DOWNLOAD PDF TUBERCULOSIS AND THE TUBERCLE BACILLUS

Chapter 1 : Tuberculosis | calendrierdelascience.com

Tuberculosis and the Tubercle Bacillus has many contributors; chapters are provided by experts in many areas of TB research to bring together a comprehensive update of research development in the past decade.

Microbiology[edit] M. This is extremely slow compared with other bacteria, which tend to have division times measured in minutes Escherichia coli can divide roughly every 20 minutes. It is a small bacillus that can withstand weak disinfectants and can survive in a dry state for weeks. Its unusual cell wall is rich in lipids such as mycolic acid and is likely responsible for its resistance to desiccation and is a key virulence factor. However, the mycolic acid in the cell wall of M. Instead, acid-fast stains such as Ziehl-Neelsen stain , or fluorescent stains such as auramine are used. Culture[edit] M. Compared to other commonly studied bacteria, M. Commonly used media include liquids such as Middlebrook 7H9 or 7H12, egg-based solid media such as Lowenstein-Jensen , and solid agar-based such as Middlebrook 7H11 or 7H It is distinguished from other mycobacteria by its production of catalase and niacin. A misconception is that M. It can only be spread through air droplets originating from a person who has the disease either coughing, sneezing, speaking, or singing. Its cell wall prevents the fusion of the phagosome with the lysosome , which contains a host of antibacterial factors. Consequently, the bacteria multiply unchecked within the macrophage. The bacteria also carry the UreC gene, which prevents acidification of the phagosome. Granulotomatous lesions are important in both regulating the immune response and minimizing tissue damage. Moreover, T cells help maintain Mycobacterium within the granulomas. Many secreted and exported proteins are known to be important in pathogenesis. Resistant strains of M. Strain variation[edit] Typing of strains is useful in the investigation of tuberculosis outbreaks, because it gives the investigator evidence for or against transmission from person to person. Consider the situation where person A has tuberculosis and believes he acquired it from person B. If the bacteria isolated from each person belong to different types, then transmission from B to A is definitively disproved; however, if the bacteria are the same strain, then this supports but does not definitively prove the hypothesis that B infected A. Until the early s, M. This method makes use of the presence of repeated DNA sequences within the M. The first scheme, called exact tandem repeat, used only five loci, [23] but the resolution afforded by these five loci was not as good as PFGE. The second scheme, called mycobacterial interspersed repetitive unit, had discrimination as good as PFGE. Additionally, extensively drug-resistant M. Within the genome are also six pseudogenes. The genome contains genes involved in fatty acid metabolism, with 39 of these involved in the polyketide metabolism generating the waxy coat. Such large numbers of conserved genes show the evolutionary importance of the waxy coat to pathogen survival. Furthermore, experimental studies have since validated the importance of a lipid metabolism for M. Bacteria isolated from the lungs of infected mice were shown to preferentially use fatty acids over carbohydrate substrates. These proteins have a conserved N-terminal motif, deletion of which impairs growth in macrophages and granulomas. Results reveal new relationships and drug resistance genes not previously associated and suggest some genes and intergenic regions associated with drug resistance may be involved in the resistance to more than one drug. Noteworthy is the role of the intergenic regions in the development of this resistance, and most of the genes proposed in this study to be responsible for drug resistance have an essential role in the development of M. This group may also include the M. These animal strains of MTBC do not strictly deserve species status, as they are all closely related and embedded in the M. Unlike the established members of the M. The majority of the known strains of this group have been isolated from the Horn of Africa. The ancestor of M. The main human-infecting species have been classified into seven lineages. A seventh type has been isolated from the Horn of Africa. Lineages 2, 3 and 4 all share a unique deletion event tbD1 and thus form a monophyletic group. Lineage 3 has been divided into two clades: Lineage 4 is also known as the Euro-American lineage. This study, relying on ancient DNA , estimated that the most recent common ancestor of the M. One study compared the M. Based on this, the study suggested that M. By calibrating the mutation rate of M. Regarding the congruence between human and M. Among the seven recognized lineages of M. Lineages 2 and 4. Among these, Lineage 4 is most well dispersed, and is e. Lineage 4 was shown to have

evolved in or in the vicinity of Europe, and to have spread globally with Europeans starting around the 13th century. It has been suggested that ancestral mycobacteria may have impacted early hominids in East Africa as early as three million years ago. Antibiotic resistance ABR [edit] You can help by adding to it. November M tuberculosis is a clonal organism and does not exchange DNA via horizontal gene transfer. This, possibly combined with a relatively low rate of evolution, might explain why the evolution of resistance has been relatively slow in the species compared to some other major bacterial pathogens. Worst hit are countries in the former Soviet republics, where ABR evolved and spread at explosive levels following the fall of the Soviet Union. An extreme example is Belarus, where a third of all new cases of tuberculosis are multidrug-resistant. Host genetics[edit] The nature of the host-pathogen interaction between humans and M. A group of rare disorders called Mendelian susceptibility to mycobacterial diseases was observed in a subset of individuals with a genetic defect that results in increased susceptibility to mycobacterial infection. Recent genome-wide association studies GWAS have identified three genetic risk loci, including at positions 11p13 and 18q DNA repair[edit] As an intracellular pathogen, M. DnaE2 polymerase is upregulated in M. History of tuberculosis M. In , though, the history of tuberculosis started to take shape into what is known of it today; as the physician Benjamin Marten described in his A Theory of Consumption, tuberculosis may be caused by small living creatures transmitted through the air to other patients.

Chapter 2 : tuberculosis | Definition, Cause, Symptoms, & Treatment | calendrierdelascience.com

Tuberculosis (TB) is an infectious disease usually caused by the bacterium Mycobacterium tuberculosis (MTB). Tuberculosis generally affects the lungs, but can also affect other parts of the body.

Multiple variants may be present simultaneously. Tuberculosis may infect any part of the body, but most commonly occurs in the lungs known as pulmonary tuberculosis. The upper lung lobes are more frequently affected by tuberculosis than the lower ones. A potentially more serious, widespread form of TB is called "disseminated tuberculosis", also known as miliary tuberculosis. In nature, the bacterium can grow only within the cells of a host organism, but M. Since MTB retains certain stains even after being treated with acidic solution, it is classified as an acid-fast bacillus. The latter two species are classified as " nontuberculous mycobacteria " NTM. Silicosis increases the risk about fold. These include alcoholism [14] and diabetes mellitus three-fold increase. Transmission When people with active pulmonary TB cough, sneeze, speak, sing, or spit, they expel infectious aerosol droplets 0. A single sneeze can release up to 40, droplets. After about two weeks of effective treatment, subjects with nonresistant active infections generally do not remain contagious to others. During this process, the bacterium is enveloped by the macrophage and stored temporarily in a membrane-bound vesicle called a phagosome. The phagosome then combines with a lysosome to create a phagolysosome. In the phagolysosome, the cell attempts to use reactive oxygen species and acid to kill the bacterium. The primary site of infection in the lungs, known as the " Ghon focus ", is generally located in either the upper part of the lower lobe, or the lower part of the upper lobe. This is known as a Simon focus and is typically found in the top of the lung. Macrophages , T lymphocytes , B lymphocytes , and fibroblasts aggregate to form granulomas , with lymphocytes surrounding the infected macrophages. When other macrophages attack the infected macrophage, they fuse together to form a giant multinucleated cell in the alveolar lumen. The granuloma may prevent dissemination of the mycobacteria and provide a local environment for interaction of cells of the immune system. Macrophages and dendritic cells in the granulomas are unable to present antigen to lymphocytes; thus the immune response is suppressed. Another feature of the granulomas is the development of abnormal cell death necrosis in the center of tubercles. To the naked eye, this has the texture of soft, white cheese and is termed caseous necrosis. Tissue destruction and necrosis are often balanced by healing and fibrosis. During active disease, some of these cavities are joined to the air passages bronchi and this material can be coughed up. It contains living bacteria, and thus can spread the infection. Treatment with appropriate antibiotics kills bacteria and allows healing to take place. Upon cure, affected areas are eventually replaced by scar tissue. However, the difficult culture process for this slow-growing organism can take two to six weeks for blood or sputum culture. Effective TB treatment is difficult, due to the unusual structure and chemical composition of the mycobacterial cell wall, which hinders the entry of drugs and makes many antibiotics ineffective. A person with fully susceptible MTB may develop secondary acquired resistance during therapy because of inadequate treatment, not taking the prescribed regimen appropriately lack of compliance , or using low-quality medication. Extensively drug-resistant TB is also resistant to three or more of the six classes of second-line drugs.

Chapter 3 : Tuberculosis - Wikipedia

Tubercle bacillus definition is - a bacterium (Mycobacterium tuberculosis) that is a major cause of tuberculosis. a bacterium (Mycobacterium tuberculosis) that is a major cause of tuberculosis See the full definition.

Scanning electron micrograph of M. In nature, the bacterium can grow only within the cells of a host organism, but M. Since MTB retains certain stains even after being treated with acidic solution, it is classified as an acid-fast bacillus. The latter two species are classified as " nontuberculous mycobacteria " NTM. Risk factors for tuberculosis A number of factors make people more susceptible to TB infections. Silicosis increases the risk about fold. These include alcoholism [14] and diabetes mellitus three-fold increase. Transmission When people with active pulmonary TB cough, sneeze, speak, sing, or spit, they expel infectious aerosol droplets 0. A single sneeze can release up to 40, droplets. After about two weeks of effective treatment, subjects with nonresistant active infections generally do not remain contagious to others. During this process, the bacterium is enveloped by the macrophage and stored temporarily in a membrane-bound vesicle called a phagosome. The phagosome then combines with a lysosome to create a phagolysosome. In the phagolysosome, the cell attempts to use reactive oxygen species and acid to kill the bacterium. The primary site of infection in the lungs, known as the " Ghon focus ", is generally located in either the upper part of the lower lobe, or the lower part of the upper lobe. This is known as a Simon focus and is typically found in the top of the lung. Macrophages , T lymphocytes , B lymphocytes , and fibroblasts aggregate to form granulomas , with lymphocytes surrounding the infected macrophages. When other macrophages attack the infected macrophage, they fuse together to form a giant multinucleated cell in the alveolar lumen. The granuloma may prevent dissemination of the mycobacteria and provide a local environment for interaction of cells of the immune system. Macrophages and dendritic cells in the granulomas are unable to present antigen to lymphocytes; thus the immune response is suppressed. Another feature of the granulomas is the development of abnormal cell death necrosis in the center of tubercles. To the naked eye, this has the texture of soft, white cheese and is termed caseous necrosis. Tissue destruction and necrosis are often balanced by healing and fibrosis. During active disease, some of these cavities are joined to the air passages bronchi and this material can be coughed up. It contains living bacteria, and thus can spread the infection. Treatment with appropriate antibiotics kills bacteria and allows healing to take place. Upon cure, affected areas are eventually replaced by scar tissue. However, the difficult culture process for this slow-growing organism can take two to six weeks for blood or sputum culture. Tuberculosis management Treatment of TB uses antibiotics to kill the bacteria. Effective TB treatment is difficult, due to the unusual structure and chemical composition of the mycobacterial cell wall, which hinders the entry of drugs and makes many antibiotics ineffective. A person with fully susceptible MTB may develop secondary acquired resistance during therapy because of inadequate treatment, not taking the prescribed regimen appropriately lack of compliance , or using low-quality medication. Extensively drug-resistant TB is also resistant to three or more of the six classes of second-line drugs.

Chapter 4 : Tuberculosis and the Tubercle Bacillus - Europe PMC Article - Europe PMC

The second edition of Tuberculosis and the Tubercle Bacillus presents the latest research on a microorganism that is exquisitely well adapted to its human host. This pathogen continues to confound scientists, clinicians, and public health specialists, who will all find much valuable information in this comprehensive set of reviews.

One in seven of all human beings dies from tuberculosis. Sanatoria were developed in the mid 19th century where patients lived in open alpine or seaside air with good and ample food, but they were not effective at curing the disease and most still died from it. In Jean Antoine Villemin, a French military surgeon, showed by experiments in animals that phthisis was infectious. The second major breakthrough was the discovery in by Hermann Heinrich Robert Koch of the cause of tuberculosis â€" a bacillus he called Tubercle bacillus and which was later renamed Mycobacterium tuberculosis. Koch used material from cases of pulmonary, extra-pulmonary and meningeal tubercular disease as well as cases of scrofula. Culture of the bacteria was difficult, he eventually used a medium of coagulated bovine serum developed by John Tyndall, a British microbiologist. Koch used his technique to demonstrate the presence of the bacillus in all forms of human and animal tuberculosis proving unequivocally not only that the bacillus was the cause, but the many different forms of tuberculosis were manifestations of the one disease entity. The letter was subsequently reprinted in the New York Times, the New York Tribune and other newspapers around the world, and within a short time Koch had gained fame in discovering the cause of a scourge that had affected humankind since recorded history. Seibert and Esmond R. Koch was awarded the Nobel Prize in for his work on tuberculosis. He died in in Baden-Baden from heart disease. Neumann in after considering it to belong to a new genus, Mycobacterium. Koch initially used methylene-blue in an alkaline solution and Bismark brown as a counterstain. In a paper following his address to the Berlin Physiological Society in Koch remarked: This was known as the Ziehl- Neelson ZN stain. Brehmer published his treatment in in his work Die Chronische Lungenschwindsucht und Tuberkulose der Lunge: They were much less salubrious with plainer food, and the patients had to work and do their own housekeeping. Rooms in sanatoria were sometimes ventilated with stringent airs â€" creosote, turpentine and eucalyptus. Sanatoria treatment was often beneficial for patients with minimal disease, but many with severe infection still died. In Carlo Forlanini, an Italian physician of Pavia, Lombardy, created the first artificial pneumothorax by collapsing the lung and filling the pleural cavity with nitrogen. Other forms of surgical treatment were used such as lobectomy and segmentectomy, but were commonly complicated by the spread of the infection, fistulas and empyema. After the introduction of streptomycin in and other anti-tuberculous drugs, all forms of surgical treatment were abandoned in favour of drug treatment. X-ray screening was introduced for military recruits during World War I and then for the general population through to World War II where it was again used to screen military recruits. By , by successive sub- culturing a virulent strain of Mycobacterium bovis previously supplied to them by Edmond Nocard, a French veterinarian and microbiologist on a medium containing ox bile, they were able to produce a non- virulent strain which they formulated into a live attenuated vaccine. The vaccine was given to an infant born of a mother who died from tuberculosis shortly after giving birth, the child survived and did not contract the disease. The vaccine soon became popular throughout Europe and over the next seven years over one hundred thousand children were immunised. Waksman was awarded the Nobel Prize in for the discovery. Since then other anti-tuberculosis antibiotics have been developed such as isoniazid, rifampicin, ethambutol, and pyrazinamide, and more recently, viomycin and ciprofloxacin which are used in drug resistant infections. WHO estimates that in there were 8. Sub-Saharan Africa had the highest rate per population with over new cases per , Both the Allies and the Germans screened their military recruits for tuberculosis using chest radiographs, however many were still enlisted with latent or active tuberculosis. Before the war ended, 2, soldiers had died of tuberculosis in the US Army and was the leading cause of discharge. During the years to there were 3, soldiers discharged from the US Army for tuberculosis, just over half of all discharges. In one half of those discharges the disease had already been present on enlistment. In the last several decades microepidemics have occurred in small close knit units on US and British Naval ships and land based units

deployed overseas. The rate declined from 1. In health care personnel in the rate was 0. Interestingly, and reminiscent of the early 20th century experiences, the most common factor associated with diagnosis during military service was latent infection at the time of enlistment. Military personnel are still at significant risk of acquiring tuberculosis infection because of living and working in close quarters and deployment in regions with a high prevalence of tuberculosis such as Afghanistan, Iraq and South- East Asia, and are particularly at risk of exposure to multidrug resistant tuberculosis MDR-TB. Tuberculosis never-the-less remains a significant public health problem worldwide, especially with the emergence of multidrug resistant tuberculosis, and also remains an important medicomilitary issue.

Chapter 5 : Tuberculosis (TB for Tubercle Bacillus)

Tuberculosis (TB), infectious disease that is caused by the tubercle bacillus, Mycobacterium tuberculosis. In most forms of the disease, the bacillus spreads slowly and widely in the lungs, causing the formation of hard nodules (tubercles) or large cheeselike masses that break down the respiratory tissues and form cavities in the lungs.

Illustration by Frank Forney. Reproduced by permission of Cengage Learning. Definition Tuberculosis TB is a chronic, potentially fatal contagious disease that most often affects the lungs but can affect other parts of the body. It is caused by a bacterium or tubercle bacillus Mycobacterium tuberculosis. Description Overview Tuberculosis was the common disease called consumption until well into the twentieth century. In when the microbiologist Robert Koch discovered the tubercle bacillus that causes the disease, TB caused one of every seven deaths in Europe. The tubercle bacillus is transmitted when an infected person coughs or sneezes and another person breathes in the infected droplets. The disease is not spread through kissing or other physical contact. Before antibiotics were discovered in the mids, the only means of controlling the spread of TB was to isolate patients in sanatoriums or hospitals limited to patients with TB. This practice continues today in some countries. The effect of this pattern of treatment was to separate the study of tuberculosis from mainstream medicine. Entire organizations were set up to study not only the disease as it affected individual patients, but also its impact on society. By there were more than specialized TB facilities in the United States. Tuberculosis spread widely in Europe as the result of the industrial revolution in the late nineteenth century when many people moved to towns where they lived in crowded, unsanitary conditions. The disease became widespread somewhat later in the United States. In the early s with the discovery of streptomycin, the first antibiotic effective against M. Although other more effective anti-tuberculosis drugs that continue to reduce the number of TB cases have been developed in the past half century, reports of active TB cases in the United States began increase in the mids. This upsurge was in part a result of overcrowding and unsanitary conditions in the poor areas of large cities, prisons, and homeless shelters. Infected visitors and immigrants to the United States also contributed to the resurgence of TB. An additional factor was the AIDS epidemic. The number of reported TB cases in the United States peaked in and has since declined. In the mid s, health officials worldwide joined to work at preventing a drug-resistant form of the disease from becoming widespread. However, the rate of multi-drug resistant had increased About one-third of infections occur in Southeast Asia. WHO estimates that TB caused about 1. Although the rate per capita of active TB is declining worldwide, the absolute number of cases is increasing in many areas because of high population growth. About one-quarter of TB cases newly diagnosed in people over age Many elderly individuals developed TB after acquiring a latent TB infection years earlier. As they age, their immune systems can no longer control the disease and they develop active TB symptoms. In addition, elderly people living in nursing homes and other group facilities are often in close contact with others who may be infected. Individuals of lower socioeconomic status tend to live in more crowded conditions and have less access to health care than higher socioeconomic status individuals, conditions which encourage the infection with M. As of , TB was a major health problem in the United States among certain immigrant groups that come from countries where TB infection is common. California, New York, Texas, Florida, all states with large immigrant populations, accounted for almost half of all active TB cases. Other people who take drugs that suppress the immune system e. Individuals who are alcoholics, intravenous drug abusers, and the homeless are also at increased risk of contracting tuberculosis. Causes and symptoms Transmission Tuberculosis spreads by droplet infection. When a person infected with M. People in close physical contact with the infected person inhale this fine mist. Tuberculosis is not highly contagious compared to some other infectious diseases. As a rule, close, frequent, or prolonged contact is needed to spread the disease. Most people do not develop TB even when exposed to a person with active TB. The most important exception is pregnancy. The fetus of an infected mother may contract TB by inhaling or swallowing the bacilli in the amniotic fluid. Progression Once a person inhales M. The bacteria can become dormant and never grow; no TB symptoms are seen, and the person is not contagious. The bacteria can become dormant for a period, then begin to grow; TB symptoms appear a long time after infection. The person is not contagious

during the dormant period, then becomes contagious when symptoms appear. The bacteria multiples immediately; active TB symptoms appear and the person is contagious. At least nine of ten people who are infected with M. These people have what is called a latent TB infection. They are not contagious; however, they do form a pool of infected individuals who may get sick later and then pass on TB to others. In the United States, there are about 10 million people with latent TB infections. It is impossible to predict which individuals with latent TB infections will develop active TB. On rare occasions, a previously infected person gets sick again after a later exposure to the tubercle bacillus. Pulmonary tuberculosis Pulmonary tuberculosis is TB that affects the lungs. Its initial symptoms are easily confused with those of other diseases. An infected person may at first feel vaguely unwell or develop a cough that could be blamed on smoking or a cold. A small amount of greenish or yellow sputum may be coughed up when the person gets up in the morning. In time, more sputum is produced that is streaked with blood. People who have pulmonary TB do not get a high fever, but they often have a low-grade one. The individual often loses interest in food and may lose weight. Chest pain is sometimes present. If the infection allows air to escape from the lungs into the chest cavity pneumothorax or if fluid collects in the pleural space pleural effusion , the patient may have difficulty breathing. If a young adult develops a pleural effusion, the chance of tubercular infection being the cause is very high. Before the development of effective TB drugs, many patients became chronically ill with increasingly severe lung symptoms. They lost a great deal of weight and developed a wasted appearance, hence the name consumption. This outcome is uncommon today where modern treatment methods are available. Extrapulmonary tuberculosis Although the lungs are the major site of damage caused by tuberculosis, other organs and tissues in the body may be affected. The usual progression is for the disease to spread from the lungs to locations outside the lungs extrapulmonary sites. In occasional cases, however, the first sign of disease appears outside the lungs. The many tissues or organs that tuberculosis may affect include: TB is particularly likely to attack the spine and the ends of the long bones. Children are especially prone to spinal tuberculosis. If not treated, the spinal segments vertebrae may collapse and cause paralysis in one or both legs. Along with the bones, the kidneys are the commonest site of extrapulmonary TB. There may, however, be few symptoms even after part of a kidney is destroyed. TB may also spread to the bladder. In men, it may spread to the prostate gland and nearby structures. The ovaries in women may be infected and TB may from them to the peritoneum the membrane lining the abdominal cavity. Tuberculosis peritonitis may cause pain ranging from the vague discomfort of stomach cramps to intense pain that may mimic the symptoms of appendicitis. Tubercular infection of joints causes a form of arthritis that most often affects the hips and knees. The wrist, hand, and elbow joints also may become painful and inflamed. The meninges are tissues that cover the brain and the spinal cord. Infection of the meninges by the TB bacillus causes tuberculosis meningitis, a condition that is most common in young children but is especially dangerous in the elderly. Patients develop headaches, become drowsy, and eventually comatose. Permanent brain damage is the rule unless prompt treatment is given. Some patients with tuberculosis meningitis develop a tumor-like brain mass called a tuberculoma that can cause stroke-like symptoms. All these parts of the body can be infected by M. Miliary TB is a life-threatening condition that occurs when large numbers of tubercle bacilli spread throughout the body. Huge numbers of tiny tubercular lesions develop that cause marked weakness and weight loss, severe anemia, and gradual wasting of the body. There is concern that drug-resistant TB could spread widely and cause a public health crisis. Diseases similar to tuberculosis There are many forms of mycobacteria other than M. This occurs, for example, in some people who are HIV-positive. People infected by MAC are not contagious, but they may develop a serious lung infection that is highly resistant to antibiotics. MAC infections typically start with the patient coughing up mucus. The infection progresses slowly, but eventually blood is brought up in the sputum, and the patient has trouble breathing. Often these patients die unless their immune system can be strengthened. Other mycobacteria grow in swimming pools and may cause skin infection. Some of them infect wounds and artificial body parts such as a breast implants or mechanical heart valves.

Chapter 6 : Robert Koch: Centenary of the Discovery of the Tubercle Bacillus,

The first edition of this exceptional book was published in The second edition is an extraordinary effort to update the first edition through identification, critical examination, and condensing of a huge body of tuberculosis-related research into a single volume, albeit a large one.

Bring fact-checked results to the top of your browser search. Diagnosis and treatment The diagnosis of pulmonary tuberculosis depends on finding tubercle bacilli in the sputum, in the urine , in gastric washings, or in the cerebrospinal fluid. If bacilli are present, the sputum specimen is cultured on a special medium to determine whether the bacilli are M. An X-ray of the lungs may show typical shadows caused by tubercular nodules or lesions. The prevention of tuberculosis depends on good hygienic and nutritional conditions and on the identification of infected patients and their early treatment. A vaccine , known as BCG vaccine , is composed of specially weakened tubercle bacilli. Injected into the skin, it causes a local reaction, which confers some immunity to infection by M. It has been widely used in some countries with success; its use in young children in particular has helped to control infection in the developing world. The main hope of ultimate control, however, lies in preventing exposure to infection, and this means treating infectious patients quickly, possibly in isolation until they are noninfectious. In many developed countries, individuals at risk for tuberculosis, such as health care workers, are regularly given a skin test see tuberculin test to show whether they have had a primary infection with the bacillus. Today, the treatment of tuberculosis consists of drug therapy and methods to prevent the spread of infectious bacilli. Historically, treatment of tuberculosis consisted of long periods, often years, of bed rest and surgical removal of useless lung tissue. As a result, with early drug treatment, surgery is rarely needed. The most commonly used antituberculosis drugs are isoniazid and rifampicin rifampin. These drugs are often used in various combinations with other agents, such as ethambutol , pyrazinamide , or rifapentine, in order to avoid the development of drug-resistant bacilli. Patients with strongly suspected or confirmed tuberculosis undergo an initial treatment period that lasts two months and consists of combination therapy with isoniazid, rifampicin, ethambutol, and pyrazinamide. These drugs may be given daily or two times per week. The patient is usually made noninfectious quite quickly, but complete cure requires continuous treatment for another four to nine months. The length of the continuous treatment period depends on the results of chest X-rays and sputum smears taken at the end of the two-month period of initial therapy. Continuous treatment may consist of once daily or twice weekly doses of isoniazid and rifampicin or isoniazid and rifapentine. If a patient does not continue treatment for the required time or is treated with only one drug, bacilli will become resistant and multiply, making the patient sick again. If subsequent treatment is also incomplete, the surviving bacilli will become resistant to several drugs. Multidrug-resistant tuberculosis MDR TB is a form of the disease in which bacilli have become resistant to isoniazid and rifampicin. MDR TB is treatable but is extremely difficult to cure, typically requiring two years of treatment with agents known to have more severe side effects than isoniazid or rifampicin. XDR TB is characterized by resistance to not only isoniazid and rifampin but also a group of bactericidal drugs known as fluoroquinolones and at least one aminoglycoside antibiotic, such as kanamycin, amikacin, or capreomycin. Aggressive treatment using five different drugs, which are selected based on the drug sensitivity of the specific strain of bacilli in a patient, has been shown to be effective in reducing mortality in roughly 50 percent of XDR TB patients. Instead of taking daily medication on their own, patients are directly observed by a clinician or responsible family member while taking larger doses twice a week. Although some patients consider DOT invasive, it has proved successful in controlling tuberculosis. Despite stringent control efforts, however, drug-resistant tuberculosis remained a serious threat in the early 21st century. This form of the disease, which had also been detected in Italy in and India in , is resistant to all first- and second-line antituberculosis drugs. Other mycobacterial infections The above discussion of tuberculosis relates to the disease caused by M. If the milk is ingested raw, M. The bovine bacillus may be caught in the tonsil s and may spread from there to the lymph node s of the neck, where it causes caseation of the node tissue a condition formerly known as scrofula. The node swells under the skin of the neck, finally eroding through the skin as a chronic discharging ulcer.

From the gastrointestinal tract , M. It shows, however, a great preference for bones and joints, where it causes destruction of tissue and eventually gross deformity. Tuberculosis of the spine, or Pott disease , is characterized by softening and collapse of the vertebrae, often resulting in a hunchback deformity. Pasteurization of milk kills tubercle bacilli, and this, along with the systematic identification and destruction of infected cattle, has led to the disappearance of bovine tuberculosis in humans in many countries. The AIDS epidemic has given prominence to a group of infectious agents known variously as nontuberculosis mycobacteria, atypical mycobacteria, and mycobacteria other than tuberculosis MOTT. This group includes such Mycobacterium species as M. These bacilli have long been known to infect animals and humans, but they cause dangerous illnesses of the lungs, lymph nodes, and other organs only in people whose immune systems have been weakened.

Chapter 7 : Tuberculosis | Revolvy

In some people, the tubercle bacilli overcome the immune system and multiply, resulting in progression from LTBI to TB disease (Figure). Persons who have TB disease are usually infectious.

Primary tuberculosis of the reproductive system is rare and is usually brought from elsewhere in the body through the bloodstream. Nodular or pustular lesions on the penis or scrotum of men or the vulva of women, resembling the gumma nodules of tertiary syphilis, mayâ€¦ The course of tuberculosis The tubercle bacillus is a small, rod-shaped bacterium that is extremely hardy; it can survive for months in a state of dryness and can also resist the action of mild disinfectants. Infection spreads primarily by the respiratory route directly from an infected person who discharges live bacilli into the air. Minute droplets ejected by sneezing, coughing, and even talking can contain hundreds of tubercle bacilli that may be inhaled by a healthy person. There the bacilli become trapped in the tissues of the body, are surrounded by immune cells, and finally are sealed up in hard, nodular tubercles. A tubercle usually consists of a centre of dead cells and tissues, cheeselike caseous in appearance, in which can be found many bacilli. This centre is surrounded by radially arranged phagocytic scavenger cells and a periphery containing connective tissue cells. Individual tubercles are microscopic in size, but most of the visible manifestations of tuberculosis, from barely visible nodules to large tuberculous masses, are conglomerations of tubercles. In otherwise healthy children and adults, the primary infection often heals without causing symptoms. The bacilli are quickly sequestered in the tissues, and the infected person acquires a lifelong immunity to the disease. A skin test taken at any later time may reveal the earlier infection and the immunity, and a small scar in the lung may be visible by X-ray. In this condition, sometimes called latent tuberculosis, the affected person is not contagious. In some cases, however, sometimes after periods of time that can reach 40 years or more, the original tubercles break down, releasing viable bacilli into the bloodstream. From the blood the bacilli create new tissue infections elsewhere in the body, most commonly in the upper portion of one or both lungs. This causes a condition known as pulmonary tuberculosis , a highly infectious stage of the disease. In some cases the infection may break into the pleural space between the lung and the chest wall, causing a pleural effusion , or collection of fluid outside the lung. Particularly among infants, the elderly, and immunocompromised adults organ transplant recipients or AIDS patients, for example , the primary infection may spread through the body, causing miliary tuberculosis , a highly fatal form if not adequately treated. In fact, once the bacilli enter the bloodstream, they can travel to almost any organ of the body, including the lymph nodes, bones and joints, skin, intestines, genital organs, kidneys, and bladder. An infection of the meninges that cover the brain causes tuberculous meningitis ; before the advent of specific drugs, this disease was always fatal, though most affected people now recover. The onset of pulmonary tuberculosis is usually insidious , with lack of energy, weight loss, and persistent cough. These symptoms do not subside, and the general health of the patient deteriorates. Eventually, the cough increases, the patient may have chest pain from pleurisy , and there may be blood in the sputum, an alarming symptom. Fever develops, usually with drenching night sweats. In the lung, the lesion consists of a collection of dead cells in which tubercle bacilli may be seen. This lesion may erode a neighbouring bronchus or blood vessel , causing the patient to cough up blood hemoptysis. Tubercular lesions may spread extensively in the lung, causing large areas of destruction, cavities, and scarring. The amount of lung tissue available for the exchange of gases in respiration decreases, and if untreated the patient will die from failure of ventilation and general toxemia and exhaustion. Page 1 of 3.

Chapter 8 : Mycobacterium tuberculosis - Wikipedia

Tubercle bacillus Koch Mycobacterium tuberculosis is a species of pathogenic bacteria in the family Mycobacteriaceae and the causative agent of tuberculosis.

Persons using assistive technology might not be able to fully access information in this file. For assistance, please send e-mail to: Type Accommodation and the title of the report in the subject line of e-mail. Three weeks later, on April 10, he published an article entitled "The Etiology of Tuberculosis" 1. He had observed the bacillus in association with all cases of the disease, had grown the organism outside the body of the host, and had reproduced the disease in a susceptible host inoculated with a pure culture of the isolated organism. Koch continued his studies on tuberculosis, hoping to find a cure. This news gave rise to tremendous hope throughout the world, which was soon replaced by disillusionment when the product turned out to be an ineffective therapeutic agent. Tuberculin later proved to be a valuable diagnostic tool. In , when Koch was awarded the Nobel Prize in medicine, he devoted his acceptance speech to promoting greater understanding of tuberculosis and its causative agent. Koch died in , leaving the scientific community and the world in general with a valuable inheritance of knowledge and understanding resulting from his seminal work on anthrax, cholera, trypanosomiasis, and especially tuberculosis. In the laboratory, recognition of the avian bacillus by Nocard in and differentiation of bovine and human tubercle bacilli by Theobald Smith in laid the groundwork for identification of other nontuberculous mycobacterial species. Diagnosis of tuberculosis was aided by discovery of the acid-fast nature of the bacillus by Ehrlich in , discovery of X rays by Roentgen in , development of the tuberculin skin test by Von Pirquet and Mantoux in , and preparation of purified protein derivative PPD of tuberculin by Seibert in In the s, the epidemiologic work of Wade Hampton Frost led to a better understanding of the epidemiology of tuberculosis. Treatment has progressed from bed rest, special diets and fresh air, through pneumothorax and other lung-collapse procedures and surgical resection, to specific chemotherapy streptomycin in , para-aminosalicylic acid in , isoniazid in , and drugs such as rifampin in recent years. Prevention of tuberculosis has been approached in 2 ways. In , Calmette and Guerin developed an attenuated strain of Mycobacterium bovis, which many countries throughout the world have used, with variable results, as a vaccine. The other major approach to prevention has been the treatment of persons with subclinical tuberculous infection tuberculous infection without disease with isoniazid. There have been recent improvements in tuberculosis-control methodology. Fluorescence microscopy has made the examination of sputum smears faster, easier, and more accurate. Phage typing is a useful tool for studying the epidemiology of tuberculosis. Newer immunologic techniques offer promise of improved diagnostic tests, and rapid radiometric methods of identifying M. Progress has been less dramatic in developing countries. Tuberculosis stubbornly persists as a major worldwide health problem. It is estimated that as many as 10 million cases of tuberculosis may occur throughout the world each year million of them highly infectious, and million resulting in death. Eradication of tuberculosis, although possibly attainable in technical terms, remains an elusive goal. Die Atiologic der Tuberkulose. Berliner Klinische Wochenschrift ; This conversion may have resulted in character translation or format errors in the HTML version. An original paper copy of this issue can be obtained from the Superintendent of Documents, U. Contact GPO for current prices.

Chapter 9 : Tubercle Bacillus | Definition of Tubercle Bacillus by Merriam-Webster

The diagnosis of pulmonary tuberculosis depends on finding tubercle bacilli in the sputum, in the urine, in gastric washings, or in the cerebrospinal fluid. The primary method used to confirm the presence of bacilli is a sputum smear, in which a sputum specimen is smeared onto a slide, stained with.