MISCELLANEOUS

BACTERIA

Dr.T.V.Rao MD

Listeria Monocytogenes

What is Listeriosis

- **Listeriosis,** a serious infection caused by eating food contaminated with the bacterium *Listeria Monocytogenes*, has recently been recognized as an important public health problem in the United States.

Who get Infected

- The disease affects primarily persons of advanced age, pregnant women, new-borns, and adults with weakened immune systems. However, persons without these risk factors can also rarely be affected.

Listeria

食物環境衞生署
Food and Environmental Hygiene Department

LISTERIA AND PREGNANCY

食物環境衞生署
Food and Environmental Hygiene Department

What is *Listeriosis*?

- ***Listeriosis*** **is a serious infection caused by eating foods contaminated with the bacterium *Listeria Monocytogenes*.**
- **This disease affects primarily pregnant women, newborn, and adults with weakened immune systems.**

Listeria Monocytogenes

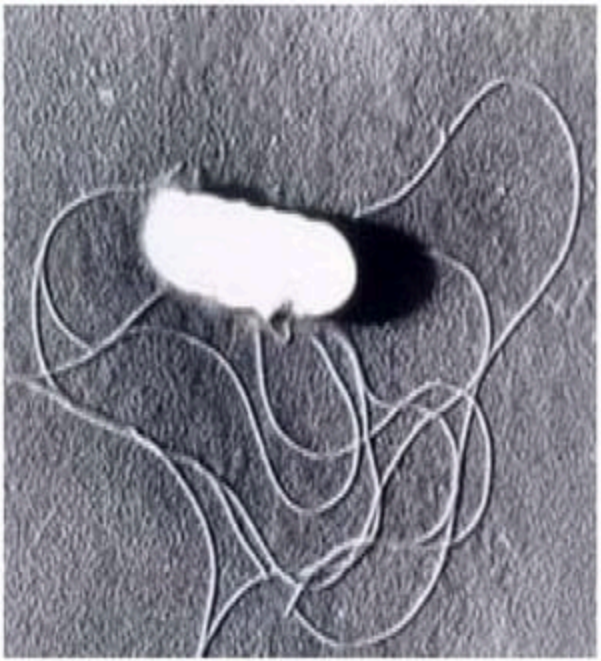
Small cocal Gram positive Bacteria

- Occurs in chains
- Long filamentous forms
- Tumbling motility at 25^{0}c and non motile at 37^{0}c

Peritrichous flagella

Aerobic and Microaerophilic

Growth at 4^{0}c

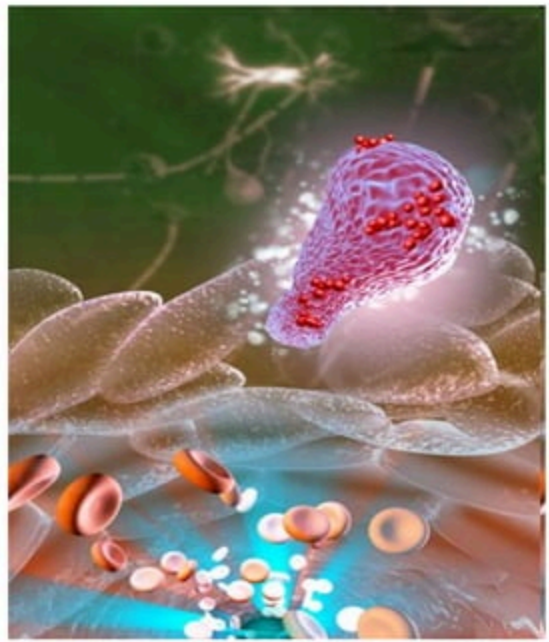


Listeriosis

- Listeriosis is caused by Bacterial agent an intracellular pathogen

Listeria Monocytogenes

- L.monocytogens produces infections world wide
- Important cause of infections in animals and man.



Culture and Growth Characteristics

- Grows on Muller Hinton agar with sheep blood as enrichment.
- Small zone of Hemolysis can be observed around and the underneath of the colony.
- Specimens are enriched if the tissues are kept at 4^0c and plated on the media

  (Cold enrichment)

Biochemical reactions

- Bacteria are facultative anaerobic microbes
- Catalase + motile
- Listeria produce acid and not gas in various sugar fermentation tests

Who are at risk with Listeriosis

- Pregnant women
- New-borns
- People with weakened immune systems
- People who are taking immuno-suppressing medication.

How Humans contact Listeriosis

- ***Listeria Monocytogenes* can be found in a variety of dairy products, vegetables, fish and meat products.**
- *Listeria Monocytogenes*, unlike most other harmful bacteria, will grow slowly on foods stored in a **refrigerator.**
- ***Listeria Monocytogenes* can also be spread by contact with an infected product or surface, such as hands or counter tops, during food preparation.**

Pathogenesis and Pathology

- Listeria Monocytogenes enters through the Gastro – intestinal tract after infections of contaminated foods such as cheese or vegetables,
- The cell wall surface protein called Interanalin interacts with E –CADHERIN and enters into epithelial cells
- Bacteria produce Listeriolysin
- L.monocygenes can move from cell to with out being exposed to Antibodies,Complement,Polymorphonuclear cells

Who are at Higher Risk

- The following conditions may be impaired with defective cell mediated Immunity
  - Pregnancy
  - AIDS
  - Lymphomas
  - Organ transplant recipients

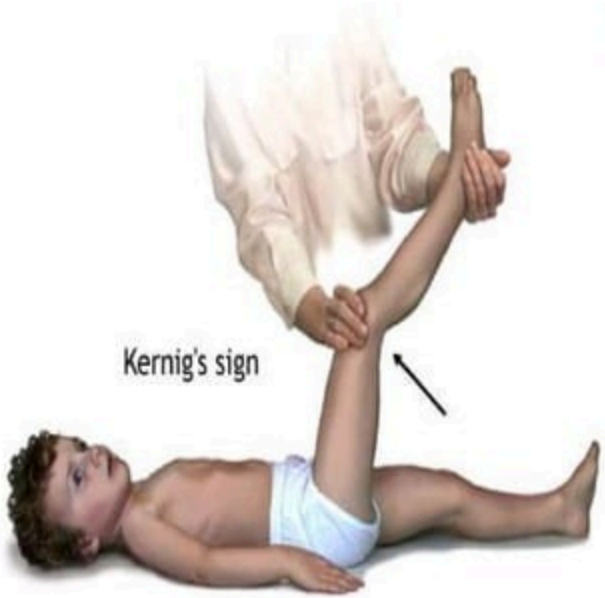
AIDS-Patient

Common presenting manifestation of Listeriosis

- Vomiting;
- Nausea;
- Cramps;
- Diarrheal;
- Severe Headache;
- Constipation; or
- Persistent fever.

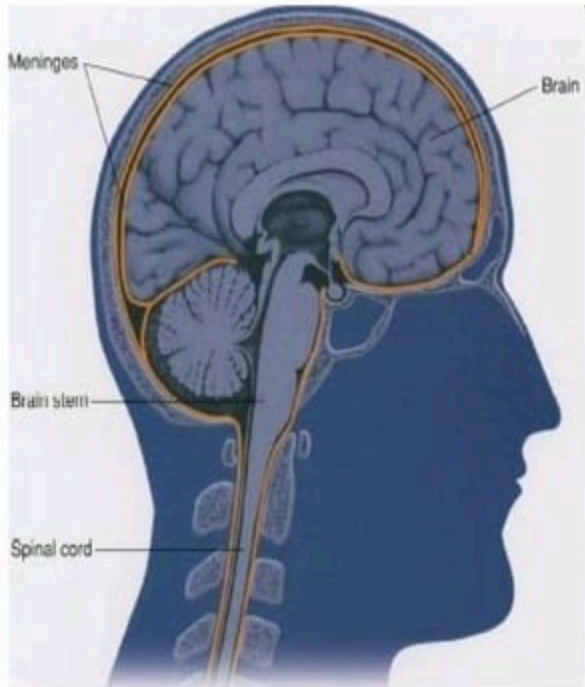
Late onset manifestations

- The new born child may present with late onset syndrome causes the development of Meningitis between birth and third week of life
- It is often caused by serotype IV b and has a significant mortality rate



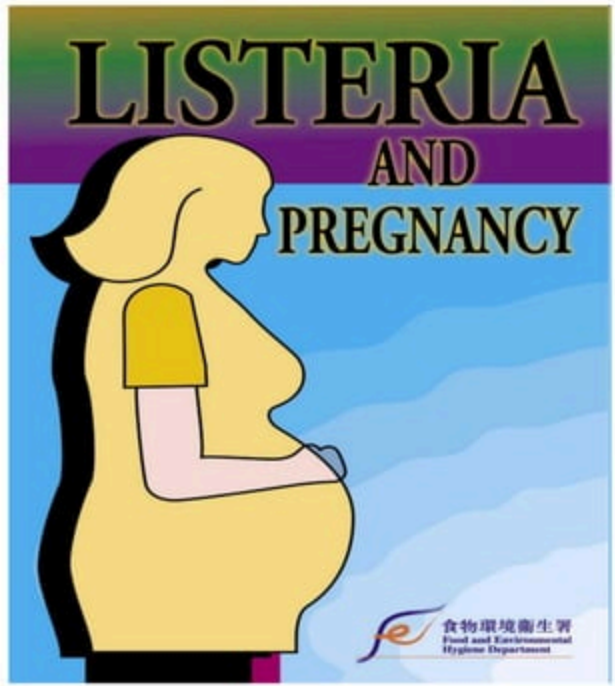
Listeriosis In Adults

- Adults may present with bacteremia . Meingoenphalitis and occur most commonly in Immunosuppressed patients in whom Listeria is one of the more common cause of Meningitis
- Disease can be insidious to fulminant



Listeriosis and Pregnancy

- Pregnant women - They are about 20 times more likely than other healthy adults to get Listeriosis. About one-third of Listeriosis cases happen during pregnancy.



Listeriosis in New Borns

- New-borns - New-borns rather than the pregnant women themselves suffer the serious effects of infection in pregnancy.

Listeriosis presenting with Meningitis

- Immunocompromised adults are at risk for a serious infection of the blood stream and central nervous system (brain and spinal cord). Meningitis occurs in about half of the cases of adult Listeriosis. Symptoms of listeria meningitis occur about four days after the flu-like symptoms and include fever, personality change, uncoordinated muscle movement, tremors, muscle contractions, seizures, and slipping in and out of consciousness.

Other Clinical manifestations

- Abscess
- Conjunctivitis
- Pharyngitis
- Urethritis
- Pneumonia
- Endocarditis
- Septicemias

Why important in Human Infections

- Can cause meningitis and Meingoenphalitis
- In particularly in neonates and elderly
- Pregnant women - abortions, and still birth
- Asymptomatic colonization in vagina produces infertility

Other characters and Biochemical reactions

- Produces hemolytic colonies
- Ferments Glucose, Maltose, lactose produces acid but no gas
- Listeria Monocytogenes present in the environment
- Saprophyte in soil
- Present in water, sewage.

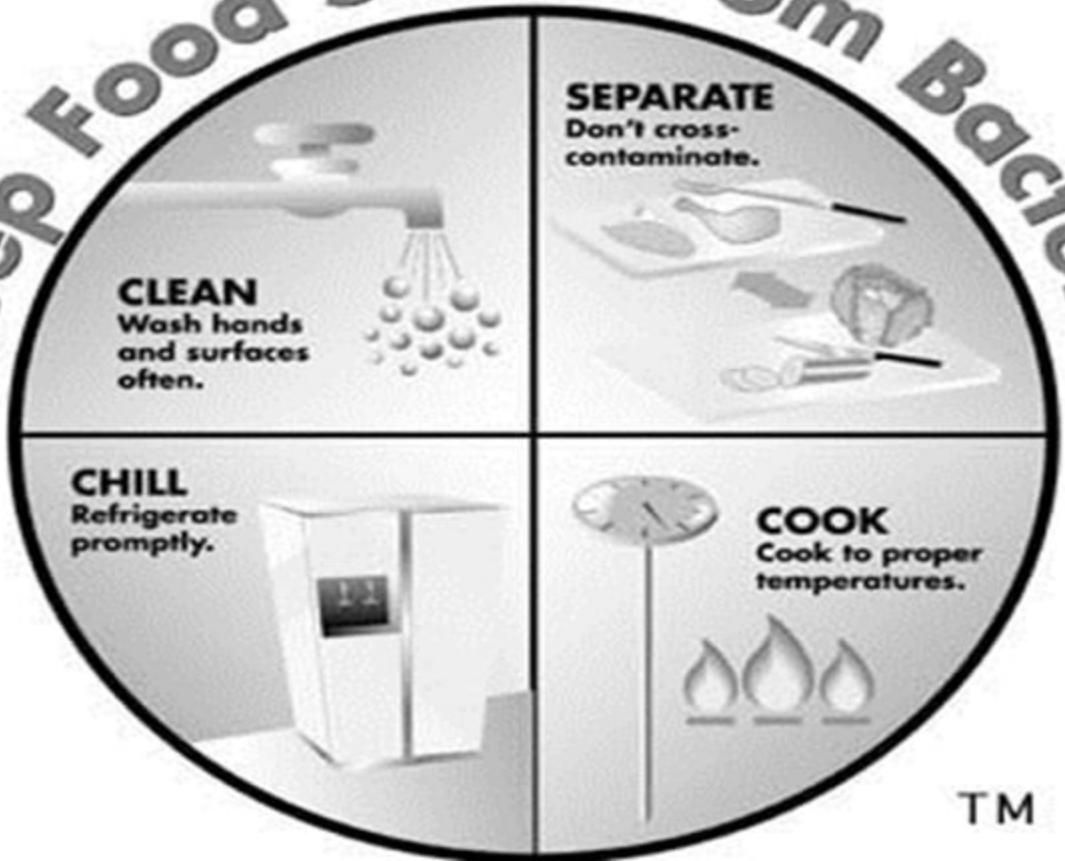
Diagnosis

- Diagnosis dependent on isolation of Organisms in cultures obtained on CSF, Blood, and other fluids

Treatment

- Ampicillin
- Erythromycin
- Intravenous **Trimethoprim – Sulphmethoxazole**
- Cephalosporins and Fluroquinoles are not active against l.monocytogens
- A commination of Gentamycin and Ampicillin on clinical basis

Keep Food Safe From Bacteria



TM

Foods to Avoid

- Hot dogs, especially straight from the package without further heating. The fluid within hot dog packages may contain more *Listeria* than the hot dogs.
- Avoid spreading fluid from packages onto other foods, cutting boards, utensils, dishes and food preparation surfaces. Wash your hands after handling hot dogs.

Why important in Human Infections

- Can cause meningitis and Meingoenphalitis
- In particularly in neonates and elderly
- Pregnant women - abortions, and still birth
- Asymptomatic colonization in vagina produces infertility

Ideal way to prevent Listeriosis

- Completely cook all meats and eggs.
- Carefully wash raw vegetables before eating.
- Keep raw meat away from raw vegetables and prepared foods. After cutting raw meat, wash the cutting board with detergent before using it for vegetables.
- Avoid drinking unpasteurized milk or foods made from such milk.
- Wash hands thoroughly after handling raw meat.

Campylobacter

Campylobacter

- Cococid Pleomorphic organisms, slender spirally curved bacteria.
- Gram negative. 2 x 0.5 microns
- Comma shaped, curved rods
- Non sporing , non motile
- Single unsheathed polar flagella at one or both ends
- Microaerophilic

Other characters

- Microaerophilic
- 5 % o2 optimal
- Oxidase +
- Sugars not fermented
- Humans causes Diarrhea
- Vetnary importance

Campylobacter jejuni

- Important cause of Diarrhea world wide
- Zoonotic importance
- Arises from food and animal origin
- Present in Intestinal tracts of animals
- Surface waters

Pathology and Clinical Manifestations

- Colonized in Jejunum, Ileum and colon and rectum
- Involves mesenteric lymph nodes and cause bacteremia
- Incubation 1 – 7 days
- Present with Fever, abdominal pain and watery diarrhea

Laboratory Diagnosis

- Isolation of Campylobacters from feces
- Observation by phase contrast microscopy, Dark field examination
- Present with tumbling motility
- Feces or rectal swabs cultured on

  Skirrows medium

  Butzlers supplement

Treatment and prevention

- Correction fluid and electrolyte balance
- Erythromycin is effective

HELICOBACTER

Helicobacter

(Warren and Marshal)

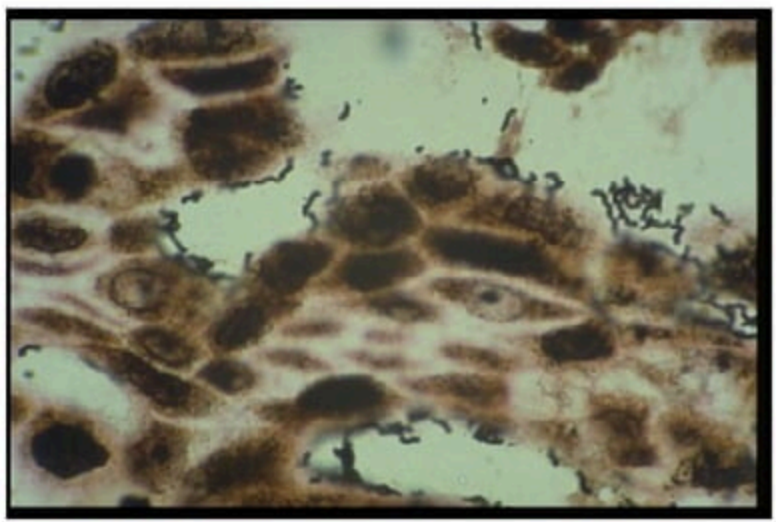
- Campylobacter like organisms
- Spiral shaped colonizes Gastric mucosa
- Etiological agent in Gastritis and peptic ulcer
- Most important bacteria.

Helicobacter pylori

Colonizes 50 % of the Individuals

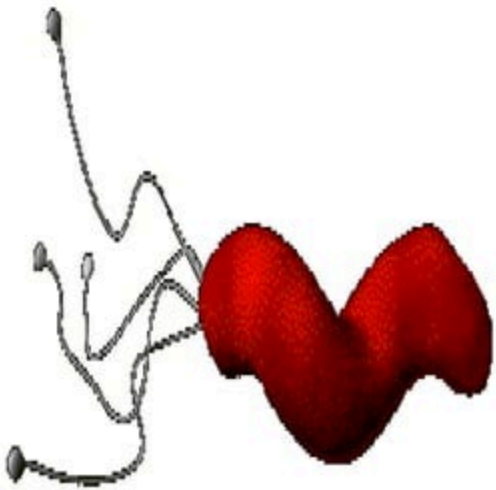
Winners of Nobel Prize in Medicine -Physiology

A silver stain of *H. pylori* on gastric mucus-secreting epithelial cells (x1000). From Dr. Marshall's stomach biopsy taken 8 days after he drank a culture of H. pylori (1985).



Helicobacter pylori

- Gram –ve spiral shaped , motile with unipolar tuft of lopotrichus flagella



MICROBIOLOGY

1. Gram negative, spiral, flagellated (motile) bacilli
2. Slow growing, requires complex media, microaerophilic
3. Oxidase and catalase positive
4. Produces urease
5. Noninvasive; proliferates in mucus overlying gastric type mucosa
6. Not cleared by host immune response

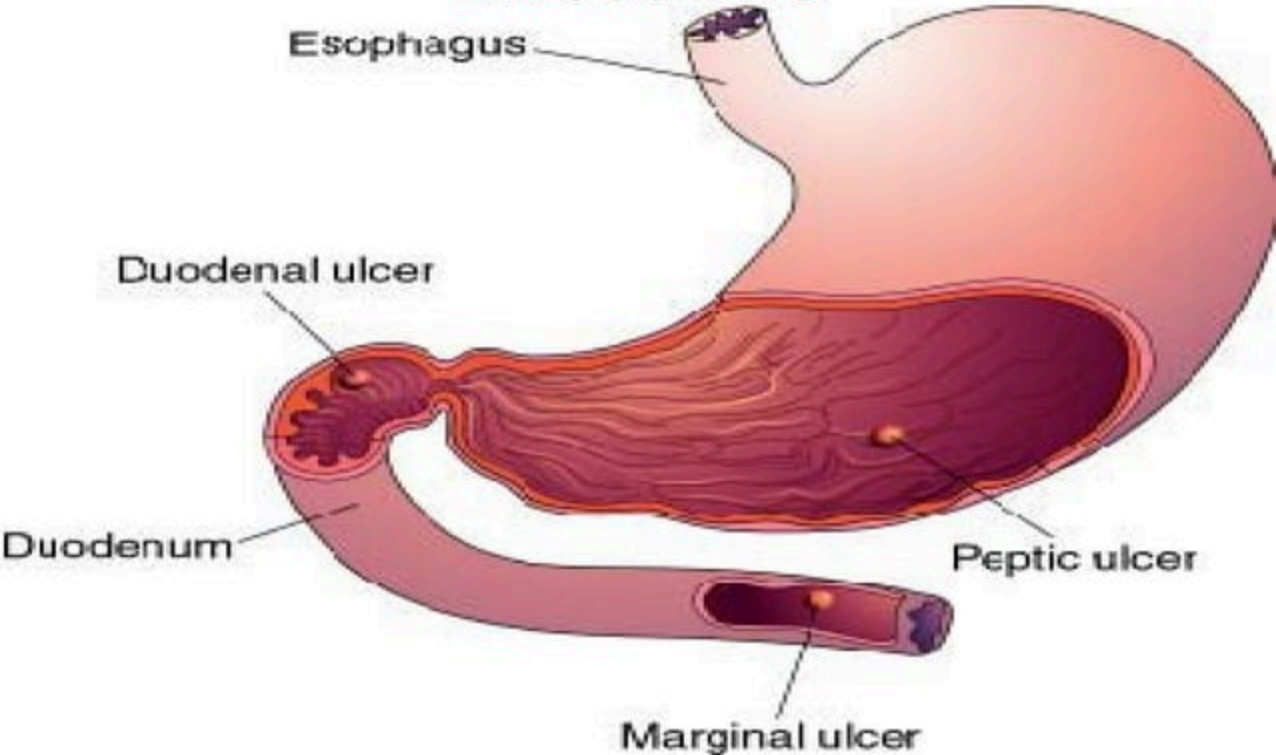
Culturing and Biochemical characters

- Grows on chocolate agar, Campylobacter media
- Grows under Microaerophilic conditions
- With presence of 5 – 20% co2
- Oxidase +
- Catalase –
- Urease strongly +++
- H2S

Pathology and pathogenesis

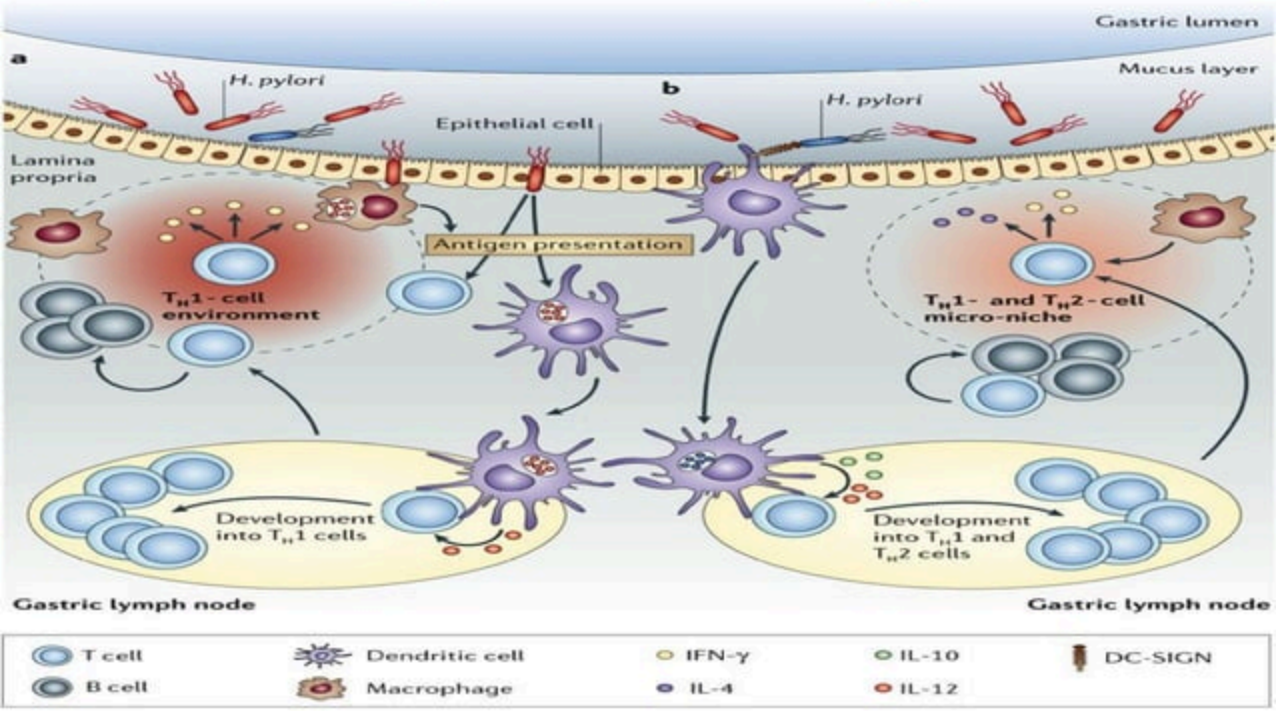
- H.pylori colonizes gastric mucosa
- Spread by oral – oral contact
- Feco oral spread prominent
- Poverty and overcrowding predisposes
- Poor Hygiene
- Causes mild to acute gastritis
- Gastric antrum - causes gastric metaplasia
- Any part of the stomach can be involved
- Colonizes overlying mucosa but do not invade mucosa

Major Location of H.pylori infections



H.pylori infecting Mucosal layer

Pathogenesis of H.pylori.



Transmission HP

- Oral – Oral.
- Faecal – Oral.
- Vectorial.
- Iatrogenic.

Pathogenesis

- Produce bacterial proteases
- Toxins
- Ammonia is release by Urease activity
- Causes Peptic ulcer
  - Chronic Atrophic gastritis
  - Gastric malignancies
  - Adeno carcinoma
  - Mucosa associated lymphomas
  - Matomas Antigen derived

Infection induces IgM, IgG, IgA

Laboratory Diagnosis

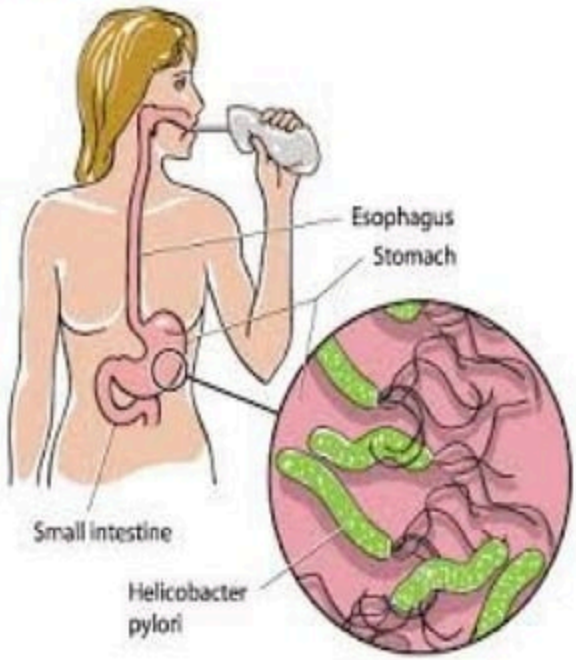
- Diagnosed by Invasive and Non Invasive tests
- Invasive, Endoscopic Biopsy of Gastric mucosa
- Microscopy – Biopsy
- Culture
- Staining by special stains
- Gram staining
- Culture more sensitive 3 – 7 days
- Biopsy testing for urease detection in urea medium

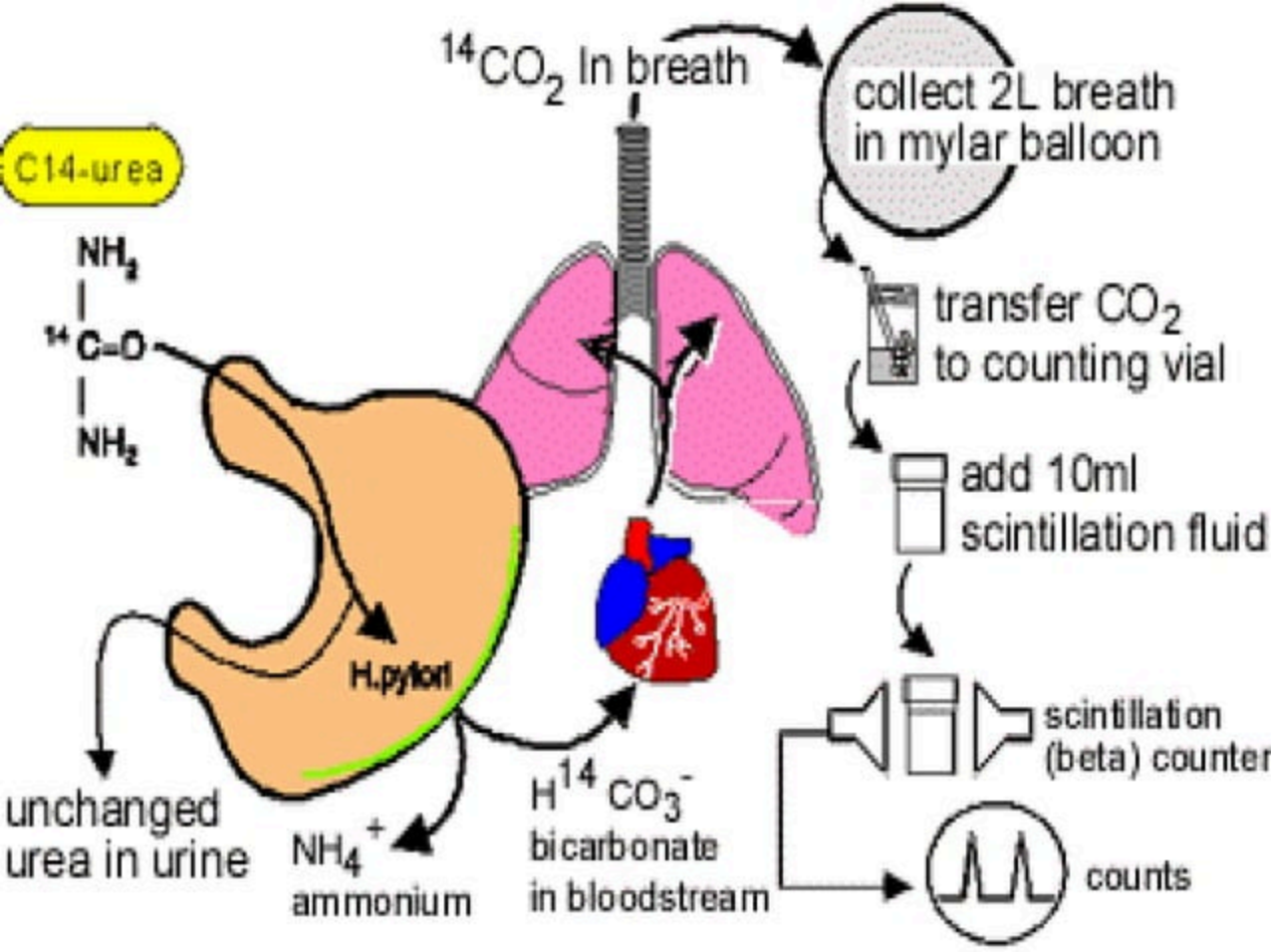
Diagnosis by Non invasive methods

- Serology ELISA
- Urea breath test patient swallows urea solution

  In this test patient drinks urea solutions labeled with an isotope carbon

  If H.pylori is present in the urea is converted to ammonia and co2 in the breath measured.




$^{14}CO_2$ In breath
collect 2L breath in mylar balloon
C14-urea
NH_2
$^{14}C=O$
NH_2
transfer CO_2 to counting vial
add 10ml scintillation fluid
H.pylori
scintillation (beta) counter
unchanged urea in urine
NH_4^+ ammonium
$H^{14}CO_3^-$ bicarbonate in bloodstream
counts

Treatment

- Use of antibiotics, bismuth salts
- Ingestion of Bismuth subsalicylate
- Antibiotics Teracycles and metronidazole for two weeks
- Use of Omeprazole
- Clarithromycin
- Donor treat for Asymptomatic colonization
- Drug resistance is a growing problem

Treatment

- Ampicillin
- Cotromoxazole
- Streptomycin
- Cephalosporins not recommended

Donovania Granulomatis
Calymmatobacterium Granulomatis

Donovan 1905

A Venereal disease

Common in Tropical countries

Morphology

- Rounded Coco bacilli size is 1 -2 microns found in cystic spaces in large mononuclear cells
- Bipolar condensation of chromatin resembling closed safety pin appearance
- Capsulated and non motile
- Gram negative
- Grown on egg yolk
- Modified Levanthal agar

Clinical Manifestations

- Produces genital lesions, a venereal disease
- Incubation 1 – 12 weeks
- Starts as a painless papule on Genitalia, progress to ulcers
- May progress to chronic course

Typical manifestation as venereal disease

Treatment

- Tetracycline
- Cotromoxazole
- Chloramphenicol
- Gentamycin
- Quinolones
- Newer macrocodes

Legionella pneumophila

Causes Legionnaires disease

Manifest two different disease
Legionnaires disease

Pontiac fever

Legionella pneumophila

- Legionella pneumophila is a thin, aerobic, pleomorphic, flagellated, non-spore forming, Gram-negative bacterium of the genus Legionella. L. pneumophila is the primary human pathogenic bacterium in this group and is the causative agent of legionellosis or Legionnaires' disease

Morphology

- Thin, Non capsulated Gram negative bacilli
- 2 – 3 microns
- Coccobacillary
- Long forms in culture
- Motile with polar Bipolar flagella
- Staining with Silver impregnation methods

Culture

- Grown on Buffered charcoal yeast extract agar with L cystine with antibiotics
- When observed under microscope appear as cut glass
- L.pneumphila catalase +

Bacterial spread

- Legionella are present in stagnant water mud and hot springs
- Live also in free living ameba
- Human infection is typically by inhalation of aerosols provided by cooling towers and air conditioners
- Shower heads
- Out come of infection depends on size of infective dose

Predisposing factors

- Smoking
- Alcohol
- Age,
- Hospitalization
- Immunodeficiency status
- Can be Community acquired or Hospital acquired

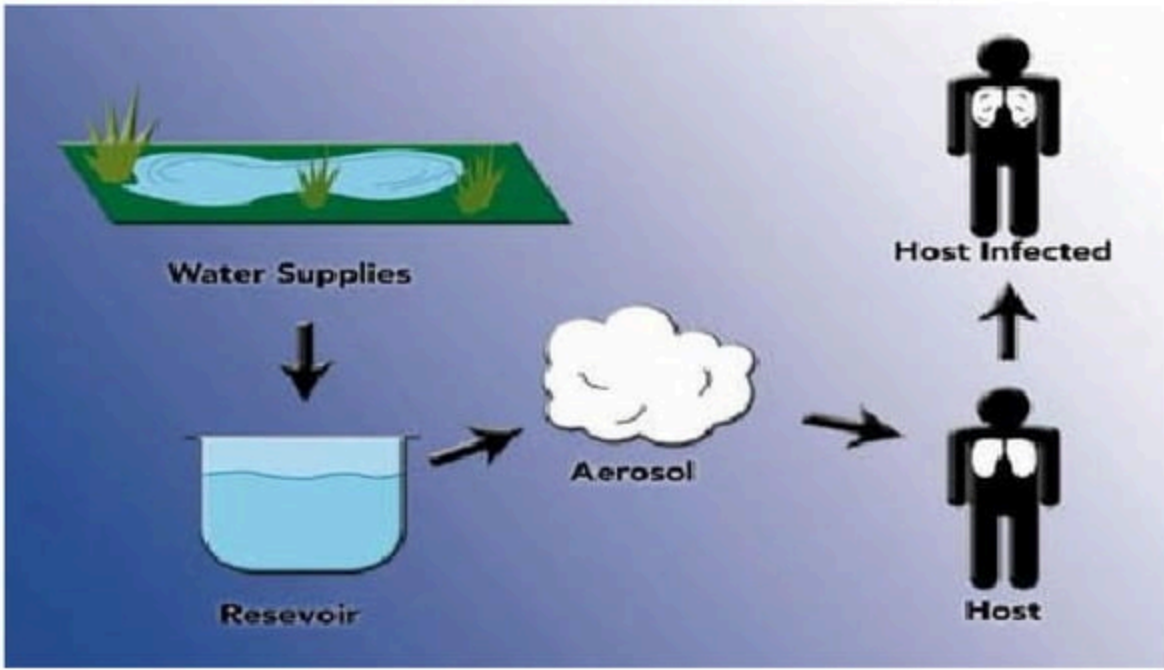
Transmission

- Legionella come from natural fresh water reservoirs, such as lakes, ponds, and puddles, where they parasitize on a broad range of protozoan species as hosts. The availability of the hosts plays a major role in the reproduction and mass release of highly infectious Legionella forms into environments where they can be spread by airborn water caplets and inhaled by people

Pathogenesis

- Bacteria enter through alveoli
- Legionella multiply inside the Monocytes and Macrophages
- CMI effective

Spread of Infection



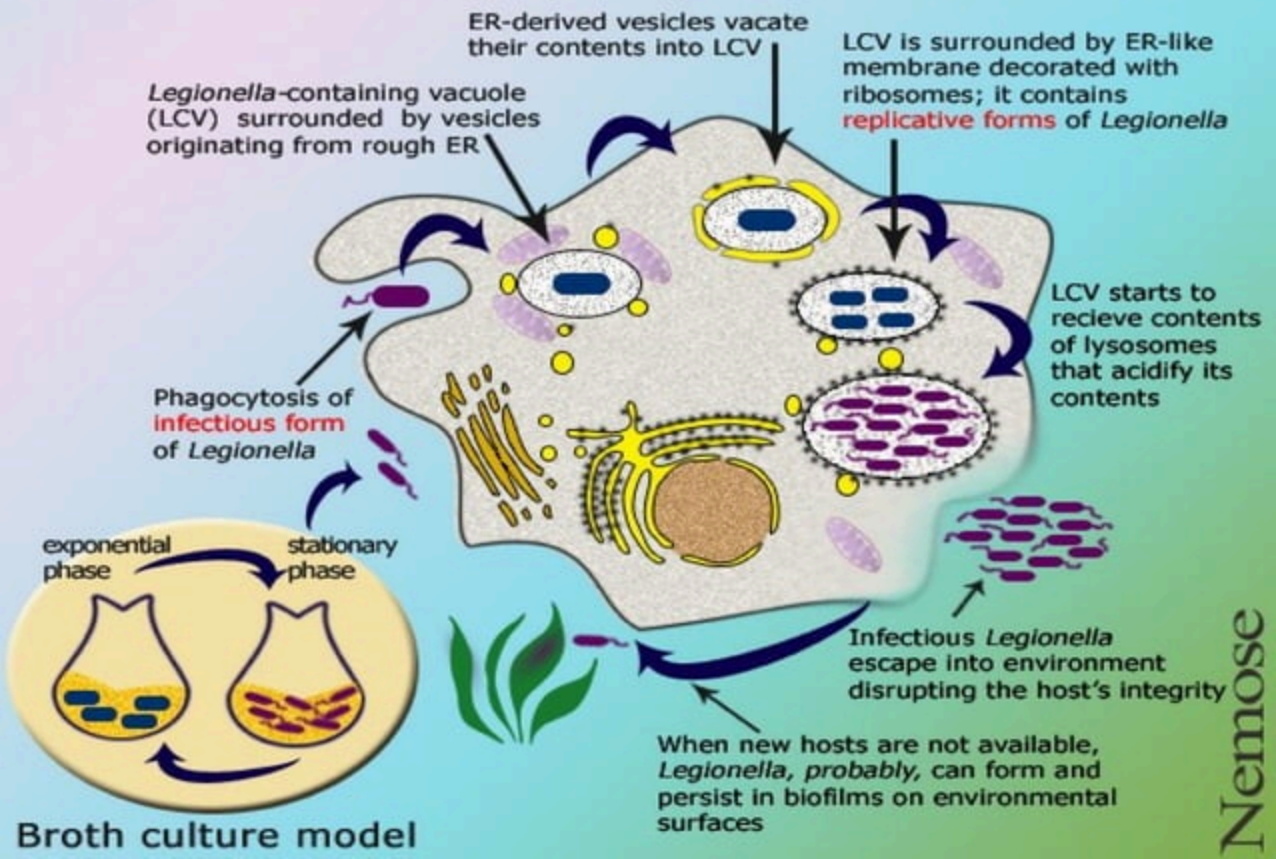
Clinically Manifest

- Legionnaires Disease
- Epidemic
- Sporadic
- Incubation 2- 10 days
- Fever, non productive cough
- Dyspnea Pneumonia
- Diarrhea Encephalopathy
- Fatal if not treated in 15 – 20 %
- Respiratory failure

Pontiac fever

- Pontiac fever is a non-pneumonic form of L. pneumophila infection Symptoms are flu-like, including fever, tiredness, myalgia, headache, sore throat, nausea, and cough may or may not be present. Pontiac fever is self limited and requires no hospitalization or antibiotic therapies. There are no reported deaths associated with Pontiac fever.

Growth cycles of *Legionella pneumophila*



Clinically

- Pontiac fever is Mild non fatal, influenza like fever

Detection

- Sera have been used both for slide agglutination studies as well as for direct detection of bacteria in tissues using fluorescent-labelled antibody. Specific antibody in patients can be determined by the indirect fluorescent antibody test. ELISA and micro agglutination tests have also been successfully applied
- Legionella stains poorly with gram stain, stains positive with silver, and is cultured on charcoal yeast extract with iron and cysteine.

Laboratory Diagnosis

- Specimens
  - Sputum
  - Bronchial aspirate
  - Lung biopsy
  - Florescent methods

Serology ELISA

Treatment

- Respiratory fluoroquinolones and the newer macrolides are used to treat L. pneumophila pneumonia. Treatment typically lasts 7-10 days or in the case of immunosuppressed patients, 21 days. Pontiac fever usually does not require antimicrobial therapy.

Treatment

- Macrolides
- Ciprofloxacin
- Tetracycline's
- Rifampicin

Acinetobacter

- Two important species
  - A baumannii
  - A lowffi

Present as soil saprophytes in sewage

An opportunistic pathogen

Morphology

- Gram – ve 1-5 to 2.5 microns in size
- Aerobic grows on ordinary media
- Oxidase –ve
- Nitrate reducing
- Pink colonies on Mac conkey
- Non acid utilizes

Clinical Manifestations

- Identified as Important opportunistic infection
- Sensitive to Broad spectrum antibiotics

Rat Bite Fever

Two types of bacteria

1 Streptobacilli moniliforms

2 Spirillum minus

Spirillum Minus

- Short Gram negative spiral organism
- 3 – 5 microns
- Stains with Giemsa stain
- Dark field microscope useful
- Not cultured- Can be isolated by inoculating the specimen Intraperitoneally into Mic

Pathogenesis

- S.minus enters the body through rat urine
- Incubation period 1-4 weeks
- Clinically present with swelling of lymph nodes near the site of bite with relapsing fever and skin rash

Treatment

- Highly susceptible to Penicillin and Tetracycline's.

Erysipeothrix rhusiopathiae

- Causes Erysipleoid in Humans
- Contaminated fish meat produce disease

Morphology

- Thin, Non motile, Non sporing Non capsulated Gram + ve bacilli, long filaments,
- Aerobic organisms
- Grows on ordinary media
- Ferments glucose, lactose
- Black colonies on Tellurite medium
- H2 S producer

Clinical Manifestations

- Painful, erythematous lesions on hands and fingers
- Involves Lymph nodes, and Joints
- EndocarditisErysipeothrix rhusiopathiae
- Septicemias

Culturing

- Skin Biopsy can put in appropriate medium
- Grows in ordinary medium

Treatment

- Ampicillin
- Erythromycin
- Ciprofloxacin

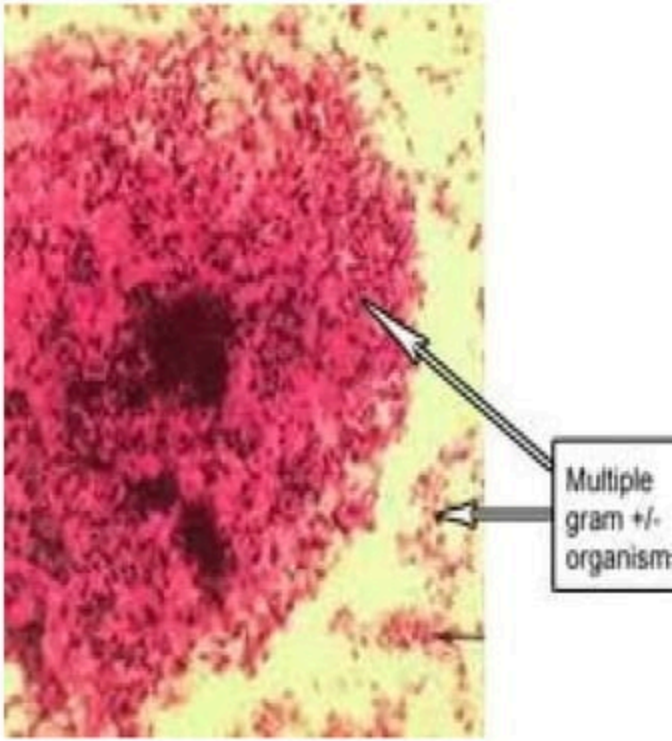
Gardenerella Vaginalis

Causes Bacterial vaginosis

An emerging infection

Morphology

- Small, Gram negative, on motile
- Pleomorphic rod which shows metachromatic granules
- Presence of Clue cells



Culturing

- Grows on Blood and Chocolate Agar
- Hemolytic colonies on Human and Rabbit blood agar,
- Catalase –
- Oxidase -

Clue Cells

- Vaginal secretions shows Clue cells
- Which are epithelial cell with surface studded with small bacteria

Treatment

- **Metronidazole**

- **The Program Created by Dr.T.V.Rao MD for Medical and Paramedical Students**

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