1. MENINGITIS

Meningitis is an acute inflammation of the protective membranes covering the brain and spinal cord, known collectively as the meninges. The most common symptoms are fever, headache, and neck stiffness. Other symptoms include confusion or altered consciousness, vomiting, and an inability to tolerate light or loud noises. Young children often exhibit only nonspecific symptoms, such as irritability, drowsiness, or poor feeding. If a rash is present, it may indicate a particular cause of meningitis; for instance, meningitis caused by meningococcal bacteria may be accompanied by a characteristic rash.

The inflammation may be caused by infection with viruses, bacteria, or other microorganisms, and less commonly by certain drugs. Meningitis can be life-threatening because of the inflammation's proximity to the brain and spinal cord; therefore, the condition is classified as a medical emergency. A lumbar puncture can diagnose or exclude meningitis. A needle is inserted into the spinal canal to collect a sample of cerebrospinal fluid (CSF), that envelops the brain and spinal cord. The CSF is examined in a medical laboratory.

Some forms of meningitis are preventable by immunization with the meningococcal, mumps, pneumococcal, and Hib vaccines. Giving antibiotics to people with significant exposure to certain types of meningitis may also be useful. The first treatment in acute meningitis consists of promptly giving antibiotics and sometimes antiviral drugs. Corticosteroids can also be used to prevent complications from excessive inflammation. Meningitis can lead to serious long-term consequences such as deafness, epilepsy, hydrocephalus, or cognitive deficits, especially if not treated quickly.
• Signs and symptoms
  o Clinical features
  o Early complications

• Causes
  o Bacterial
  o Viral
  o Fungal
  o Parasitic
  o Non-infectious

• Diagnosis
  o Blood tests and imaging
  o Lumbar puncture
  o Postmortem

• Prevention
  o Behavioral
  o Vaccination
  o Antibiotics

• Management
  o Bacterial meningitis
  o Viral meningitis
  o Fungal meningitis

Symptoms
Fever, headache, neck stiffness, include photophobia (intolerance to bright light) and phonophobia (intolerance to loud noises)

Complications
Deafness, epilepsy, hydrocephalus, cognitive deficits

Causes
Viral, bacterial, other

Diagnostic method
Lumbar puncture, blood tests are performed for markers of inflammation (e.g. C-reactive protein, complete blood count), as well as blood cultures, CT or MRI

Differential diagnosis
Brain tumor, lupus, Lyme disease, seizures, neuroleptic malignant syndrome, naegleriasis

Prevention
Vaccination & Some behavioral measures

Medication
Antibiotics, antivirals, steroids
1. TYPHOID FEVER

**Specialty** | Infectious disease
---|---
**Symptoms** | Fever, abdominal pain, headache, rash
**Usual onset** | 6–30 days after exposure
**Causes** | Salmonella typhi (spread by food or water contaminated with feces)
**Risk factors** | Poor sanitation, poor hygiene.
**Diagnostic method** | Bacterial culture, DNA detection
**Differential diagnosis** | Other infectious diseases
**Prevention** | Typhoid vaccine, handwashing
**Treatment** | Antibiotics

**INTRODUCTION**

Typhoid fever, also known simply as typhoid, is a bacterial infection due to Salmonella typhi that causes symptoms. Symptoms may vary from mild to severe and usually begin six to thirty days after exposure. Often there is a gradual onset of a high fever over several days. Weakness, abdominal pain, constipation, and headaches also commonly occur. Diarrhea is uncommon and vomiting is not usually severe. Some people develop a skin rash with rose colored spots. In severe cases there may be confusion. Without treatment, symptoms may last weeks or months. Other people may carry the bacterium without being affected; however, they are still able to spread the disease to others. Typhoid fever is a type of enteric fever along with paratyphoid fever.

The cause is the bacterium Salmonella Typhi, also known as Salmonella enterica serotype Typhi, growing in the intestines and blood. Typhoid is spread by eating or drinking food or water contaminated with the feces of an infected person. Risk factors include poor sanitation and poor hygiene. Those who travel to the developing world are also at risk and only humans can be infected. Diagnosis is by either culturing the bacteria or detecting the bacterium's DNA in the blood, stool, or bone marrow. Culturing the bacterium can be difficult. Bone marrow testing is the most accurate. Symptoms are similar to that of many other infectious diseases. Typhus is a different disease.

A typhoid vaccine can prevent about 30% to 70% of cases during the first two years. The vaccine may have some effect for up to seven years. It is recommended for those at high risk or people traveling to areas where the disease is common. Other efforts to prevent the disease include providing clean drinking water, good sanitation, and handwashing. Until it has been confirmed that an individual's infection is cleared, the individual should not prepare food for others. Treatment of disease is with antibiotics such as azithromycin, fluoroquinolones or third generation cephalosporins. Resistance to these antibiotics has been developing, which has made treatment of the disease more difficult.
SIGNS AND SYMPTOMS

Classically, the course of untreated typhoid fever is divided into four distinct stages, each lasting about a week. Over the course of these stages, the patient becomes exhausted and emaciated.

- In the first week, the body temperature rises slowly, and fever fluctuations are seen with relative bradycardia (Faget sign), malaise, headache, and cough. A bloody nose (epistaxis) is seen in a quarter of cases, and abdominal pain is also possible. A decrease in the number of circulating white blood cells (leukopenia) occurs with eosinopenia and relative lymphocytosis; blood cultures are positive for Salmonella Typhi or S. paratyphi. The Widal test is usually negative in the first week.
- In the second week, the person is often too tired to get up, with high fever in plateau around 40 °C (104 °F) and bradycardia (sphygmothermic dissociation or Faget sign), classically with a dicrotic pulse wave. Delirium is frequent, often calm, but sometimes agitated. This delirium gives to typhoid the nickname of "nervous fever". Rose spots appear on the lower chest and abdomen in around a third of patients. Rhonchi are heard in lung bases.
- The abdomen is distended and painful in the right lower quadrant, where borborygmi can be heard. Diarrhea can occur in this stage: six to eight stools in a day, green, comparable to pea soup, with a characteristic smell. However, constipation is also frequent. The spleen and liver are enlarged (hepatosplenomegaly) and tender, and liver transaminases are elevated. The Widal test is strongly positive, with antiO and antiH antibodies. Blood cultures are sometimes still positive at this stage.
- (The major symptom of this fever is that the fever usually rises in the afternoon up to the first and second week.)
- In the third week of typhoid fever, a number of complications can occur:
  - Intestinal haemorrhage due to bleeding in congested Peyer's patches; this can be very serious, but is usually not fatal.
  - Intestinal perforation in the distal ileum; this is a very serious complication and is frequently fatal. It may occur without alarming symptoms until septicaemia or diffuse peritonitis sets in.
  - Encephalitis
  - Respiratory diseases such as pneumonia and acute bronchitis
  - Neuropsychiatric symptoms (described as "muttering delirium" or "coma vigil"), with picking at bedclothes or imaginary objects.
  - Metastatic abscesses, cholecystitis, endocarditis, and osteitis
  - The fever is still very high and oscillates very little over 24 hours. Dehydration ensues, and the patient is delirious (typhoid state). One-third of affected individuals develop a macular rash on the trunk.
  - Platelet count goes down slowly and risk of bleeding rises.
- By the end of third week, the fever starts subsiding

Without treatment, some patients develop sustained fever, bradycardia, hepatosplenomegaly, abdominal symptoms and, occasionally, pneumonia. In white-skinned patients, pink spots, which fade on pressure, appear on the skin of the trunk in up to 20% of cases. In the third week, untreated cases may develop gastrointestinal and cerebral complications

CAUSE

- Bacteria
The Gram-negative bacterium that causes typhoid fever is *Salmonella Typhi*, also known as *Salmonella enterica* serotype Typhi. There are two main types of Typhi namely the ST1 and ST2 based on MLST subtyping scheme, which are currently widespread globally.

### Transmission

*Salmonella Typhi* is spread through the fecal-oral route from individuals that are currently infected and from asymptomatic carriers of the bacteria. Unlike other strains of *Salmonella*, there are no animal carriers of *S. Typhi*. Humans are the only carrier of the bacteria. An asymptomatic human carrier is an individual who is still excreting *S. Typhi* in their stool a year after the acute stage of the infection. Human carriers are responsible for the transmission of the bacteria in endemic regions of the world.

### Diagnosis

Diagnosis is made by any blood, bone marrow or stool cultures and with the Widal test (demonstration of antibodies against *Salmonella* antigens O-somatic and H-flagellar). In epidemics and less wealthy countries, after excluding malaria, dysentery, or pneumonia, a therapeutic trial time with chloramphenicol is generally undertaken while awaiting the results of the Widal test and cultures of the blood and stool.

The Widal test is time-consuming, and prone to significant false positive results.

Typhidot is a medical test consisting of a dot ELISA kit that detects IgM and IgG antibodies against the outer membrane protein (OMP) of the *Salmonella typhi*. The typhidot test becomes positive within 2–3 days of infection and separately identifies IgM and IgG antibodies. The test is based on the presence of specific IgM and IgG antibodies to a specific 50Kd OMP antigen, which is impregnated on nitrocellulose strips, IgM shows recent infection whereas IgG signifies remote infection. The most important limitation of this test is that it is not quantitative and result is only positive or negative.

### Prevention

Sanitation and hygiene are important to prevent typhoid. Typhoid does not affect animals other than humans. Typhoid can only spread in environments where human feces are able to come into contact with food or drinking water. Careful food preparation and washing of hands are crucial to prevent typhoid. Industrialization, and in particular, the invention of the automobile, contributed greatly to the elimination of typhoid fever, as it eliminated the public health hazards associated with having horse manure in the public street which led to large number of flies. According to statistics from the United States Centers for Disease Control and Prevention (CDC), the chlorination of drinking water has led to dramatic decreases in the transmission of typhoid fever in the United States.

### Vaccination

Two typhoid vaccines are licensed for use for the prevention of typhoid: the live, oral Ty21a vaccine (sold as Vivotide by Crucell Switzerland AG) and the injectable typhoid polysaccharide vaccine (sold as Typhim Vi by Sanofi Pasteur and Typherix by GlaxoSmithKline). Both are efficacious and recommended for travellers to areas where typhoid is endemic. Boosters are recommended every five years for the oral vaccine and every two years for the injectable form.
TREATMENT

The treatment of choice is a fluoroquinolone such as ciprofloxacin. Otherwise, a third-generation cephalosporin such as ceftriaxone or cefotaxime is the first choice. Cefixime is a suitable oral alternative.

Typhoid fever, when properly treated, is not fatal in most cases. Antibiotics, such as ampicillin, chloramphenicol, trimethoprim-sulfamethoxazole, amoxicillin, and ciprofloxacin, have been commonly used to treat typhoid fever in microbiology. Treatment of the disease with antibiotics reduces the case-fatality rate to about 1%.

■ Surgery
   Surgery is usually indicated in cases of intestinal perforation. Most surgeons prefer simple closure of the perforation with drainage of the peritoneum.

■ Resistance
   As resistance to ampicillin, chloramphenicol, trimethoprim-sulfamethoxazole, and streptomycin is now common, these agents have not been used as first-line treatment of typhoid fever.
   Typhoid resistant to these agents is known as multidrug-resistant typhoid (MDR typhoid). Azithromycin has been suggested to be better at treating typhoid in resistant populations than both fluoroquinolone drugs and ceftriaxone.
2. **LEPROSY**

**Synonyms**  
Hansen's disease (HD)

Leprosy has affected humanity for thousands of years. The disease takes its name from the Greek word *lepra*, while the term "Hansen's disease" is named after the Norwegian physician Gerhard Armauer Hansen.

**Leprosy**, also known as **Hansen's disease (HD)**, is a long-term infection by the bacterium *Mycobacterium leprae* or *Mycobacterium lepromatosis*. Initially, infections are without symptoms and typically remain this way for 5 to 20 years. Symptoms that develop include granulomas of the nerves, respiratory tract, skin, and eyes. This may result in a lack of ability to feel pain, thus loss of parts of extremities due to repeated injuries or infection due to unnoticed wounds. Weakness and poor eyesight may also be present.

Leprosy is spread between people. This is thought to occur through a cough or contact with fluid from the nose of an infected person. Leprosy occurs more commonly among those living in poverty. Contrary to popular belief, it is not highly contagious. The two main types of disease are based on the number of bacteria present: paucibacillary and multibacillary. The two types are differentiated by the number of poorly pigmented, numb skin patches present, with paucibacillary having five or fewer and multibacillary having more than five. The diagnosis is confirmed by finding acid-fast bacilli in a biopsy of the skin or by detecting the DNA using polymerase chain reaction.

Leprosy is curable with a treatment known as multidrug therapy. Treatment for paucibacillary leprosy is with the medications dapsone and rifampicin for six months. Treatment for multibacillary leprosy consists of rifampicin, dapsone, and clofazimine for 12 months. A number of other antibiotics may also be used. These treatments are provided free of charge by the World Health Organization.

**Symptoms**  
Decreased ability to feel pain

**Causes**  
*Mycobacterium leprae* or *Mycobacterium lepromatosis*

**Risk factors**  
Close contact with a case of leprosy, living in poverty.

**Treatment**  
Multidrug therapy
Medication  Rifampicin, dapsone, clofazimine

Signs and symptoms
Leprosy is mostly a granulomatous disease of the peripheral nerves and mucosa of the upper respiratory tract; skin lesions (light or dark patches) are the primary external sign. If untreated, leprosy can progress and cause permanent damage to the skin, nerves, limbs, and eyes. Secondary infections, in turn, can result in tissue loss, causing fingers and toes to become shortened and deformed, as cartilage is absorbed into the body.

Transmission
Transmission of leprosy occurs during close contact with those who are infected. Transmission is proposed to be by nasal droplets, but many questions remain about its mode of transmission and epidemiology.

Treatment
Multidrug therapy (MDT) remains highly effective, and people are no longer infectious after the first monthly dose. It is safe and easy to use under field conditions due to its presentation in calendar blister packs. Relapse rates remain low, and no resistance to the combined drugs is seen.
3. TUBERCULOSIS

Synonyms  Phthisis, phthisis pulmonalis, consumption

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. Most infections do not have symptoms, in which case it is known as latent tuberculosis. About 10% of latent infections progress to active disease which, if left untreated, kills about half of those infected. The classic symptoms of active TB are a chronic cough with blood-containing sputum, fever, night sweats, and weight loss. The historical term "consumption" came about due to the weight loss. Infection of other organs can cause a wide range of symptoms.

Tuberculosis is spread through the air when people who have active TB in their lungs cough, spit, speak, or sneeze. People with latent TB do not spread the disease. Active infection occurs more often in people with HIV/AIDS and in those who smoke. Diagnosis of active TB is based on chest X-rays, as well as microscopic examination and culture of body fluids. Diagnosis of latent TB relies on the tuberculin skin test (TST) or blood tests.

Prevention of TB involves screening those at high risk, early detection and treatment of cases, and vaccination with the bacillus Calmette-Guérin (BCG) vaccine. Those at high risk include household, workplace, and social contacts of people with active TB. Treatment requires the use of multiple antibiotics over a long period of time. Antibiotic resistance is a growing problem with increasing rates of multiple drug-resistant tuberculosis (MDR-TB) and extensively drug-resistant tuberculosis (XDR-TB).

- Signs and symptoms
  - Pulmonary
  - Extrapulmonary
- Causes
  - Mycobacteria
  - Risk factors
- Diagnosis
  - Active tuberculosis
  - Latent tuberculosis
- Prevention
  - Vaccines
  - Public health
- Management
  - New onset
Symptoms

Chronic cough, fever, blood in the sputum, weight loss. General signs and symptoms include fever, chills, night sweats, loss of appetite, weight loss, and fatigue. Significant nail clubbing may also occur.

Causes

*Mycobacterium tuberculosis*

Transmission

When people with active pulmonary TB cough, sneeze, speak, sing, or spit, they expel infectious aerosol droplets 0.5 to 5.0 µm in diameter. A single sneeze can release up to 40,000 droplets. Each one of these droplets may transmit the disease, since the infectious dose of tuberculosis is very small (the inhalation of fewer than 10 bacteria may cause an infection).

Risk factors

Smoking, HIV/AIDS

Diagnostic method

CXR, culture, tuberculin skin test, Mantoux tuberculin skin test, chest X-ray and multiple sputum cultures for acid-fast bacilli, Nucleic acid amplification tests and adenosine deaminase

Differential diagnosis

Necrotizing pneumonia, histoplasmosis, sarcoidosis, coccidioidomycosis

Treatment

Antibiotics, The recommended treatment of new-onset pulmonary tuberculosis, is six months of a combination of antibiotics containing rifampicin, isoniazid, pyrazinamide, and ethambutol for the first two months, and only rifampicin and isoniazid for the last four months. Where resistance to isoniazid is high, ethambutol may be added for the last four months as an alternative.
A urinary tract infection (UTI) is an infection that affects part of the urinary tract. When it affects the lower urinary tract it is known as a bladder infection (cystitis) and when it affects the upper urinary tract it is known as a kidney infection (pyelonephritis). Symptoms from a lower urinary tract infection include pain with urination, frequent urination, and feeling the need to urinate despite having an empty bladder. Symptoms of a kidney infection include fever and flank pain usually in addition to the symptoms of a lower UTI. Rarely the urine may appear bloody. In the very old and the very young, symptoms may be vague or non-specific.

The most common cause of infection is Escherichia coli, though other bacteria or fungi may sometimes be the cause. Risk factors include female anatomy, sexual intercourse, diabetes, obesity, and family history. Although sexual intercourse is a risk factor, UTIs are not classified as sexually transmitted infections (STIs). Kidney infection, if it occurs, usually follows a bladder infection but may also result from a blood-borne infection. Diagnosis in young healthy women can be based on symptoms alone. In those with vague symptoms, diagnosis can be difficult because bacteria may be present without there being an infection. In complicated cases or if treatment fails, a urine culture may be useful.

In uncomplicated cases, UTIs are treated with a short course of antibiotics such as nitrofurantoin or trimethoprim/sulfamethoxazole. Resistance to many of the antibiotics used to treat this condition is increasing. In complicated cases, a longer course or intravenous antibiotics may be needed. If symptoms do not improve in two or three days, further diagnostic testing may be needed. Phenazopyridine may help with symptoms. In those who have bacteria or white blood cells in their urine but have no symptoms, antibiotics are generally not needed, although during pregnancy is an exception. In those with frequent infections, a short course of antibiotics may be taken as soon as symptoms begin or long-term antibiotics may be used as a preventive measure.

**SIGNS AND SYMPTOMS**

Urine may contain pus (a condition known as pyuria) as seen from a person with sepsis due to a urinary tract infection. Lower urinary tract infection is also referred to as a bladder infection. The most common symptoms are burning with urination and having to urinate frequently (or an urge to urinate) in the absence of vaginal discharge and significant pain. These symptoms may vary from mild to severe and in healthy women last an average of six days. Some pain above the pubic bone or in the lower back may be present. People experiencing an upper urinary tract infection, or pyelonephritis, may experience flank pain, fever, or nausea and vomiting in addition to the classic symptoms of a lower urinary tract infection. Rarely, the urine may appear bloody or contain visible pus in the urine.

It is reasonable to obtain a urine culture in those with signs of systemic infection that may be unable to report urinary symptoms, such as when advanced dementia is present. Systemic signs of infection include a fever or increase in temperature of more than 1.1 °C (2.0 °F) from usual, chills, and an increased white blood cell count.
CAUSE
Uropathogenic E. coli from the gut is the cause of 80–85% of community-acquired urinary tract infections, with Staphylococcus saprophyticus being the cause in 5–10%. Rarely they may be due to viral or fungal infections. Healthcare-associated urinary tract infections (mostly related to urinary catheterization) involve a much broader range of pathogens including: E. coli (27%), Klebsiella (11%), Pseudomonas (11%), the fungal pathogen Candida albicans (9%), and Enterococcus (7%) among others. Urinary tract infections due to Staphylococcus aureus typically occur secondary to blood-borne infections. Chlamydia trachomatis and Mycoplasma genitalium can infect the urethra but not the bladder. These infections are usually classified as a urethritis rather than urinary tract infection.

- Intercourse
In young sexually active women, sexual activity is the cause of 75–90% of bladder infections, with the risk of infection related to the frequency of sex. The term "honeymoon cystitis" has been applied to this phenomenon of frequent UTIs during early marriage. In post-menopausal women, sexual activity does not affect the risk of developing a UTI. Spermicide use, independent of sexual frequency, increases the risk of UTIs. Diaphragm use is also associated. Condom use without spermicide or use of birth control pills does not increase the risk of uncomplicated urinary tract infection.

- Sex
Women are more prone to UTIs than men because, in females, the urethra is much shorter and closer to the anus. As a woman's estrogen levels decrease with menopause, her risk of urinary tract infections increases due to the loss of protective vaginal flora. Additionally, vaginal atrophy that can sometimes occur after menopause is associated with recurrent urinary tract infections. Chronic prostatitis in the forms of chronic prostatitis/chronic pelvic pain syndrome and chronic bacterial prostatitis (not acute bacterial prostatitis or asymptomatic inflammatory prostatitis) may cause recurrent urinary tract infections in males.

- Urinary catheters
Urinary catheterization increases the risk for urinary tract infections. The risk of an associated infection can be decreased by catheterizing only when necessary, using aseptic technique for insertion, and maintaining unobstructed closed drainage of the catheter.

- Others
A predisposition for bladder infections may run in families. This is believed to be related to genetics. Other risk factors include diabetes, being uncircumcised, and having a large prostate. In children UTIs are associated with vesicoureteral reflux (an abnormal movement of urine from the bladder into ureters or kidneys) and constipation.
Persons with spinal cord injury are at increased risk for urinary tract infection in part because of chronic use of catheter, and in part because of voiding dysfunction.

**PATHOGENESIS**

- **Bladder infection**

The bacteria that cause urinary tract infections typically enter the bladder via the urethra. However, infection may also occur via the blood or lymph. It is believed that the bacteria are usually transmitted to the urethra from the bowel, with females at greater risk due to their anatomy. After gaining entry to the bladder, E. Coli are able to attach to the bladder wall and form a biofilm that resists the body's immune response.

Escherichia coli is the single most common microorganism, followed by Klebsiella and Proteus spp., to cause urinary tract infection. Klebsiella and Proteus spp., are frequently associated with stone disease. The presence of Gram positive bacteria such as Enterococcus and Staphylococcus increased.

**DIAGNOSIS**

Multiple bacilli (rod-shaped bacteria, here shown as black and bean-shaped) shown between white blood cells in urinary microscopy. It may be useful to confirm the diagnosis via urinalysis, looking for the presence of urinary nitrites, white blood cells (leukocytes), or leukocyte esterase. Another test, urine microscopy, looks for the presence of red blood cells, white blood cells, or bacteria. Urine culture is deemed positive if it shows a bacterial colony count of greater than or equal to 10³ colony-forming units per mL of a typical urinary tract organism.

**CLASSIFICATION**

A urinary tract infection may involve only the lower urinary tract, in which case it is known as a bladder infection. Alternatively, it may involve the upper urinary tract, in which case it is known as pyelonephritis. If the urine contains significant bacteria but there are no symptoms, the condition is known as asymptomatic bacteriuria.

If a urinary tract infection involves the upper tract, and the person has diabetes mellitus, is pregnant, is male, or immunocompromised, it is considered complicated.

In children when a urinary tract infection is associated with a fever, it is deemed to be an upper urinary tract infection.

**DIFFERENTIAL DIAGNOSIS**

In women with cervicitis (inflammation of the cervix) or vaginitis (inflammation of the vagina) and in young men with UTI symptoms, a Chlamydia trachomatis or Neisseria gonorrhoeae infection may be the cause.
Interstitial cystitis (chronic pain in the bladder) may be considered for people who experience multiple episodes of UTI symptoms but urine cultures remain negative and not improved with antibiotics.

Hemorrhagic cystitis, characterized by blood in the urine, can occur secondary to a number of causes including: infections, radiation therapy, underlying cancer, medications and toxins. Medications that commonly cause this problem include the chemotherapeutic agent cyclophosphamide.

**PREVENTION**

A number of measures have not been confirmed to affect UTI frequency including: urinating immediately after intercourse, the type of underwear used, personal hygiene methods used after urinating or defecating, or whether a person typically bathes or showers. There is similarly a lack of evidence surrounding the effect of holding one's urine, tampon use, and douching. In those with frequent urinary tract infections who use spermicide or a diaphragm as a method of contraception, they are advised to use alternative methods. In those with benign prostatic hyperplasia urinating in a sitting position appears to improve bladder emptying which might decrease urinary tract infections in this group.

Using urinary catheters as little and as short of time as possible and appropriate care of the catheter when used prevents catheter-associated urinary tract infections. They should be inserted using sterile technique in hospital however non-sterile technique may be appropriate in those who self catheterize. The urinary catheter set up should also be kept sealed. Evidence does not support a significant decrease in risk when silver-alloy catheters are used.

- **Medications**

For those with recurrent infections, taking a short course of antibiotics when each infection occurs is associated with the lowest antibiotic use. A prolonged course of daily antibiotics is also effective. Medications frequently used include nitrofurantoin and trimethoprim/sulfamethoxazole (TMP/SMX).

Methenamine is another agent used for this purpose as in the bladder where the acidity is low it produces formaldehyde to which resistance does not develop. Some recommend against prolonged use due to concerns of antibiotic resistance.

In cases where infections are related to intercourse, taking antibiotics afterwards may be useful. In post-menopausal women, topical vaginal estrogen has been found to reduce recurrence. As opposed to topical creams, the use of vaginal estrogen from pessaries has not been as useful as low dose antibiotics. Antibiotics following short term urinary catheterization decreases the subsequent risk of a bladder infection.

- **Alternative medicine**
Some research suggests that cranberry (juice or capsules) may decrease the number of UTIs in those with frequent infections.

**TREATMENT**

The mainstay of treatment is antibiotics. Phenazopyridine is occasionally prescribed during the first few days in addition to antibiotics to help with the burning and urgency sometimes felt during a bladder infection. Acetaminophen (paracetamol) may be used for fevers.

- **Asymptomatic bacteriuria**

Those who have bacteria in the urine but no symptoms should not generally be treated with antibiotics. This includes those who are old, those with spinal cord injuries, and those who have urinary catheters. Pregnancy is an exception and it is recommended that women take 7 days of antibiotics.

- **Uncomplicated**

Uncomplicated infections can be diagnosed and treated based on symptoms alone. Antibiotics taken by mouth such as trimethoprim/sulfamethoxazole (TMP/SMX), nitrofurantoin, or fosfomycin are typically first line. Cephalosporins, amoxicillin/clavulanic acid, or a fluoroquinolone may also be used.
2. SEXUALLY TRANSMITTED INFECTION

<table>
<thead>
<tr>
<th>Synonyms</th>
<th>Sexually transmitted diseases (STD), venereal diseases (VD)</th>
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<tbody>
<tr>
<td>&quot;Syphilis is a dangerous disease, but it can be cured.&quot; Poster encouraging treatment.</td>
<td></td>
</tr>
<tr>
<td>Specialty</td>
<td>Infectious disease</td>
</tr>
<tr>
<td>Symptoms</td>
<td>None, vaginal discharge, penile discharge, ulcers on or around the genitals, pelvic pain[1]</td>
</tr>
<tr>
<td>Complications</td>
<td>Infertility[1]</td>
</tr>
<tr>
<td>Causes</td>
<td>Infections commonly spread by sex[1]</td>
</tr>
<tr>
<td>Prevention</td>
<td>Not having sex, vaccinations, condoms[2]</td>
</tr>
</tbody>
</table>

INTRODUCTION

STIs were commonly known as *venereal diseases*, the word *venereal* being derived from the Latin word *venereus*, and meaning relating to sexual intercourse or desire, ultimately derived from Venus, the Roman goddess of love. STIs have been euphemistically referred to as "blood diseases" and "social diseases" in the past.

Sexually transmitted infections (STI), also referred to as sexually transmitted diseases (STD) and venereal diseases (VD), are infections that are commonly spread by sexual activity, especially vaginal intercourse, anal sex and oral sex. Many times STIs initially do not cause symptoms. This results in a greater risk of passing the disease on to others. Symptoms and signs of disease may include vaginal discharge, penile discharge, ulcers on or around the genitals, and pelvic pain. STIs can be transmitted to an infant before or during childbirth and may result in poor outcomes for the baby. Some STIs may cause problems with the ability to get pregnant.

More than 30 different bacteria, viruses, and parasites can be transmitted through sexual activity.[1] Bacterial STIs include chlamydia, gonorrhea, and syphilis. Viral STIs include genital herpes, HIV/AIDS, and genital warts. Parasitic STIs include trichomoniasis. While usually spread by sex, some STIs can be spread by non-sexual contact with donor tissue, blood, breastfeeding, or during childbirth. STI diagnostic tests are usually easily available in the developed world, but this is often not the case in the developing world.

The most effective way of preventing STIs is by not having sex. Some vaccinations may also decrease the risk of certain infections including hepatitis B and some types of HPV. Safer sex practices such as use of condoms, having a smaller number of sexual partners, and being in a relationship where each person only has sex with the other also decreases the risk. Circumcision in males may be effective to prevent some infections. Most STIs are treatable or curable. During school, comprehensive sex education may also be useful. Of the most common infections, syphilis, gonorrhea, chlamydia, trichomoniasis are curable, while herpes, hepatitis B, HIV/AIDS, and HPV are treatable but not curable. Resistance to certain antibiotics is developing among some organisms such as gonorrhea.
Not all STIs are symptomatic, and symptoms may not appear immediately after infection. In some instances a disease can be carried with no symptoms, which leaves a greater risk of passing the disease on to others. Depending on the disease, some untreated STIs can lead to infertility, chronic pain or even death. The presence of an STI in prepubescent children may indicate sexual abuse.

### Cause

#### Transmission

A sexually transmitted infection present in a pregnant woman may be passed on to the infant before or after birth. The risks and transmission probabilities of sexually transmitted diseases are:

<table>
<thead>
<tr>
<th>Type</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>i.)</td>
<td>Bacterial</td>
</tr>
<tr>
<td></td>
<td>- Chancroid (Haemophilus ducreyi)</td>
</tr>
<tr>
<td></td>
<td>- Chlamydia (Chlamydia trachomatis)</td>
</tr>
<tr>
<td></td>
<td>- Gonorrhea (Neisseria gonorrhoeae), colloquially known as &quot;the clap&quot;</td>
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<tr>
<td></td>
<td>- Granuloma inguinale or (Klebsiella granulomatis)</td>
</tr>
<tr>
<td></td>
<td>- Mycoplasma genitalium</td>
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<tr>
<td></td>
<td>- Mycoplasma hominis</td>
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<tr>
<td></td>
<td>- Syphilis (Treponema pallidum)</td>
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<tr>
<td></td>
<td>- Ureaplasma infection</td>
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<tr>
<td>ii.)</td>
<td>Fungal</td>
</tr>
<tr>
<td></td>
<td>- Candidiasis (yeast infection)</td>
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<tr>
<td>iii.)</td>
<td>Viral</td>
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<tr>
<td></td>
<td>- Viral hepatitis (Hepatitis B virus)—saliva, venereal fluids. (Note: Hepatitis A and Hepatitis E are transmitted via the fecal-oral route; Hepatitis C is rarely sexually transmittable, and the route of transmission of Hepatitis D (only if infected with B) is uncertain, but may include sexual transmission.)</td>
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<tr>
<td></td>
<td>- Herpes simplex (Herpes simplex virus 1, 2) skin and mucosal, transmissible with or without visible blisters</td>
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<tr>
<td></td>
<td>- HIV (Human Immunodeficiency Virus)—venereal fluids, semen, breast milk, blood</td>
</tr>
<tr>
<td></td>
<td>- HPV (Human Papillomavirus)—skin and mucosal contact. 'High risk' types of HPV cause almost all cervical cancers, as well as some anal, penile, and vulvar cancer. Some other types of HPV cause genital warts.</td>
</tr>
<tr>
<td></td>
<td>- Molluscum contagiosum (molluscum contagiosum virus MCV)—close contact</td>
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Pathophysiology B.Pharmacy II semester

JAIPUR COLLEGE OF PHARMACY, JAIPUR
- Crab louse, colloquially known as "crabs" or "pubic lice" (Pthirus pubis) The infestation and accompanying inflammation is Pediculosis pubis
- Scabies (Sarcoptes scabiei)
- Trichomoniasis (Trichomonas vaginalis), colloquially known as "trich"

**MAIN TYPES**

Sexually transmitted infections include:

- **Chlamydia** is a sexually transmitted infection caused by the bacterium *Chlamydia trachomatis*. In women, symptoms may include abnormal vaginal discharge, burning during urination, and bleeding in between periods, although most women do not experience any symptoms. Symptoms in men include pain when urinating, and abnormal discharge from their penis. If left untreated in both men and women, Chlamydia can infect the urinary tract and potentially lead to pelvic inflammatory disease (PID). PID can cause serious problems during pregnancy and even has the potential to cause infertility. It can cause a woman to have a potentially deadly ectopic pregnancy, in which the egg implants outside of the uterus. However, Chlamydia can be cured with antibiotics.

- The two most common forms of herpes are caused by infection with **herpes simplex virus** (HSV). HSV-1 is typically acquired orally and causes cold sores, HSV-2 is usually acquired during sexual contact and affects the genitals, however either strain may affect either site. Some people are asymptomatic or have very mild symptoms. Those that do experience symptoms usually notice them 2 to 20 days after exposure which last 2 to 4 weeks. Symptoms can include small fluid-filled blisters, headaches, backaches, itching or tingling sensations in the genital or anal area, pain during urination, Flu like symptoms, swollen glands, or fever. Herpes is spread through skin contact with a person infected with the virus. The virus affects the areas where it entered the body. This can occur through kissing, vaginal intercourse, oral sex or anal sex. The virus is most infectious during times when there are visible symptoms, however those who are asymptomatic can still spread the virus through skin contact. The initial infection and symptoms are usually the most severe because the body does not have any antibodies built up. After the primary attack, one might have recurring attacks that are milder or might not even have future attacks. There is no cure for the disease but there are antiviral medications that treat its symptoms and lower the risk of transmission (Valtrex). Although HSV-1 is typically the "oral" version of the virus, and HSV-2 is typically the "genital" version of the virus, a person with HSV-1 orally CAN transmit that virus to their partner genitally. The virus, either type, will settle into a nerve bundle either at the top of the spine, producing the "oral" outbreak, or a second nerve bundle at the base of the spine, producing the genital outbreak.

- **The human papillomavirus** (HPV) is the most common STI in the United States. There are more than 40 different strands of HPV and many do not cause any health problems. In 90% of cases the body’s immune system clears the infection naturally within 2 years. Some cases may not be cleared and can lead to genital warts (bumps around the genitals that can be small or large, raised or flat, or shaped like cauliflower) or cervical cancer and other HPV related cancers. Symptoms might not show up until advanced stages. It is important for women to get pap smears in order to check for and treat cancers. There are also two vaccines available for women (Cervarix and Gardasil) that protect against the types of HPV that cause cervical cancer. HPV can be passed through genital-to-genital contact as well as during oral sex. It is important to remember that the infected partner might not have any symptoms.
Gonorrhea

It is caused by bacterium that lives on moist mucous membranes in the urethra, vagina, rectum, mouth, throat, and eyes. The infection can spread through contact with the penis, vagina, mouth or anus. Symptoms of gonorrhea usually appear 2 to 5 days after contact with an infected partner however, some men might not notice symptoms for up to a month. Symptoms in men include burning and pain while urinating, increased urinary frequency, discharge from the penis (white, green, or yellow in color), red or swollen urethra, swollen or tender testicles, or sore throat. Symptoms in women may include vaginal discharge, burning or itching while urinating, painful sexual intercourse, severe pain in lower abdomen (if infection spreads to fallopian tubes), or fever (if infection spreads to fallopian tubes); however, many women do not show any symptoms. There are some antibiotic resistant strains for Gonorrhea but most cases can be cured with antibiotics.

For pathophysiology, prevention diagnosis and treatment referred at page no. 9 and onwards.

Syphilis

- It is an STI caused by a bacterium.
- Causative organism is *Treponema pallidum*.
- Spread by unprotective sex. Untreated, it can lead to complications and death. Clinical manifestations of syphilis include the ulceration of the uro-genital tract, mouth or rectum; if left untreated the symptoms worsen.
- Its diagnosis, prevention and treatment referred at page no. 9 and onwards or given together with other STDs.

HIV (human immunodeficiency virus)

- It damages the body's immune system, which interferes with its ability to fight off disease-causing agents. The virus kills CD4 cells, which are white blood cells that help fight off various infections. HIV is carried in body fluids, and is spread by sexual activity. It can also be spread by contact with infected blood, breast feeding, childbirth, and from mother to child during pregnancy. When HIV is at its most advanced stage, an individual is said to have AIDS (acquired immunodeficiency syndrome). There are different stages of the progression of and HIV infection. The stages include primary infection, asymptomatic infection, symptomatic infection, and AIDS. In the primary infection stage, an individual will have flu like symptoms (headache, fatigue, fever, muscle aches) for about 2 weeks. In the asymptomatic stage, symptoms usually disappear, and the patient can remain asymptomatic for years. When HIV progresses to the symptomatic stage, the immune system is weakened, and has a low cell count of CD4+ T Cells. When the HIV infection becomes life-threatening, it is called AIDS. People with AIDS fall prey to opportunistic infections and die as a result. When the disease was first discovered in the 1980s, those who had AIDS were not likely to live longer than a few years. There are now antiretroviral drugs (ARVs) available to treat HIV infections. There is no known cure for HIV or AIDS but the drugs help suppress the virus. By suppressing the amount of virus in the body, people can lead longer and healthier lives. Even though their virus
levels may be low they can still spread the virus to others.

For pathophysiology, prevention diagnosis and treatment referred at page no. 9 and onwards.

- **Trichomoniasis** is a common STI that is caused by infection with a protozoan parasite called *Trichomonas vaginalis*. Trichomoniasis affects both women and men, but symptoms are more common in women. Most patients are treated with an antibiotic called metronidazole, which is very effective.

Microbes known to be sexually transmissible (but not generally considered STDs/STIs) include:

- **Marburg virus** – Virus in semen for seven weeks after clinical recovery.
- **HTLV (both types 1 and 2)** – Sexually transmissible, consumption of breast milk, breastfeeding, and once mistaken as a HIV, risk of leukemia.

**PATHOPHYSIOLOGY**

Many STIs are (more easily) transmitted through the mucous membranes of the penis, vulva, rectum, urinary tract and (less often depending on type of infection) the mouth, throat, respiratory tract and eyes. The visible membrane covering the head of the penis is a mucous membrane, though it produces no mucus (similar to the lips of the mouth). Mucous membranes differ from skin in that they allow certain pathogens into the body. The amount of contact with infective sources which causes infection varies with each pathogen but in all cases a disease may result from even light contact from fluid carriers like venereal fluids onto a mucous membranes.

Some STIs such as HIV can be transmitted from mother to child either during pregnancy or breastfeeding.

Healthcare professionals suggest safer sex, such as the use of condoms, as a reliable way of decreasing the risk of contracting sexually transmitted diseases during sexual activity, but safer sex cannot be considered to provide complete protection from an STI. The transfer of and exposure to bodily fluids, such as blood transfusions and other blood products, sharing injection needles, needle-stick injuries (when medical staff are inadvertently jabbed or pricked with needles during medical procedures), sharing tattoo needles, and childbirth are other avenues of transmission. These different means put certain groups, such as medical workers, and haemophiliacs and drug users, particularly at risk.

It is possible to be an asymptomatic carrier of sexually transmitted diseases. In particular, sexually transmitted diseases in women often cause the serious condition of pelvic inflammatory disease.

**PREVENTION**

The Centers for Disease Control and Prevention strategies for reducing STD risk include: vaccination, mutual monogamy, reducing the number of sexual partners and abstinence.

The most effective way to prevent sexual transmission of STIs is to avoid contact of body parts or fluids which can lead to transfer with an infected partner. Not all sexual activities involve contact: cybersex, phonesex or masturbation from a distance are methods of avoiding contact.
Proper use of condoms reduces contact and risk. Although a condom is effective in limiting exposure, some disease transmission may occur even with a condom. Both partners can get tested for STIs before initiating sexual contact, or before resuming contact if a partner engaged in contact with someone else. Many infections are not detectable immediately after exposure, so enough time must be allowed between possible exposures and testing for the tests to be accurate. Certain STIs, particularly certain persistent viruses like HPV, may be impossible to detect with current medical procedures.

Some treatment facilities utilize in-home test kits and have the person return the test for follow-up. Other facilities strongly encourage that those previously infected return to ensure that the infection has been eliminated. Novel strategies to foster re-testing have been the use of text messaging and email as reminders. These types of reminders are now used in addition to phone calls and letters. After obtaining a sexual history, a healthcare provider can encourage risk reduction by providing prevention counseling. Prevention counseling is most effective if provided in a nonjudgmental and empathetic manner appropriate to the person's culture, language, gender, sexual orientation, age, and developmental level. Prevention counseling for STIs is usually offered to all sexually active adolescents and to all adults who have received a diagnosis, have had an STI in the past year, or have multiple sex partners.

USPSTF recommends high-intensity behavioral counseling for all sexually active adolescents and for adults at increased risk for STIs. Such interactive counseling, which can be resource intensive, is directed at a person's risk, the situations in which risk occurs, and the use of personalized goal-setting strategies.

■ Vaccines

Vaccines are available that protect against some viral STIs, such as Hepatitis A, Hepatitis B, and some types of HPV. Vaccination before initiation of sexual contact is advised to assure maximal protection. The development of vaccines to protect against gonorrhea is ongoing.

■ Condoms

Condoms and female condoms only provide protection when used properly as a barrier, and only to and from the area that they cover. Uncovered areas are still susceptible to many STIs. In the case of HIV, sexual transmission routes almost always involve the penis, as HIV cannot spread through unbroken skin; therefore, properly shielding the penis with a properly worn condom from the vagina or anus effectively stops HIV transmission. An infected fluid to broken skin borne direct transmission of HIV would not be considered "sexually transmitted", but can still theoretically occur during sexual contact. This can be avoided simply by not engaging in sexual contact when presenting open, bleeding wounds.

Other STIs, even viral infections, can be prevented with the use of latex, polyurethane or polyisoprene condoms as a barrier. Some microorganisms and viruses are small enough to pass through the pores in natural skin condoms, but are still too large to pass through latex or synthetic condoms.

Proper male condom usage entails:

- Not putting the condom on too tight at the tip by leaving 1.5 centimetres (0.6 in) room for ejaculation. Putting the condom on snug can and often leads to failure.
- Wearing a condom too loose can defeat the barrier
- Avoiding inverting or spilling a condom once worn, whether it has ejaculate in it or not
- If a user attempts to unroll the condom, but realizes they have it on the wrong side, then this condom may not be effective
In order to best protect oneself and the partner from STIs, the old condom and its contents are assumed to be infectious. Therefore, the old condom must be properly disposed of. A new condom is used for each act of intercourse, as multiple usage increases the chance of breakage, defeating the effectiveness as a barrier.

■ **Nonoxynol-9**

Researchers had hoped that nonoxynol-9, a vaginal microbicide would help decrease STI risk. Trials, however, have found it ineffective and it may put women at a higher risk of HIV infection.

**SCREENING**

Screening can be performed:

- to assess the presence of infection and prevent tubal infertility in women
- during the initial evaluation before infertility treatment
- to identify HIV infection
- for men who have sex with men
- for those who may have been exposed to hepatitis C
- for HCV

Testing may be for a single infection, or consist of a number of tests for a range of STIs, including tests for syphilis, trichomonas, gonorrhea, chlamydia, herpes, hepatitis and HIV. No procedure tests for all infectious agents.

STI tests may be used for a number of reasons:

- as a diagnostic test to determine the cause of symptoms or illness
- as a screening test to detect asymptomatic or presymptomatic infections
- as a check that prospective sexual partners are free of disease before they engage in sex without safer sex precautions (for example, when starting a long term mutually monogamous sexual relationship, in fluid bonding, or for procreation).
- as a check prior to or during pregnancy, to prevent harm to the baby
- as a check after birth, to check that the baby has not caught an STI from the mother
- to prevent the use of infected donated blood or organs
- as part of the process of contact tracing from a known infected individual
- as part of mass epidemiological surveillance

Early identification and treatment results in less chance to spread disease, and for some conditions may improve the outcomes of treatment.

**MANAGEMENT**
In the case of rape, the person can be treated prophylactically with antibiotics.

An option for treating partners of patients (index cases) diagnosed with chlamydia or gonorrhea is patient-delivered partner therapy, which is the clinical practice of treating the sex partners of index cases by providing prescriptions or medications to the patient to take to his/her partner without the health care provider first examining the partner.