The Syllabus

MLB-G-DSE-B-6-2

Clinical Biochemistry (4 + 2 = 6 credits)

MLB-G-DSE-B-6-2-TH (4 credits/50 marks)

Unit 1 (20 hours)

Idea about the features of pathogenic and non-pathogenic microorganisms. General properties of synthetic and naturally occurring antimicrobial drugs: selective toxicity, and modes of action, of Penicillin, Chloramphenicol and Streptomycin. Antibiotic resistance.: mechanism of drug resistance, origin & transmission of drug resistance in microbes.

Unit 2 (20 hours)

Mechanism of Bacterial Pathogenicity: entry, colonization, pathogenicity, course of infectious disease, duration of symptoms

Mechanism of damage of host cell Exo-and endotoxins - definition and general properties.

General properties and importance of clinically important enzymes like SGOT, SGPT, Alkaline phosphatase and Creatine kinase, lactate dehydrogenase

Pathogenicity Islands

Pathogenicity Islands

Pathogenicity Islands (PAI):

- ❖ Are a distinct class of genomic islands which are acquired by horizontal gene transfer.

- ❖ Incorporated in the genome of pathogenic bacteria
  - ✓ usually absent from non-pathogenic organisms of the same or closely related species.
- ❖ They occupy relatively large genomic regions ranging from 10-200 kb
  - ✓ encode genes which contribute to virulence of the pathogen.

- ❖ Typical examples:
  - ✓ adhesins, toxins, iron uptake systems, invasins, etc.

Pathogenicity Islands…contd

❖One species of bacteria may have more than one pathogenicity island.

✓For example, in *Salmonella*, five pathogenicity islands have been identified.

❖Found mainly in Gram-ve bacteria, but have been shown in a few Gram-positives.

❖Found in pathogens that undergo gene transfer by plasmid, phage, or a conjugative transposon and are typically transferred through mechanisms of horizontal gene transfer (HGT).

Pathogenicity Islands…contd

- May be located on the bacterial chromosome or may be a part of a plasmid.
- Are rich in Guanine + Cytosine content.
- They are flanked by direct repeats i.e., the sequence of bases at two ends are the same.
- Are associated with tRNA genes, which target sites for the integration of DNA.
- Have characteristics of transposons in that they carry functional genes
  - ✓ e.g. integrase, transposase, or part of insertion sequences
  - ✓ may move from one tRNA locus to another on the chromosome or plasmid.

Pathogenicity Islands…contd

- Play a vital role in the virulence of bacterial pathogens of humans , animals and plants.

- The availability of a large number of genome sequences of pathogenic bacteria and their nonpathogenic relatives
  ⟹ identification of novel pathogen-specific genomic islands.

- PAI apparently -acquired during the speciation of pathogens from their nonpathogenic or environmental ancestors.
  - The acquisition of PAI is an ancient evolutionary event that led to the appearance of bacterial pathogens on a timescale of millions of years

  - May also represent a mechanism that contributes to the appearance of new pathogens.

Pathogenicity Islands…contd

❖Knowledge about PAI, their structure, their mobility, and the pathogenicity factors they encode is helpful:

a) In gaining a better understanding of bacterial evolution and interactions of pathogens with eucaryotic host cells

b) Also may have important practical implications such as providing delivery systems for vaccination and tools for the development of new strategies for therapy of bacterial infections.

Pathogenicity Islands…contd

- PAIs represent distinct genetic elements encoding virulence factors of pathogenic bacteria
  - Belong to a more general class of **genomic islands**
  - Common genetic elements sharing a set of unifying features.
  - Genomic islands have been acquired by horizontal gene transfer.
  - In recent years many different genomic islands have been discovered in a variety of pathogenic as well as non-pathogenic bacteria.
  - Because they promote genetic variability, genomic islands play an important role in microbial evolution

Thank You