

Other Gram Negative Bacilli

Brucella (Brucellosis Bacilli)

Brucella organism cause brucellosis which is also known as **malta fever**, **mediterranean fever**, **undulant fever** or **Rock fever**. This genus is small, gram negative, non motile bacilli, usually coccobacillary in shape. This genus include three species are (*B. abortus*, *B. suis* and *B. melitensis*)

Pathogenicity

Brucellosis is a zoonosis and man gets infection when he comes in close contact with animal or animal products. Drinking of unpasteurized milk is a major transmission route.

Clinical symptoms are **fever**, **weakness**, **malaise**, **headache** and **sweating**. The fever may occur in cycles with febrile periods alternating with afebrile periods. This fever pattern had given the disease the name of undulant fever.

Diagnosis

- 1- Direct demonstrate of organism by culture.
- 2- Indirect evidence in the form of specific antibody (serology) can be shown to establish the diagnosis.

Treatment

Tetracycline is the most effective antibiotics against brucellosis. Streptomycin has been used in conjunction with tetracycline to prevent recurrence.

Genus: *Pseudomonas*

***Pseudomonas* sp.** are gram negative and non-fermentative bacilli that are widely distributed in the nature. Some of these are important opportunistic pathogens that infect individuals with impaired host defenses. Such human infections are usually severe, difficult to treat and are hospital acquired.

Pseudomonas aeruginosa is an important pathogenic species, which is obligatorily aerobic, motile by monotrichous flagella. The strain of ***P. aeruginosa*** can produce four different types of pigments. Most commonly produced is a blue-green pigment called **pyocyanin** which diffuses into the surrounding medium.

Virulence Factors

A large number of enzymes and toxins are liberated by ***P. aeruginosa*** which includes:

- 1- Proteolytic enzymes
- 2- Lipase
- 3- Endotoxin
- 4- Hemolysin
- 5- Exotoxin
- 6- Cytotoxin and slime polysaccharide.

Pathogenicity

There are several clinical conditions which are highly related with ***P. aeruginosa*** infections. These conditions are serious and have mortality rates in the order of 60-70% like:

- ✓ Wound infections
- ✓ Burn infections
- ✓ UTIs

- ✓ Bacteraemia
- ✓ Pneumonia and meningitis
- ✓ Cystic fibrosis
- ✓ Opportunistic infections

Diagnosis

Commonly collected samples include urine, blood, CSF, sputum and pus. The sample is cultured onto ordinary laboratory media. Gram staining and taken of the cultural characters and biochemical tests to reach at a diagnosis.

Treatment and Prevention

Infections of Pseudomonas bacteria are often serious and very resistant to therapy. The **penicillins** can be used in combination with an **aminoglycosides**, usually gentamycin, amikacin or tobramycin. **Ciprofloxacin** has been found to be effective against *P aeruginosa*.

Genus: Vibrio

Vibrios are short and curved Gram negative bacilli, which are motile, non sporing and oxidase positive organism. This genus comprises of 33 well-defined species of which 11 can infect human beings. *Vibrio cholerae* is the most important species.

Vibrio cholerae: is Gram negative, curved or comma shaped organism. This species shows **darting motility** which is due to single polar flagella. This organism can grow with NaCl and even at pH of 10. Within the species *Vibrio cholerae*, **two** biotypes are recognized: **classical and El Tor**.

Pathogenicity

The pathogenesis of cholera is due to the production of **enterotoxin** which causes severe **rice water diarrhea** which may be accompanied with vomiting.

Diagnosis

Microscopic examination of faeces can yield valuable information. **Wet drop preparation** may show darting motility under the dark field microscope.

Culturing: by inoculating faeces into (**Alkaline Peptone Water**) and spreading a loopful onto **thioglycollate citrate bile salt sucrose agar (TCBS)**. Biochemical test can confirm the identity.

Treatment

Replacement of fluids and electrolytes lost is the key of the successful management. **Oral rehydration therapy (ORT)** has been used with great success.

Among the antibiotics **tetracycline** is the most effective.

Vibrio parahaemolyticus: a large number of cases of **gastroenteritis** and infections of **eyes and ears** associated with seafood are caused by ***Vibrio parahaemolyticus***. These organisms resemble ***V. cholerae*** in many aspects but differ in being tolerant to **8% NaCl** and in its inability to grow in ordinary medium **without NaCl**.

Helicobacter pylori (previously called ***Camylobacter pylori***)

H. pylori: motile by four or five polar flagella. This organism is found under the layer of mucus on the epithelium of the **gastric antrum** in nearly all cases of active gastritis or duodenal ulcer.

H. pylori: Is thought to cause gastritis, duodenitis and peptic ulceration. The mode of transmission of this bacterium is unknown.

Diagnosis

Can be done by taking endoscopic **biopsy** of the gastric mucosa from the antrum (infected area). The specimen is **Gram stained** and **cultured** on **campylobacter selective medium** in microaerophilic conditions at 37 C. Biochemical tests for this bacteria are **positive** for **oxidase**, **catalase** and **rapid urease test**.

Treatment

Combination therapy consisting bismuth salt, metronidazol, and either amoxicillin or tetracycline.

Bordetella sp. (Whooping cough bacillus)

Whooping cough:

is an acute infectious disease caused by *Bordetella pertusis*. It usually affects young children. *B. pertusis* is strictly aerobic, gram negative coccobacilli which require complex media for its growth.

Virulence Factors

Pili which present in the surface of *B. pertusis* probably play a role in adherence of bacteria to the **ciliated cells** of the upper respiratory tract.

Various virulence factors alone or together are responsible for producing clinical manifestation.

These factors include:

- Endotoxin and Exotoxin
- Tracheal cytotoxin
- Haemolysin

- Pertussis toxin
- Filamentous haemagglutinin

Pathogenicity: the organism is transmitted to other by **airborne route**. This bacterium selectively attaches to the **ciliated epithelial cells** of the upper respiratory tract and growth is limited to the superficial tissues.

Stages of disease:

- 1- **1st stage Catarrhal stage:** symptoms of upper respiratory tract which include sneezing, running nose and coughing for 1-2 weeks.
- 2- **2nd stage Episodes of uncontrollable cough.** Each paroxysm consists of 5-20 rapid cough with the patient unable to breathe between the coughs.
- 3- **Last stage Forced inspiratory breath** cause the “whooping” sound, from which the disease has derived its name from this feature. Such prolonged coughing may lead to anoxia, expelling of mucus and vomiting.

The major complications of the disease are bronchopneumonia and lung collapse. The pressure effects during coughing can lead to subconjunctival hemorrhage and cerebral hemorrhage leading to convulsions and coma.

Diagnosis

By examination of samples from the URT during the early stage. Multiple samples (up to six) especially by the per nasal swab technique are recommended.

Culturing on suitable media and identification can be confirmed by the slide agglutination method.

Treatment

Erythromycin is the drug of choice but is useful only if initiated within first 10 days of the disease. Alternatively, **tetracycline** or **cotrimoxazole** may be used.

Prevention

Primary prevention can be achieved by the immunization of the infant with **DPT** vaccine

Bacteriodes

Bacteriodes spp: Are the most important group of **anaerobes** that cause human infections. These are none sporing, anaerobic, gram negative bacilli Part of **normal flora** of the **intestine**, the **female genital tract** and **upper respiratory tract**.

Bacteriodes spp: Are often associated with the **abdominal, brain and lung abscesses, pelvic inflammatory disease (PID)** and **postoperative infection**.

It is important to remember that anaerobic infection of the **brain, lung and abdomen** are mostly **polymicrobial**, i.e. the **Bacteriodes sp.** is often associated with anaerobic cocci and anaerobic gram positive rods.

The **Bacteriodes** bacteria respond well to **metronidazole, chloramphenicol and tetracycline**.