children with croup have is also distinctive. Unlike other viral respiratory illnesses, which can cause a dry, wet, or deep cough, croup causes a cough that sounds like a barking seal.

Another common sign or symptom of croup is inspiratory stridor, which is a loud, high-pitched, harsh noise that children with croup often have when they are breathing in. Stridor is often confused with wheezing, but unlike wheezing, which is usually caused by inflammation in the lungs, stridor is caused by inflammation of the larger airways.

Children with croup are usually about 6 months to 6 years old, have a few days of a low grade fever or up to 102°F or 104°F, although some kids with croup don't have any fever at all, cough, and runny nose may be visible symptoms

Also characteristic is that the symptoms are worse at night and when your child gets agitated, and are better during the day and when he calms down. Symptoms can also get better when your child is exposed to cool air, which explains why many children get better on the way to the emergency room.

Croup Treatment

For most children with viral croup, spasmodic croup or infectious laryngitis, the following simple measures are all that is necessary to alleviate the symptoms:

(1) Administer mist therapy which involves sitting in a steam-filled bathroom, with the window open and the door closed. Turn on the hot water in the shower or tub and let the room fill up with steam. Sit with the child in the room, with the water still running, for 10 minutes. (2) Bundle the child up in warm clothes and take them outside in the cool night air for 10-15 minutes. (3) Use a cool mist vaporizer or humidifier in the child's room. (4) Give the child plenty of clear fluids such as apple juice, water or popsicles to suck on. (5) Treat the fever with acetaminophen. (6) Avoid smoke or smoke-filled rooms. (7) Keep the child calm and reassured.

Diphtheria

Diphtheria is an acute infectious disease caused by the bacteria *Corynebacterium diphtheria*.

Diphtheria causes

Diphtheria spreads through respiratory droplets (such as those produced by a cough or sneeze) of an infected person or someone who carries the bacteria but has no symptoms. Diphtheria can also be spread by contaminated objects or foods (such as contaminated milk).

The bacterium most commonly infects the nose and throat. The throat infection causes a gray to black, tough, fiber-like covering, which can block the airways. In some cases, diphtheria may first infect the skin, producing skin lesions.

Once infected, dangerous toxins, produced by the bacteria, can spread through your bloodstream to other organs, such as the heart, and cause significant damage.

Diphtheria symptoms

Symptoms usually occur 2 to 5 days after you have come in contact with the bacteria.

(1) Bluish coloration of the skin (2) Bloody, watery drainage from nose (3) Breathing problems; difficulty in breathing, Rapid breathing, Stridor (4) Chills (5) Croup-like (barking) cough (6) Drooling (suggests airway blockage is about to occur) (7) Fever (8) Hoarseness (9) Painful swallowing (10) Skin lesions (usually seen in tropical areas) (11) Sore throat (may range from mild to severe).

Note: There may be no symptoms at all.

Diphtheria treatment

If the health care provider thinks you have diphtheria, treatment should be started immediately, even before test results are available.

Diphtheria antitoxin is given as a shot into a muscle or through an IV (intravenous line). The infection is then treated with antibiotics, such as penicillin and erythromycin.

People with diphtheria may need to stay in the hospital while the antitoxin is being received. Other treatments may include:

(1) Fluids by IV (2) Oxygen (3) Bed rest (4) Heart monitoring (5) Insertion of a breathing tube (6) Correction of airway blockages.

Anyone who has come in contact with the infected person should receive an immunization or booster shots against diphtheria. Protective immunity lasts only 10 years from the time of vaccination, so it is important for adults to get a booster of tetanus-diphtheria (Td) vaccine every 10 years.

Those without symptoms who carry diphtheria should be treated with antibiotics.

Influenza

Influenza, commonly called "the flu", is an illness caused by RNA viruses that infect the respiratory tract of many animals, birds, and humans.

Influenza causes

The infection is a result of the entry and establishment of the influenza virus into the body, which may gain entry into the system due to inhalation of infectious particles from another infected source.

Influenza symptoms

In most people, the infection results in the person getting fever, cough, headache, and malaise (tired, no energy); some people may also develop a sore throat, nausea, vomiting, and diarrhea. The majority of individuals have symptoms for about one to two weeks and then recover with no problems. However, compared with most other viral respiratory infections, such as the common cold, influenza (flu) infection can cause a more severe illness with a mortality rate (death rate) of about 0.1% of people who are infected with the virus.

Influenza treatment

Typically, there is little that is done to treat the flu in otherwise healthy people.

Home Treatment

(1) Bed rest (2) Drink extra fluids – at least one full glass of water or juice every hour. (3) Acetaminophen, or Ibuprofen can relieve head and muscle aches. Aspirin should be avoided for children.

Legionnaires' Disease

Legionnaires' Disease is a severe bacterial infection of the respiratory tract, caused by *Legionella pneumophila*.

Legionnaires' Disease causes

The major environmental source of the infection is water from reservoirs and cooling units of air conditioning systems. Lakes, creeks, and areas of excavation also may harbor the bacteria. Transmission is by breathing in droplets of contaminated water. Person-to-person transmission has not been documented.

Legionnaires' Disease symptoms

The symptoms are similar to those of many other respiratory diseases, making it difficult to differentiate and diagnose. Symptoms may include dry coughing, high fever, chills, diarrhea, shortness of breath, chest pains, headaches, excessive sweating, nausea, vomiting, and abdominal pain. Occasionally, bloody sputum is produced. Lethargy and confusion can occur in progressive, serious cases.

Legionnaires' Disease treatment

Treatment includes an antibiotic, usually erythromycin, azithromycin, ciprofloxacin, or levofloxacin.

Hospitalization may be required.

Pleurisy

Pleurisy is inflammation of the lining of the lungs and chest (the pleura) that leads to chest pain (usually sharp) when you take a breath or cough.

Pleurisy causes

Pleurisy may develop when you have lung inflammation due to infections such as pneumonia or tuberculosis. It is often a sign of a viral infection of the lungs. This inflammation also causes the sharp chest pain of pleurisy.

Pleurisy may also occur with:

(1) Asbestos-related disease (2) Certain cancers (3) Chest trauma (4) Pulmonary embolus (5) Rheumatic diseases

Pleurisy symptoms

The main symptom of pleurisy is pain in the chest. This pain most likely occurs when you take a deep breath in or out, or cough. Some people feel the pain in the shoulder. Pleurisy can cause fluid to collect inside the chest cavity. This can make breathing difficult and may cause the following symptoms:

(1) Bluish skin color (cyanosis) (2) Coughing (3) Shortness of breath (4) Rapid breathing (tachypnea)

Pleurisy treatment

The health care provider can remove fluid in the lungs by thoracentesis and check it for signs of infection.

Treatment depends on what is causing the pleurisy. Bacterial infections are treated with antibiotics. Some bacterial infections require a surgical procedure to drain all the infected fluid.

Viral infections normally run their course without medications. Acetaminophen or anti-inflammatory drugs such as ibuprofen to allay the pain associated with pleurisy.

Sinusitis

Sinusitis simply means your sinuses are infected or inflamed.

Sinusitis causes

The inflammation of the sinuses may be the result of viral and or bacterial infections, which may last up to 2 weeks, however may be chronic and last for months.

Sinusitis symptoms

One of the most common symptom of acute or chronic sinusitis is pain, and the location depends on which sinus is affected. If you have pain;

(1) In your forehead over the frontal sinuses, your frontal sinuses may be inflamed. (2) In your upper jaw and teeth and your cheeks are tender to the touch, your maxillary sinuses may be infected. (3) Between your eyes, sometimes with swelling of the eyelids and tissues around your eyes, stuffy nose, loss of smell, and tenderness when you touch the sides of your nose, your ethmoid sinuses may be inflamed. (4) In your neck, with earaches and deep aches at the top of your head, your sphenoid sinuses may be infected, though these sinuses are less frequently affected.

However, most people with sinusitis have pain or tenderness in several locations, and their symptoms usually do not clearly point out which sinuses are inflamed.

Sinusitis treatment

After diagnosing sinusitis and identifying a possible cause, your health care provider can suggest various treatments.

(1) Antibiotics to control a bacterial infection, if present (2) Pain relievers to reduce any pain (3) Decongestants to reduce congestion (4) Nasal steroid sprays (5) Oral steroids

Tuberculosis

Tuberculosis is caused by the infectious agent known as *Mycobacterium tuberculosis* (Mtb). This rod-shaped bacterium, also called Koch's bacillus, was discovered by Dr. Robert Koch in 1882.

Tuberculosis causes

When a person breathes in Mtb-contaminated air, the inhaled TB bacteria reach the lungs. This causes an Mtb infection. However, not everyone infected with TB bacteria becomes sick. The bacteria can remain dormant (asleep) for years and not cause any TB disease. This is called latent TB infection. People who have latent TB infection do not get sick and do not spread the bacteria to others. But, some people with latent TB infection eventually do get TB disease.

Tuberculosis symptoms

Early symptoms of active TB can include weight loss, fever, night sweats, and loss of appetite. Symptoms may be vague, however, and go unnoticed by the affected person. For some, the disease either goes into remission (halts) or becomes chronic and more debilitating with cough, chest pain, and bloody sputum (saliva). Symptoms of TB involving areas other than the lungs vary, depending upon the organ or area affected.

Tuberculosis treatment

Successful treatment of TB depends on close cooperation between patient and the health care provider. Treatment usually combines several different antibiotic drugs that are given for at least 6 months, sometimes for as long as 12 months.

Some people with TB do not get better with treatment because their disease is caused by a TB strain that is resistant to one or more of the standard TB drugs. If that happens, their health care providers will prescribe different drugs and increase the length of treatment.

Respiratory infections are not restricted to any one in particular however, a healthy well hydrated and adequately nourished person is better equipped to deal with such a condition.

Encyclopedia

Disinfectant: Disinfection was first introduced by Joseph Lister who introduced "carbolic acid" (phenol), the first disinfectant. Today disinfectants are widely used in the health care, food and pharmaceutical sectors to prevent unwanted microorganisms from causing disease. These are chemicals that act to disrupt significant cellular structures or processes in order to kill or eliminate microorganisms.

Disinfection is defined as a process that eliminates many if not all pathogenic organisms. Most agricultural, veterinary and food users are aiming for disinfection since their facilities are not designed for sterilization.

Disinfectant Strength

Generally, a commercially available disinfectant will exhibit the ability to reduce microbial contamination by several orders of magnitude in a standard test method in order to be approved for use. In use however, not all disinfectants exhibit the activity that one would expect based on standardized tests. There are many reasons for this but one of the main points to consider is the carefully controlled conditions of the standard test methods and/are simply not the same as the real world. One well known is the failure of quaternary ammonium compounds in the presence of anionic detergents and, in the case of some formulations, hard water. These conditions disrupt the binding of the quaternary ammonium compounds to the microbial cell membrane.

The other factor is that some of the targeted organisms are more difficult to kill than the standard test specimens.

Resistance to Disinfectant Chemicals

Generally, the resistance of microorganisms to disinfection is due to the existing cellular structures and life cycle adaptations. It is important to read the label carefully and follow the manufacturer's directions to achieve the best results.

Successful Disinfection

The first step in successful disinfection is to choose a disinfectant that will act on the types of microorganism that is to be eliminated. For example, a quaternary ammonium formulation will not be effective against bacterial spores while a formaldehyde based product would. The next step is to confirm that the disinfectant is compatible with the planned application: it is difficult to disinfect bare wood structures such as bank barns.

Disinfectants depend on binding or reaction with bacterial cell membranes to kill microorganisms. Disinfectant chemicals are not selective, formaldehyde will react with any acceptor not just microbial proteins, similar observations have been made for all the other disinfectant chemicals. It is therefore crucial to thoroughly clean and rinse all surfaces and equipment prior to disinfection. Cleaning also removes large numbers of microorganisms from surfaces or equipment so that the disinfectant will achieve large reductions in the remaining organisms due to its higher effective concentration.

Following cleaning, the disinfectant should be applied according to the label instructions. It is important not to mix insecticides or other chemicals with the disinfectant, not only might the efficacy of both the disinfectant and the insecticide be reduced, but in some cases dangerous chemical reactions will occur. The full contact time specified on the label should be allowed prior to rinsing any surfaces or equipment that may contact feed or drinking water.

It is important to take temperature into account when determining contact times: chemical binding and reactions are strongly affected by temperature. When disinfecting in the winter, the contact times should be extended in low temperature environments and probably not attempted at all if the temperature is below freezing.

Antiseptics in Sitz Baths

Water has been used medicinally for thousands of years, with traditions rooted in ancient China, Japan, India, Rome, Greece, the Americas, and the Middle East. There are references to the therapeutic use of mineral water in the Old Testament. During the Middle Ages, bathing fell out of favor due to health concerns, but by the 17th century, "taking the waters" at hot springs and spas became popular across Europe (and later in the United States).

Hydrotherapy is broadly defined as the external application of water in any form or temperature (hot, cold, steam, liquid, ice) for healing purposes. Modern hydrotherapy originated in 19th century Europe with the development of spas for "water cure" ailments, ranging from anxiety to pneumonia to back pain. In modern times, a wide variety of water-related therapies are used, Sitz bath is one of them.

Sitz bath originates from the German word *Sitzen*, meaning 'to sit'. A sitz bath, also known as hip bath, refers to a bath where the pelvic region is immersed in water. It is a form of hydrotherapy – use of hot/cold water/steam/ice – to increase blood flow to the pelvic and abdominal area and help reduce inflammation and other variety of problems. Sitz baths are used in the management of back pain, sore muscles/muscle spasm, body aches, sprains, anorectal disorders (a group of medical disorders that occur at the junction of the anal canal and the rectum), pruritis (itching), inflammation, rashes, anxiety, for wound care/hygiene, and to promote relaxation. Sitz baths are commonly used in conjunction with other pharmacological therapies such as analgesics, stool softeners, fiber supplements, and antibiotics in managing anorectal disorders. For various ailments, different temperatures are used, and minerals or medications are added to the water.

Hot Sitz baths are particularly useful in disorders such as hemorrhoids, muscular disorders, painful ovaries and testicles, prostate problems and uterine cramps. Heat causes vasodilation (expansion of blood vessels) which increases blood flow in the area and this increases the amount of oxygen, nutrients, and white blood cells delivered to the body tissues. Vasodilation also helps in removal of waste products from injured tissues such as the debris from phagocytosis. Hot sitz bath also assists in wound healing, reduction of inflammation & pain and promote drainage of infected material out of wounds. Warm water also helps the larger muscles of the body to relax, helping ease the tone of the rectal sphincter (something that can cause hemorrhoids to get worse or become painful).

Cold Sitz bath is useful in the treatment of constipation, impotence, inflammation, muscle disorders and vaginal discharge. Cold causes vasoconstriction (shrinkage of vessels) which decreases the amount of blood flow to the area, slowing the body's metabolism and its requirement for oxygen. Cold Sitz bath help in controlling hemorrhage, reducing edema, easing inflammation, blocking pain receptors and slowing down microbial activity in clients with an infection. Hot and cold Sitz bath are also used to treat diseases of the abdomen.

The first thing to be careful with a Sitz bath is the issue of hygiene. There are reports of infection outbreaks during the period of use of Sitz bath. To overcome this complication it is advised to maintain hygiene by cleaning the Sitz bath equipment well in between uses and use clean water. Addition of a broad spectrum **antiseptic** to Sitz bath water inhibits the growth of bacteria and other organisms, prevents infections and helps in the treatment of open wounds.

Antiseptics are agents that destroy or inhibit the growth and development of microorganisms in or on living tissue. Unlike antibiotics that act selectively on a specific target, antiseptics have multiple targets and a broader spectrum of activity, which include bacteria, fungi, viruses, protozoa, and even prions. Antiseptics are mainly used to reduce levels of microorganisms on the skin and mucous membranes. The skin and mucous membranes of the mouth, nose, and vagina are home to a large number of harmless micro-organisms. However, when the skin or mucous membranes are damaged or breached in surgery, antiseptics can be used to disinfect the area and reduce the chances of infection.

Use of antiseptics on open wounds helps in the prevention and treatment of infection and increases rate of healing process. It is an established fact that infections may delay healing, cause failure of healing, and even cause wound deterioration through several different mechanisms, such as persistent production of inflammatory mediators, metabolic wastes, and toxins, and maintenance of the activated state of neutrophils, which produce cytolytic enzymes and free oxygen radicals. This prolonged inflammatory response contributes to host injury and delays healing. Moreover, bacteria compete with host cells for nutrients and oxygen necessary for wound healing. Wound infection can also lead to tissue hypoxia, render the granulation tissue hemorrhagic and fragile, reduce fibroblast number and collagen production, and damage reepithelisation. Consequently, although creation of an optimal environment for the wound healing process is currently the primary objective of wound care, addressing infection still plays a critical role in wound management. Antiseptics are also preferable to topical antibiotics with regard to development of bacterial resistance. Antibiotic resistance of skin wound flora has emerged as a significant problem. Although resistance towards antiseptics has been reported, it is to a significantly lesser degree than reported with antibiotic usage. Payne, et al.,(1998) states that the sensible use of antiseptics could help decrease the usage of antibiotics, preserving their advantage for clinically critical situations. Antiseptics are also considered superior to topical antibiotics when their rates of causing contact sensitization are compared. Patients allergic to one antibiotic may acquire cross-allergy to other antibiotics, as well.

The next thing to be careful about is; which antiseptic to put into the water for Sitz bath. Traditionally, potassium permanganate, iodine/iodophores, Epsom salt and boric powder are commonly

used in Sitz baths. As per the WHO Model Prescribing Information on drugs used in Skin Diseases (1997), potassium permanganate is a powerful oxidizing agent that is used as an antiseptic agent. Skin irritation is a common problem in patients using potassium permanganate. Brown staining of the skin and sticky feeling also occurs due to which patients avoid to take Sitz bath.

Iodophores are being used for various medical procedures including Sitz bath as well as wound management for a long time. But povidone iodine is not a safe and effective antiseptic. 'Guidelines for hand hygiene in health-care settings' of CDC, USA states about iodine and iodophores (eg. povidone iodine) that

- Antimicrobial activity of iodophores can be affected by pH, temperature, exposure time, concentration of total available iodine and amount and type of organic and inorganic compounds present (eg. Alcohols and detergents)
- In concentrations used in antiseptics, iodophores are not sporicidal
- In studies in which bacterial counts were obtained after gloves were worn for 1-4 hours after washing, iodophores have demonstrated poor persistent activity
- The in-vivo antimicrobial activity of iodophores is substantially reduced in the presence of organic substances (eg. Blood, serum & other body fluids)
- Iodophores cause irritant dermatitis more frequently as compared to other antiseptics
- There are also reports of iododerma (skin reaction related to high levels of iodine in the body) following Sitz bath with povidone-iodine (Aydingöz et al., 2007).
- Iodophores such as povidone iodine have other drawbacks also, viz. *Can not be used for thyroid patients, *Are known to be cytotoxic, *Known to become contaminated with *Pseudomonas* sp and have caused outbreaks of infection.

Development of resistance in pathogens against traditional antiseptics due to over exposure is also possible. Therefore, it is important to use an ideal antiseptic which is of a new generation, powerful, broad spectrum, highly effective, has residual activity, non-stinging, safe and resistance free.

Poly (hexamethylenbiguanide) hydrochloride (PHMB) is one such antimicrobial agent which is successfully used in antiseptics. **PHMB** was first introduced by Willenegger in 1994 as an antiseptic in abdominal surgery. Over the past years ready to use wound care products containing **PHMB** have been successfully launched.

PHMB is a polymeric biguanide. It is a poly-cationic linear polymer comprising of a hydrophobic backbone with multi cationic groups separated by hexamethylene chain. The basic molecular chain of **PHMB** can be repeated from 2 to 30 times, with increasing antiseptic/antimicrobial efficacy. **PHMB** is also structurally similar to naturally occurring antimicrobial peptides (AMPs). AMPs have been suggested as therapeutic alternatives to antibiotics. They are positively-charged molecules that bind to bacterial cell membrane and induce cell lysis, in a similar way

that penicillin and cephalosporin antibiotics do. The structural similarities between AMPs and **PHMB** mean that **PHMB** can insert into bacterial cell membranes and kill bacteria in a similar way to AMPs.

Benefits of **PHMB** are

- Chemically stable and non volatile
- Can be easily rinsed with water and do not have residual streaks or tackiness
- Effective and stable over a wide pH range (4-10)
- Novel non specific mode of action
- No known evidence of development of organism resistance
- High activity against *Pseudomonas*, MRSA, VRE, food borne pathogens, viruses and so on
- Remains active in the presence of organic matter
- Effective against biofilms
- Not cytotoxic to human cells
- No skin sensitization/irritation
- Can be used for thyroid patients
- Very high safety profile (LD50 > 2000 mg/kg body wt)
- Uniform dispersion within the matrix
- Does not damage or harm the surrounding healthy tissue
- Promotes epithelisation and healing
- Maintains hydrobalance in the wound
- Reduces pain
- Non-irritating/non-staining and non-malodourous

Over the past years end – use (ready to use) wound care products containing **PHMB** have been successfully launched including antiseptics, wound rinsing solutions, wound gels and dressings. **PHMB** containing wound rinsing solutions show superior wound healing due to its antimicrobial efficacy as well as its ability to maintain the moist environment. In wound care, **PHMB** has also been demonstrated to block *Pseudomonas aeruginosa* induced infection.

PHMB in the form of an antiseptic, can be conveniently introduced in Sitz baths; and bears many advantages; Sitz baths may contain high levels of organic matter depending on the use and keeping quality of the bath vessel, **PHMB** being active in the presence of organic matter assures that the antiseptic properties of the **PHMB** solution are fully harnessed, thereby, being ideal for Sitz baths.

Being non – cytotoxic to human cells, **PHMB** does not cause any skin sensitization or irritation. The fact that **PHMB** can be used for thyroid patients and has a very high safety profile, makes **PHMB** based antiseptics a preference among antiseptics used in Sitz bath.

PHMB aids in reducing pain, epithelisation and healing, and does not damage or harm the surrounding healthy tissue. **PHMB** being non staining and non malodorous has a clear advantage over contemporary antiseptics used in Sitz baths.

These special features of **PHMB** qualify **PHMB** based antiseptics for their effective application in wound care management including Sitz bath.



Christiaan Eijkman

Birth: August 11, 1858

Death: November 5, 1930

Nationality: Dutch

Known for: Demonstration that Beriberi is caused by poor diet and thus, led to the discovery of vitamins

Christiaan Eijkman was born on August 11, 1858, at Nijkerk in Gelderland (The Netherlands), the seventh child of Christiaan Eijkman, the headmaster of a local school, and Johanna Alida Pool. A year later, in 1859, the Eijkman family moved to Zaandam, where his father was appointed head of a newly founded school for advanced elementary education. It was here that Christiaan and his brothers received their early education. In 1875, after taking his preliminary examinations, Eijkman became a student at the Military Medical School of the University of Amsterdam, where he was trained as a medical officer for the Netherlands Indies Army, passing through all his examinations with honors.

From 1879 to 1881, he was an assistant of T. Place, Professor of Physiology, during which time he wrote his thesis *On Polarization of the Nerves*, which gained him his doctor's degree, with honors, on July 13, 1883. That same year he left Holland for the Indies, where he was made medical officer of health first in Semarang later at Tjilatjap, a small village on the south coast of Java, and at Padang Sidempoean in W. Sumatra. It was at Tjilatjap that he caught malaria which later so impaired his health that he, in 1885, had to return to Europe on sick-leave.

For Eijkman this was to prove a lucky event, as it enabled him to work in E. Forster's laboratory in Amsterdam, and also in Robert Koch's bacteriological laboratory in Berlin; here he came into contact with A. C. Pekelharing and C. Winkler, who were visiting the German capital before their departure to the Indies. In this way, medical officer Christiaan Eijkman was seconded as assistant to the Pekelharing-Winkler mission, together with his colleague M. B. Romeny. This mission had been sent out by the Dutch Government to conduct investigations into beriberi, a disease which at that time was causing havoc in that region.

In 1887, Pekelharing and Winkler were recalled, but before their departure Pekelharing proposed to the Governor General that the laboratory which had been temporarily set up for the Commission in the Military Hospital in Batavia should be made permanent. This proposal was readily accepted, and Christiaan Eijkman was appointed its first Director, at the same time being made Director of the "Dokter Djawa School" (Javanese Medical School). Thus ended Eijkman's short military career - now he was able to devote himself entirely to science.

Eijkman was Director of the "Geneeskundig Laboratorium" (Medical Laboratory) from January 15, 1888 to March 4, 1896, and during that time he made a number of his most important researches. These dealt first of all with the physiology of people living in tropical regions. He was able to demonstrate that a number of theories had no factual basis. Firstly he proved that in the blood of Europeans living in the tropics the number of red corpuscles, the specific gravity, the serum, and the water content, undergo no change, at least when the blood is not affected by disease which will ultimately lead to anaemia. Comparing the metabolism of the European with that of the native, he found that in the tropics as well in the temperate zone, this is entirely governed by the work carried out. Neither could he find any disparity in respiratory metabolism, perspiration, and temperature regulation. Thus Eijkman put an end to a number of speculations on the acclimatization of Europeans in the tropics which had hitherto necessitated the taking of various precautions.

But Eijkman's greatest work was in an entirely different field. He discovered, after the departure of Pekelharing and Winkler, that the real cause of beriberi was the deficiency of some vital substance in the staple food of the natives, which is located in the so-called "silver skin" (pericarpium) of the rice. This discovery has led to the concept of vitamins. This important achievement earned him the Nobel Prize in Physiology or Medicine for 1929. This late recognition of his outstanding merits has ended all criticism of his work. In addition to his work on beriberi, he occupied himself with other problems such as arach fermentation, and indeed still had time to write two textbooks for his students at the Java Medical School, one on physiology and the other on organic chemistry.

In 1898 he became successor to G. Van Overbeek de Meyer, as Professor in Hygiene and Forensic Medicine at Utrecht. His inaugural speech was entitled *Over Gezondheid en Ziekten in Tropische Gewesten* (On health and diseases in tropical regions). At Utrecht, Eijkman turned to the study of bacteriology, and carried out his well-known fermentation test, by means of which it can be readily established if water has been polluted by human and animal defaecation containing coli bacilli. Another research was into the rate of mortality of bacteria as a result of various external factors, whereby he was able to show that this process could not be represented by a logarithmic curve. This was followed by his investigation of the phenomenon that the rate of growth of bacteria on solid substratum often decreases, finally coming to a halt. *Beijerinck's* auxanographic method was applied on several occasions by Eijkman, as for example during the secretion of enzymes which break down casein or bring about haemolysis, whereby he could demonstrate the hydrolysis of fats under the influence of lipases.

As a lecturer he was known for his clarity of speech and demonstration, his great practical knowledge standing him in good stead. He had a preeminently critical mind and he continuously warned his students against the acceptance of dogmas. But Eijkman did not confine himself to the University he also engaged himself in problems of water supply, housing, school hygiene, physical education; as a member of the *Gezondheidsraad* (Health Council) and the *Gezondheidscommissie* (Health Commission) he participated in the struggle against alcoholism and tuberculosis. He was the founder of the *Vereeniging tot Bestrijding van de Tuberculose* (Society for the struggle against tuberculosis).

His unassuming personality has contributed to the fact that his great merits were at first not really appreciated in his own country; but anyone who had the privilege of coming into close contact with him, quickly perceived his keen intellect and extensive knowledge.

In 1907, Eijkman was appointed Member of the Royal Academy of Sciences (The Netherlands), after having been Correspondent since 1895. The Dutch Government conferred upon him several orders of knighthood, whereas on the occasion of the 25th anniversary of his professorship a fund has been established to enable the awarding of the Eijkman Medal. But the crown of all his work was the award of the Nobel Prize in 1929.

Eijkman was holder of the John Scott Medal, Philadelphia, and Foreign Associate of the National Academy of Sciences in Washington. He was also Honorary Fellow of the Royal Sanitary Institute in London.

In 1883, before his departure to the Indies, Eijkman married Aaltje Wigeri van Edema, who died in 1886. In Batavia, Professor Eijkman married Bertha Julie Louise van der Kemp in 1888; a son, Pieter Hendrik, who became a physician, was born in 1890. He died in Utrecht, on November 5, 1930, after a protracted illness.

Enjoy the humour

“But why study philosophy? It doesn't make you any happier.”

“No, but it enables me to be unhappy more intelligently.”

Lawyer: “Do you realize you are facing the electric chair?”

Prisoner: “I don't mind facing it. It's sitting down in it that gets me.”

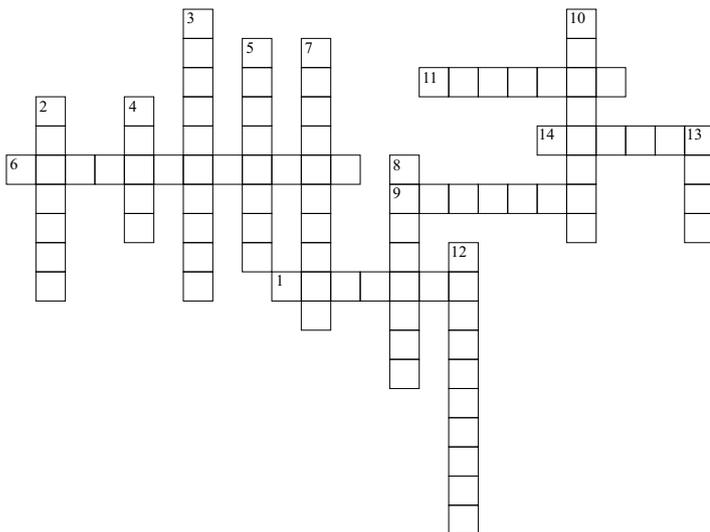
A profane man walked up to the new minister and said, “Your face looks familiar, but I can't figure out why. Where in hell have I seen you before?”

The minister answered, with a pleasant smile, “What part of hell do you come from?”

A customer sat down at a table in a smart restaurant and tied a napkin around his neck. The scandalized manager called a waiter and instructed him. “Try and make him understand as tactfully as possible that that's not done.”

Said the thoughtful waiter to the customer: “Pardon me, sir. Shave or haircut?”

Track your brain



3. _____ (10) is an acute inflammation of the air passage within the lungs.
4. _____ (5) is also called laryngotracheobronchitis.
5. _____ (8) is the inflammation of the lining of the lungs and chest.
7. _____ (10) cause irritant dermatitis more frequently as compared to other antiseptics.
8. Christiaan Eijkman demonstrated that _____ (8) is caused by poor diet.
10. Pneumococcus can be typed using the _____ (8) test.
12. _____ (10) survives for up to 90 days on porous paper but only for 60 days on non porous aluminum in contrast to most viruses.
13. A biological safety cabinet (BSC) is equipped with _____ (4) filter.



Thoughts to live by

- Common sense in an uncommon degree is what the world calls wisdom. (Samuel Taylor Coleridge)
- Only a life lived for others is a life worthwhile. (Albert Einstein)
- Important principles may, and must, be inflexible. (Abraham Lincoln)
- If you can, help others; if you cannot do that, at least do not harm them. (Dalai Lama)
- We shall never know all the good that a simple smile can do. (Mother Teresa)



Across

1. _____ (7) require oxygen for their cellular respiration.
6. _____ (12) is defined as the external application of water in any form or temperature for healing purposes.
9. _____ (7) fermentation is the test by means of which it can be readily established if water has been polluted by human and animal feces containing coli bacilli.
11. Diseases that spread by droplet transmission, fecal-oral transmission, or contact transmission, often do so by means of _____ (7).
14. Either 70% ethanol or 10% _____ (6) solution is used to disinfect surfaces prior and after microbiological procedures.

Down

2. The _____ (7) cartilage is also known as the 'Adam's apple'.

Check your Answers on Page 16



Pneumococcus species

Pneumococci were first noticed in 1881 by Pasteur and Sternberg independently. They produced a fatal septicaemia in rabbits by inoculating human saliva and inoculated pneumococci from the blood of the animals. But the relation between pneumococci and pneumonia was established only later by Fraenkel and Weichselbaum independently on 1886.

Characteristics

Pneumococci are Gram positive, lanceolate diplococci which resemble the viridans streptococci, with which they were classified formerly. Pneumococcus has been reclassified as *Streptococcus pneumoniae* because of its genetic relatedness to streptococcus. They however differ from streptococci chiefly in their morphology, bile solubility, optochin sensitivity and possession of a specific polysaccharide capsule. Pneumococci are normal inhabitants of the upper respiratory tract of humans. They are the most prevalent single bacterial agent in pneumonia and in otitis media in children. They can also cause sinusitis, bronchitis, bacteraemia, meningitis and other infections.

Morphology

Pneumococci are typically small, approx 1 µm, slightly elongated cocci, with one end broad or rounded and the other pointed, presenting a flame shaped or lanceolate appearance. They occur in pairs (diplococci), with the broad ends in apposition, the long axis of the coccus parallel to the line joining the two cocci in a pair. Capsules are best seen in material taken directly from exudates and may be lost on repeated cultivation. In cultures, the typical morphology may not be apparent and the cocci are more rounded, tending to occur in short chains. They are non motile and non sporing.

They are readily stained with aniline dyes and are Gram positive. The capsule may be demonstrated as a clear halo in Indian ink preparations or may be stained directly by special techniques.

Cultural Characteristics

Pneumococci have complex growth requirements and grow only in enriched media. They are aerobes and facultative anaerobes, the optimum temperature being 37°C (range 25°C–42°C) and pH 7.8 (range 6.5–8.3). Growth is improved by 5–10 per cent CO₂.

On blood agar, after inoculation for 18 hours, the colonies are small (0.5–1 mm), dome shaped and glistening, with an area of greenish discoloration (alpha hemolysis) around them.

On further incubation, the colonies become flat, with raised edges and central umbonation, so that concentric rings are seen when viewed from above (draughtsman appearance). Some strains produce abundant capsular material from large mucoid colonies (*Diplococcus mucosus*).

Under anaerobic conditions colonies on blood agar are surrounded by a zone of beta hemolysis due to oxygen labile pneumolysin O. In liquid media such as glucose broth, growth occurs as uniform turbidity. The cocci readily undergo autolysis in cultures, due to the activity of intracellular enzymes. Autolysis is enhanced by bile salts, sodium lauryl sulphate and other surface agents. Heat killed cultures do not undergo autolysis.

Biochemical Reactions

Pneumococci ferment several sugars, forming acid only. Fermentation is tested in Hiss's serum water or serum agar slopes.

Fermentation of inulin by pneumococci is a useful test for differentiating them from streptococci as the latter do not ferment it.

Pneumococci are bile soluble. If a few drops of 10% sodium deoxycholate solution are added to 1.0 ml of an overnight broth culture, the culture clears due to the lysis of the cocci. Alternatively if a loopful of 10% deoxycholate solution is placed on a pneumococcus colony on blood agar the colony lyses within a few minutes. Bile solubility is a constant property of pneumococci and hence is of diagnostic importance. Pneumococci are catalase and oxidase negative.

Antigenic Properties

The most important antigen of the pneumococcus is the type specific capsular polysaccharide. As this polysaccharide diffuses into the culture medium of infective exudates and tissues, it is also called the 'specific soluble substance' (SSS). Pneumococci are classified into types based on the antigenic nature of the capsular polysaccharide.

Toxins and other virulence factors

Pneumococcal isolates produce few toxins; however, all serotypes produce pneumolysin, which is an important virulence factor that acts as a cytotoxin and activates the complement system. In addition, pneumolysin causes a release of tumor necrosis factor-alpha and interleukin-1.

Pneumococci also produce an oxygen labile hemolysin and a leucocidin, but these are weak and make no contribution to virulence. The virulence of pneumococci is directly dependent on the production of the capsular polysaccharide. This substance, because of its acidic and hydrophilic properties, protects the cocci from phagocytosis. Capsulated pneumococci are not phagocytosed efficiently in fluid media or exudates. They are, however, susceptible to 'surface phagocytosis', being engulfed against a firm surface, such as fibrin clot or epithelium.

The enhanced virulence of type 3 pneumococcus is due to the abundance of its capsular material. Noncapsulated strains are avirulent. The antibody to the capsular polysaccharide affords protection against infection.

Other potential virulence factors include cell surface proteins such as surface protein A and surface adhesin A and enzymes such as autolysin, neuraminidase, and hyaluronidase. The contributions of these substances to pneumococcal virulence are being studied extensively, and some are being investigated as potential vaccine constituents.

Pathogenicity

Lobar pneumonia does not always follow infection with a virulent pneumococcus. Airborne infection of the respiratory tract with pneumococcus is a frequent occurrence. The cocci are usually eliminated by the natural defense mechanism, or they establish symptomless carriage in the throat. Pneumonia results only when, in such a carrier, the general resistance is lowered. The pneumococci penetrate the bronchial mucosa and spread through the lung along the peribronchial tissues and lymphatics. Bacteraemia is frequent during the early stage of lobar

pneumonia and bears a relation to the severity and outcome of the disease. The toxemia is due to the diffusion of the capsular polysaccharide into the blood and tissues. The fall of temperature by 'crisis' and the relief of toxic symptoms coincide with the complete neutralization of SSS by the anticapsular antibody.

Bronchopneumonia is almost always a secondary infection and commonly follows viral infections of the respiratory tract. Pneumococcus is the most common aetiological agent. This may be caused by any serotype of pneumococcus. The damage to respiratory epithelium and excessive bronchial secretions caused by the primary infection facilitate the invasion of pneumococci along the bronchial tree. Other causative agents include *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Streptococcus pyogenes*, *Hemophilus influenzae*, *Pseudomonas aeruginosa*, *Proteus* species, *Serratia marcescens*, anaerobic organisms such as *Peptostreptococcus*, *Peptococcus*, *Fusobacterium* and *Bacteroides*. Bronchopneumonia is frequently a terminal event in aged and debilitated patients.

Pneumococci are commonly associated with the acute exacerbations in chronic bronchitis. The copious respiratory secretions in chronic bronchitis. The copious respiratory secretions in chronic bronchitis aid pneumococcal invasion. Another bacterium commonly associated with this condition is *H. influenzae*.

Meningitis is the most serious of pneumonia infections. It is usually secondary to other pneumococcal infections such as pneumonia, otitis media, sinusitis or conjunctivitis, but in a proportion of cases, other foci of infection may not be demonstrable. The disease is commoner in children. Untreated cases are, almost invariably fatal.

Pneumococci may also produce suppurative lesions in other parts of the body – empyema, pericarditis, otitis media, sinusitis, conjunctivitis, suppurative arthritis and peritonitis, usually as complications of pneumonia.

Epidemiology

Natural infection with pneumococci have been reported in species of animals such as guinea pigs, but they have little relation to human disease. The source of human infection is the respiratory tract of carriers, and less often of patients. Pneumococci occur in the throat of approximately half the population sampled at any one time. They are transmitted from one to another by an inhalation of contaminated dust, droplet nuclei. Dissemination is facilitated by crowding.

Infection usually leads only to temporary pharyngeal carriage. Disease results only when the host resistance is lowered by contributory factors such as respiratory viral infections, pulmonary congestion, stress, malnutrition or alcoholism. Pneumococcal serotypes vary greatly in virulence. The case fatality rates of pneumonia may vary according to the virulence of the infecting serotype.

Lobar pneumonia is usually a sporadic disease but epidemics may occur among closed communities as in army camps. The incidence of bronchopneumonia increases when an epidemic of influenza or other viral infections of the respiratory tract infections. Cases are more common in winter and affect the two extreme age groups more often.

Laboratory Diagnosis

The clinical diagnosis of pneumonia is easy, but as the disease may be caused by several different microorganisms, etiological diagnosis should be made by laboratory tests. This is of great importance in treatment.

In the acute phase of lobar pneumonia, the rusty sputum contains pneumococci in large numbers, with hardly any kind of bacterium. They may be demonstrated by Gram stain and typed by the Quellung test in wet films – a procedure that was routine when antisera were employed for treatment. In later stages of the disease, pneumococci are less abundant.

The sputum, after homogenisation if necessary, is inoculated on blood agar plates and incubated at 37°C under 5 – 10 per cent CO₂. Growth occurs after overnight incubation. Where sputum is not available, as in infants, serum coated laryngeal swabs may be used for culture.

The isolate of pneumococcus may be typed with appropriate antisera. Besides yielding epidemiological information, typing is also of prognostic significance. But routine typing is not necessary, nor is it possible as typing sera are not available.

From specimen where pneumococci are expected to be scanty, isolation may be obtained by intraperitoneal inoculation in mice, even if cultures are negative. Inoculated mice die in one to three days and pneumococci may be demonstrated in the peritoneal exudate and heart blood. The test may be negative with occasional strains that are avirulent for mice.

In the acute stage of pneumonia, the organism may be obtained from blood culture in glucose broth. Isolation of pneumococci from blood indicates bad prognosis.

In case of meningitis, presumptive diagnosis may be made from Gram stained films of Cerebro Spinal Fluid (CSF). Gram positive diplococci can be seen both inside polymorphs, as well as extracellularly. Diagnosis is confirmed by culture. In cases negative by culture, it may be possible to establish the diagnosis by demonstrating the SSS in CSF by precipitation with antisera. Capsular polysaccharide can be demonstrated in blood, urine and CSF by counterimmunoelectrophoresis. Antibodies can be demonstrated by agglutination, quantitative precipitation, mouse protection tests and bactericidal tests with whole blood. Indirect hemagglutination and radioimmunoassay have also been employed.

Treatment

Treatment is usually with lactam antibiotics. In the 1960s, nearly all strains of *S. pneumoniae* were susceptible to penicillin, but since that time, there has been an increasing prevalence of resistance, especially in areas of high antibiotic use. A varying proportion of penicillin-resistant strains may also be resistant to erythromycin, macrolides, clindamycin and the quinolones. Most remain susceptible to vancomycin, which is a less desirable antibiotic because of dosing and tissue penetration issues. Susceptibility testing is routine, with empiric antibiotic treatment, guided by resistance patterns in the community in which the organism was acquired.

Prevention

The best way to protect against pneumococcal disease is through vaccination. There are two types of pneumococcal vaccines currently available: a polysaccharide vaccine and a conjugate vaccine. The polysaccharide vaccine is used in adults and the conjugate vaccine is used in children.

What are Fomites?

Fomites are inanimate objects that carry disease-causing germs that spread infections. Fomites are one of the most common ways that kids get sick. However infections which are related to fomites are also significant in cases of adult and geriatric individuals. Diseases that spread by droplet transmission, fecal-oral transmission, or contact transmission often do so by means of fomites.

Toys in a daycare or in a doctor's waiting room may have been handled (or mouthed) by infected kids. Cutting boards and kitchen sponges may teem with bacteria from the uncooked food they have touched. Kids' toothbrushes in the same drawer or cup may be the way that colds spread through the family.

Germs commonly live on fomites for minutes or hours or sometimes even longer. The most likely fomites are objects that frequently come into contact with uncooked food, toileting or diapering activities, dirt, or the bodies of living creatures (especially if the objects are moist or are stored in a dark place). Tissues, diapers, hairbrushes, forks, and spoons are common fomites. Dry, impersonal objects, such as walls, light fixtures, or door frames, are less likely to spread infection.

Diseases that commonly spread by means of fomites include the common cold, cold sores, conjunctivitis, coxsackievirus (hand-foot-mouth disease), croup, *E. coli* infection, fifth disease ("slap cheek"), *Giardia*, impetigo, influenza, lice, meningitis, pinworms, rotavirus diarrhea, and RSV infection. Fomites are highly significant in the spread of viral infections.

FOMITES ARE OFTEN CULPRITS FOR VIRAL DISEASE TRANSMISSION...

Role of Fomites in Viral Disease Transmission

Fomites consist of both porous and nonporous surfaces or objects that can become contaminated with pathogenic microorganisms and serve as vehicles in transmission. During and after illness, viruses are shed in large numbers in body secretions, including blood, feces, urine, saliva, and nasal fluid. Fomites become contaminated with virus by direct contact with body secretions or fluids, contact with soiled hands, contact with aerosolized virus (large droplet spread) generated via talking, sneezing, coughing, or vomiting, or contact with airborne virus that settles after disturbance of a contaminated fomite (i.e., shaking a contaminated blanket). Once a fomite is contaminated, the transfer of infectious virus may readily occur between inanimate and animate objects, or vice versa, and between two separate fomites (if brought together). The nature and frequency of contact with contaminated surfaces vary for each person depending on age, personal habits, type of activities, personal mobility, and the level of cleanliness in the surroundings. Viral transfer and disease transmission is further complicated by variations in virus survival on surfaces and the release of viruses from fomites upon casual contact. Virus survival on fomites is influenced by intrinsic factors which include fomite properties or virus characteristics and extrinsic factors, including environmental temperature, humidity, etc.. If viruses remain viable on surfaces long enough to come in contact with a host, the virus may only need to be present in small numbers to infect the host. After contact with the host is achieved, viruses can gain entry into the host systems through portals of entry or contact with the mouth, nasopharynx, and eyes. Host susceptibility to viruses is influenced by previous contact

with the virus and the condition of the host immune system at the time of infection.

There are many complex variables that influence virus survival on fomites, viral transfer from fomites, and viral infection of the host. As a result, direct experimental evidence of viral transmission via fomite has been very difficult to generate due to a variety of uncontrollable variables and the unpredictability of human infection.

Epidemiological data indicating transmission via fomite are also difficult to evaluate. This difficulty stems from problems in distinguishing between different routes of transmission, such as person-to-person transmission or autoinoculation.

Currently, laboratory studies, epidemiological evidence, and disinfection intervention studies have generated strong indirect and circumstantial evidence that supports the involvement of fomites as a vehicle in respiratory and enteric virus transmission. Studies from a variety of disciplines investigating viruses clearly support the following: (i) most respiratory and enteric viruses can survive on fomites and hands for varying lengths of time; (ii) fomites and hands can become contaminated with viruses from both natural and laboratory sources; (iii) viral transfer from fomites to hands is possible; (iv) hands come in contact with portals of entry for viral infection; and (v) disinfection of fomites and hands interrupts viral transmission.

Viral Viability on Surfaces

The potential for a virus to be spread via contaminated fomite depends first on the ability of the virus to maintain infectivity while on the fomite surface. Viruses are obligate parasites; therefore, the level of viral infectivity on a fomite can only decrease over time. Several studies have demonstrated that viruses can remain infective on surfaces for different time periods. The length of time a virus remains viable depends on a number of complex variables. In general, UV exposure and pH have minimal effects on viral survival in indoor environments. Viral survival may increase or decrease with the number of microbes present on a surface. Increasing amounts of microbes can protect viruses from desiccation and disinfection, but deleterious effects may also result from microbial proteases and fungal enzymes. Typically, viral presence on fomites may decrease with surface cleanliness and increase with surface usage. However, some cleaning products or disinfectants are ineffective against viruses and can result in viral spread or cross-contamination of surfaces. Easily measured and predictable factors that influence viral survival on surfaces include fomite properties, initial viral titer, virus strain, temperature, humidity, and suspending medium. Intrinsic factors, like fomite properties, virus strain, and viral inoculation titer, consistently impact the total virus survival end point (hours, days). The majority of viruses remain viable longer on nonporous surfaces; however, there are exceptions. Astrovirus survives for 90 days on porous paper but only 60 days on nonporous aluminum. Initial inoculation titer can prolong viral survival on environmental surfaces.

Reference: Significance of Fomites in the Spread of Respiratory and Enteric Viral Disease; Stephanie A. Boone and Charles P. Gerba; Applied and Environmental Microbiology; Mar 2007.

Microbiological Lab: Health and Safety

In a workplace like a laboratory there is always a certain risk element, but the potential risks in a microbiology course are greater. Persons who work in a microbiology lab may handle infectious agents in addition to other hazardous materials such as chemicals and radioactive materials. There have been many documented cases of lab personnel acquiring diseases due to their work. About 20% of these cases have been attributed to a specific incident, while the rest have been attributed to work practices in the lab. It is possible that you can be exposed to potentially harmful microbes when you isolate bacteria from environmental materials. So, you should consider environmental samples potentially hazardous and use Biological Safety Level 2 (BSL2) containment practices.

A microbiology laboratory is a unique environment that requires special practices and containment facilities in order to properly protect persons working with microorganisms. Safety in the laboratory is of primary concern. The three main elements of safe containment of microorganisms are (1) good laboratory practices and technique, (2) safety equipment, and (3) facility design.

Microbiology Lab Practices and Safety Rules

1. Wash your hands with disinfectant soap when you arrive at the lab and again before you leave.
2. Absolutely no food, drinks, chewing gum, or smoking is allowed in the laboratory. Do not put anything in your mouth such as pencils, pens, labels, or fingers. Do not store food in areas where microorganisms are stored.
3. Purchase a lab coat and safety glasses, bring them to class, and use them. Alternatively, a long sleeved shirt that buttons or snaps closed is acceptable protective clothing. This garment must cover your arms and be able to be removed without pulling it over your head. Leave protective clothing in the lab and do not wear it to other non-lab areas.
4. Avoid loose fitting items of clothing. Wear appropriate shoes (sandals are not allowed) in the laboratory.
5. Keep your workspace free of all unnecessary materials. Backpacks, purses, and coats should be placed in the cubbyholes by the front door of the lab. Place needed items on the floor near your feet, but not in the aisle.
6. Disinfect work areas before and after use with 70% ethanol or fresh 10% bleach. Laboratory equipment and work surfaces should be decontaminated with an appropriate disinfectant on a routine basis, and especially after spills, splashes, or other contamination.
7. Label everything clearly.
8. Replace caps on reagents, solution bottles, and bacterial cultures. Do not open Petri dishes in the lab unless absolutely necessary.
9. Inoculating loops and needles should be flame sterilized in a Bunsen burner before you lay them down.
10. Turn off Bunsen burners when not in use. Long hair must be restrained if Bunsen burners are in use.
11. When you flame sterilize with alcohol, be sure that you do not have any papers under you.
12. Treat all microorganisms as potential pathogens. Use appropriate care and do not take cultures out of the laboratory.
13. Wear disposable gloves when working with potentially

infectious microbes or samples (e.g., sewage). If you are working with a sample that may contain a pathogen, then be extremely careful to use good bacteriological technique.

14. Sterilize equipment and materials.
15. Never pipette by mouth. Use a pipetting aid or adjustable volume pipettors. [In the distant past, some lab personnel were taught to mouth pipette. This practice has been known to result in many laboratory-acquired infections. With the availability of mechanical pipetting devices, mouth pipetting is strictly prohibited.]
16. Consider everything a biohazard. Do not pour anything down the sink. Autoclave liquids and broth cultures to sterilize them before discarding.
17. Dispose of all solid waste material in a biohazard bag and autoclave it before discarding in the regular trash.
18. Familiarize yourself with the location of safety equipment in the lab (e.g., eye-wash station, shower, sinks, fire extinguisher, biological safety cabinet, first aid kit, emergency gas valve).
19. Dispose of broken glass in the broken glass container.
20. Dispose of razor blades, syringe needles, and sharp metal objects in the "sharps" container.
21. Report spills and accidents immediately to your instructor. Clean small spills with care (see instructions below). Seek help for large spills.
22. Report all injuries or accidents immediately to the instructor, no matter how small they seem.

Laboratory Safety Equipment

Biological Safety Cabinet

A biological safety cabinet (BSC) is used as a primary barrier against exposure to infectious biological agents. A BSC has High Efficiency Particulate Air (HEPA) filters. The airflow in a BSC is laminar, i.e. the air moves with uniform velocity in one direction along parallel flow lines. Depending on the design, a BSC may be vented to the outside or the air may be exhausted into the room. BSCs are not chemical fume hoods. A percentage of the air is recirculated in most types of BSCs. HEPA filters only trap particulates, allowing any contaminant in non-particulate form to pass through the filter.

Proper Use of BSCs:

1. Operate the cabinet for five minutes before and after performing any work in it in order to purge airborne contaminants.
2. Before and after use, wipe the surface of the BSC with a suitable disinfectant, e.g., 70% alcohol or a 10% bleach solution.
3. Place everything you will need inside the cabinet before beginning work, including a waste container. You should not have to penetrate the air barrier of the cabinet once work has begun.
4. Do not place anything on the air intake grills, as this will block the air supply.
5. You should prevent unnecessary opening and closing of door because this will disrupt the airflow of the cabinet.
6. Always wear a lab coat while using the cabinet and conduct your work at least four inches inside the cabinet.
7. Place burners to the rear of the cabinet to reduce air turbulence.

8. Do not work in the BSC while the ultraviolet light is on. Ultraviolet light can quickly injure the eye.
9. When finished with your work procedure, decontaminate the surfaces of any equipment.
10. Remove the equipment from the cabinet and decontaminate the work surface.
11. Thoroughly wash your hands and arms.

Eyewash and shower

Fire Extinguisher

First Aid Kit

Emergency Gas Valve

Cleaning Small Spills

First, contact your instructor or the Biology Department Safety Officer. If it is a small spill of a low hazard microorganism or sample, then you should clean the spill yourself.

The proper procedures for cleaning **small spills** of microorganisms or samples (BSL1 and BSL2 levels):

1. Wear a lab coat, disposable gloves, safety glasses or a face shield, and if needed, approved respiratory equipment.
2. Soak a paper towel(s) in an appropriate disinfectant (70% ethanol or fresh 10% bleach solution) and place around the spill area.
3. Working from the outer edges into the center, clean the spill area with fresh towels soaked in the disinfectant. Be sure to decontaminate any areas or surfaces that you suspect may have been affected by the spill. Allow 10 minutes contact time.
4. Place the paper towels and gloves into a biohazard bag and autoclave these materials to sterilize them.
5. Dispose of any contaminated clothing properly.
6. Wash your hands with a disinfectant soap.

Biosafety Levels and Practices

The Centers for Disease Control (CDC) and the National Institutes of Health (NIH) have developed standard procedures providing protection against biological hazards. The publication, *Biosafety in Microbiological and Biomedical Laboratories* provides specific descriptions of microbiological practices, laboratory facilities, and safety equipment, and recommends their use in four biosafety levels (BSLs).

Biosafety levels are selected to provide the end-user with a description of the minimum containment required for handling different microorganisms safely in a laboratory setting and reduce or eliminate exposure to potentially hazardous agents. Containment refers to safe methods for managing infectious material in the laboratory environment. These biosafety levels are applicable to facilities such as diagnostic, research, clinical, teaching, and production facilities that are working at a laboratory scale.

The four biosafety levels are described as:

Biosafety Level 1 (BSL1)

Examples of BSL1 Agents: *Bacillus subtilis*, *Naegleria gruberi*, *Escherichia coli*, Infectious Canine Hepatitis Virus

BSL1 containment is suitable for work involving well-characterized agents not known to cause disease in healthy adult humans, and of minimal potential hazard to laboratory personnel and the environment.

A BSL1 lab requires no special design features beyond those suitable for a well-designed and functional laboratory. Biological safety cabinets (BSCs) are not required. Work may be done on an

open bench top, and containment is achieved through the use of practices normally employed in a basic microbiology laboratory.

Biosafety Level 2 (BSL2)

Examples of BSL2 Agents: *B. anthracis*, *Bordetella pertussis*, *Brucella* spp., *Cryptococcus neoformans*, *Clostridium botulinum*, *C. tetani*, *H. pylori*, most *Salmonella* spp., *Y. pestis*, *M. leprae*, *Shigella* spp., HIV, Human blood

The primary exposure hazards associated with organisms requiring BSL2 are through the ingestion, inoculation and mucous membrane route. Agents requiring BSL2 facilities are not generally transmitted by airborne routes, but care must be taken to avoid the generation of aerosols (aerosols can settle on bench tops and become an ingestion hazard through contamination of the hands) or splashes. Primary containment devices such as BSCs and centrifuges with sealed rotors or safety cups are to be used as well as appropriate personal protective equipment (i.e., gloves, laboratory coats, protective eyewear). As well, environmental contamination must be minimized by the use of hand washing sinks and decontamination facilities (autoclaves).

Biosafety Level 3 (BSL3)

Examples of BSL3 Agents: *M. tuberculosis*, *S. typhi*, Vesicular Stomatitis Virus, Yellow Fever Virus, *Francisella tularensis*, *Coxiella burnetii*

Laboratory personnel have specific training in handling these pathogenic and potentially lethal agents and are supervised by scientists who are experienced in working with these agents. These agents may be transmitted by the airborne route, often have a low infectious dose to produce effects and can cause serious or life-threatening disease. BSL3 emphasizes additional primary and secondary barriers to minimize the release of infectious organisms into the immediate laboratory and the environment. Additional features to prevent transmission of BSL3 organisms are appropriate respiratory protection, HEPA filtration of exhausted laboratory air and strictly controlled laboratory access.

Biosafety Level 4 (BSL4)

Examples of BSL4 Agents: smallpox virus, Ebola virus, hemorrhagic fever viruses

This is the maximum containment available and is suitable for facilities manipulating agents that are dangerous/exotic agents, which pose a risk of life threatening disease. These agents have the potential for aerosol transmission, often have a low infectious dose and produce very serious and often fatal disease; there is generally no treatment or vaccine available. This level of containment represents an isolated unit, functionally and, when necessary, structurally independent of other areas. BSL4 emphasizes maximum containment of the infectious agent by complete sealing of the facility perimeter with confirmation by pressure decay testing; isolation of the researcher from the pathogen by his or her containment in a positive pressure suit or containment of the pathogen in a Class III BSC line; and decontamination of air and other effluents produced in the facility.

Regardless of the work and effort, the health and safety of the lab personnel must be of prime importance.

Reference: Microbiological Lab Practices and Safety Rules: Randall E. Hicks

Microxpress introduces **Biogram antimicrobial susceptibility discs** (As per US-FDA/W.H.O. recommendations and CLSI standard design).

Since there is a rapid rise in resistance in microbes worldwide; it is imperative to screen out the antibiotics to which the microbial strain is susceptible in order to use only these drugs for effective therapy.

The method of choice for clinical microbiologists for in-vitro antimicrobial susceptibility testing is the **Disc Diffusion Method**. Acceptance of the in-vitro disc susceptibility method has been aided by its simplicity and rapidity. The Kirby-Bauer technique for disc susceptibility testing has been recommended by the CLSI (Clinical Laboratory Standards Institute), and is approved by the US-FDA and is also recommended by W.H.O.

Biogram antimicrobial susceptibility discs

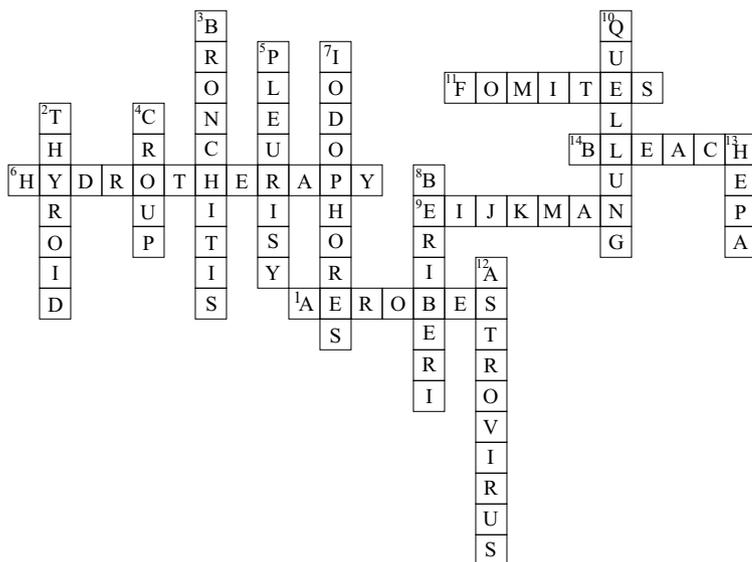
W.H.O. Parameters (As per the Technical report series 610, 1977)	Feature	Biogram antimicrobial susceptibility discs
Quality of antibiotics	Antibiotics used for impregnating on the disc should be as per international pharmacopoeia	✓
Paper	Paper used for disc diffusion should not have any inhibitory action on the antibiotics	✓
Solvent	Solvent used for impregnating antibiotics should not have any inhibitory activity on the antibiotics.	✓
Drying	Drying process should be such that only the solvents are dried without acting on the antibiotics impregnated on the discs.	✓
Packaging	Packaging used should be free from moisture to prevent deterioration of antibiotics. Also it should have a desiccant which indicates presence of moisture with colour change.	✓
Size of antimicrobial disc	Size of antimicrobial disc should be 5-7 mm	✓

Biogram Pack Sizes

The Biogram antimicrobial discs are available in pack size of 5 and 10 cartridges.

Each pack of 5 / 10 cartridges pack contains: ● 5 cartridges / 10 cartridges ● Each aluminium foil pouch contains one single cartridge which accommodates 50 discs and desiccant. ● Single disc dispenser ● Package insert.

Track your brain



BioShields Presents Nusept

Composition - 1% w/v Poly (hexamethylene biguanide) hydrochloride, Perfume, Fast green FCF as color.

Description: NUSEPT™ is a new generation, powerful, non stinging, safe, highly effective and resistance-free microbicidal antiseptic solution. NUSEPT™ is an ideal antiseptic for use in medical settings. The main active ingredient of NUSEPT™ is poly (hexamethylenebiguanide) hydrochloride (PHMB). PHMB is a polymeric biguanide. There is no evidence that PHMB susceptibility is affected by the induction or hyper expression of multi-drug efflux pumps, neither there have been any reports of acquired resistance towards this agent.

ACTIVITY : Broad spectrum: Bactericidal, Fungicidal & Virucidal.

CONTACT TIME : 1 min (undiluted & 10% v/v solution), 5 min (5% v/v solution), 10 min (2.5% v/v solution).

APPLICATIONS :

Medical: In Hospitals, Nursing homes, Medical colleges, Pathological laboratories for Inter-operative irrigation. Pre & post surgery skin and mucous membrane disinfection. Post-operative dressings. Surgical & non-surgical wound dressings. Surgical Bath/Sitz bath. Routine antiseptic during minor incisions, catheterization, scopy etc. First aid. Surface disinfection.

Industrial: In Pharmaceutical industry, Food & beverage industry, Hotel industry etc. General surface disinfection. Eliminating biofilms.

USAGE DIRECTIONS :

- Surgical, postoperative, non surgical dressings – Use undiluted
- Pre & post surgery, skin cleaning & disinfection – Use undiluted
- Surgical/Sitz bath – Add 50 ml of NUSEPT™ in 1L of water & use
- Antisepsis during minor incisions, catheterization, – Use undiluted scopy, first aid, bites, cuts stings etc
- Midwifery, nursery & sickroom – Use undiluted
- General surface disinfection – Add 100 ml of NUSEPT™ in 1L of water and gently mop the floor or surfaces

