

Microbiology-I

**Lecture: Bacterial Enzymes-Associations Between
Bacteria**

Bacterial Enzymes

- **Endoenzymes**

- Permeases, DNA polymerase, RNA polymerase, restriction endonuclease

- **Exoenzymes**

- Hydrolitic enzymes, proteinase, carbohydrase, lipase, nuclease

- **Structural enzymes**

- **Inducible enzymes**

- Beta-galactosidase

Bacterial Enzymes

How do we name bacterial enzymes?

Due to their functions

- Oksido-reductase
- Transferase
- Hydrolase
- Izomerase
- Lyase-Ligase

Due to their activities

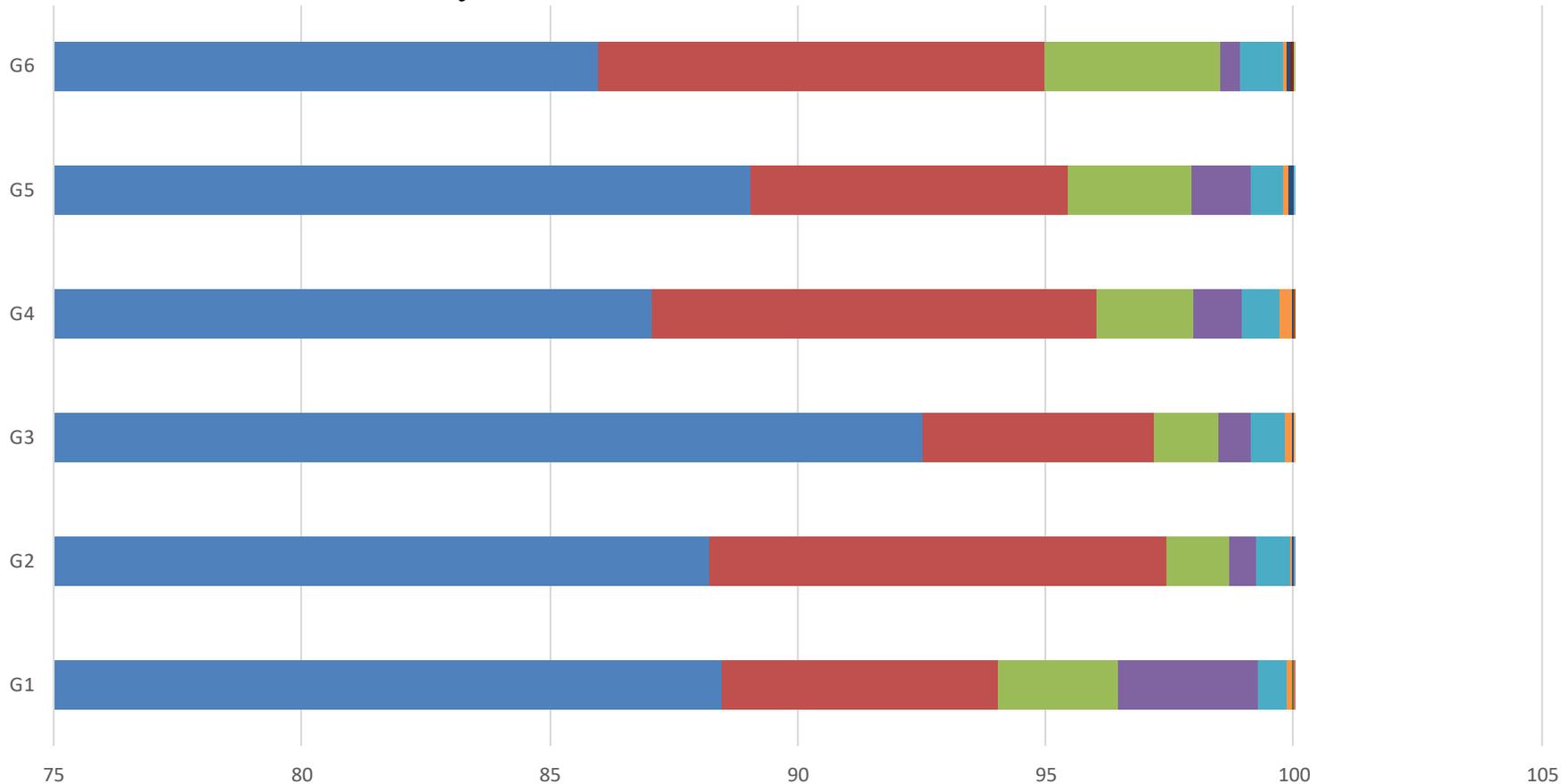
- Hyaluronidase
- Collegenase
- Neurominidase
- Phospholipase
- Lesitinase
- Coagulase
- Hemolysin
- Restriction endonuclease

Bacterial Enzymes

- Apo-enzyme+Co-enzyme \longrightarrow Holoenzyme
- Enzyme activity
 - Chemical factors
 - Temperature
 - pH
 - Substrate concentration
 - Enzyme concentration
 - Salt concentration
 - Others

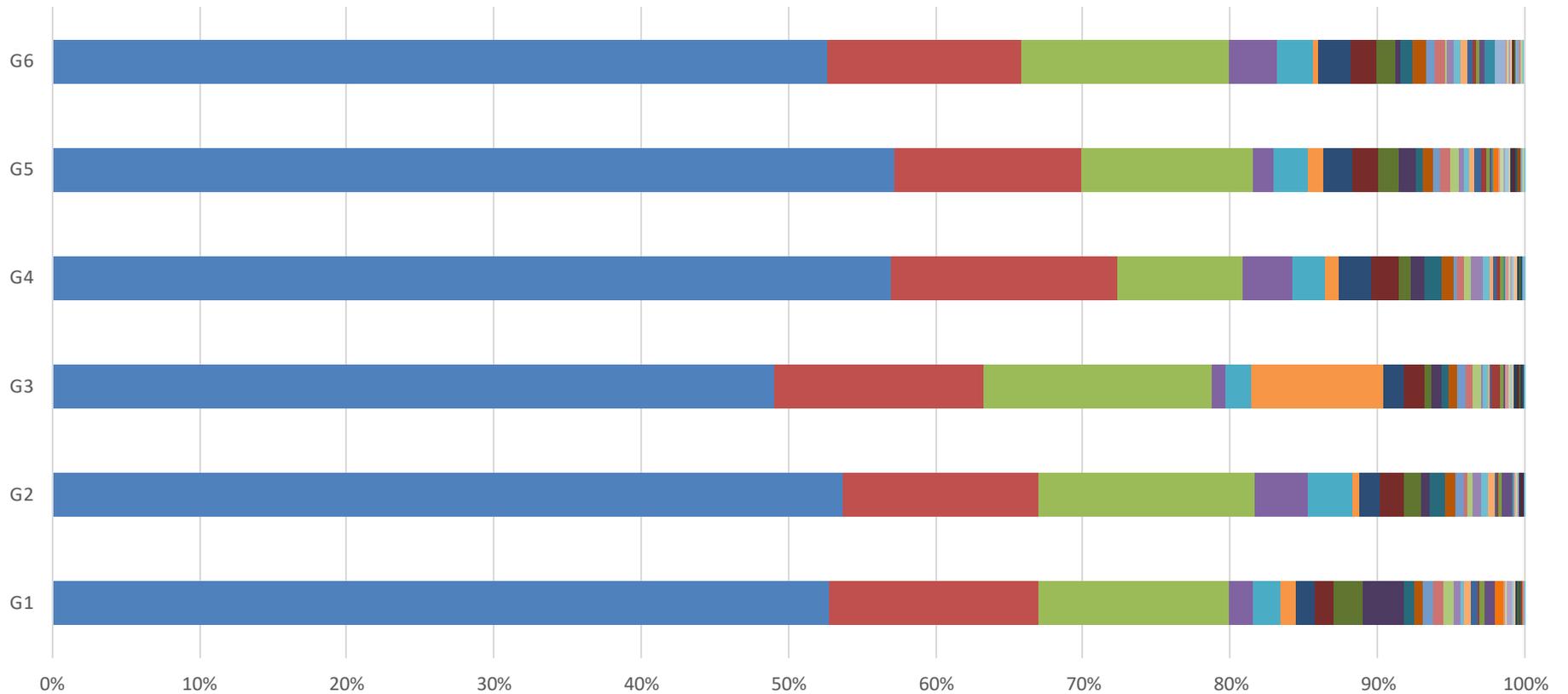
Associations Between Bacteria

Phylum % Relative Abundance



- Firmicutes
- Actinobacteria
- Lentisphaerae
- Armatimonadetes
- Acidobacteria
- candidate_division_WPS-1
- Bacteroidetes
- Bacteria_unclassified
- Deinococcus-Thermus
- Fusobacteria
- Planctomycetes
- Elusimicrobia
- Proteobacteria
- Tenericutes
- Verrucomicrobia
- Gemmatimonadetes
- Candidatus_Saccharibacteria
- Aquificae

Family Relative Abundance >0,1



Associations Between Bacteria

- **Mutualism**

Organisms in this type of symbiotic life provide mutual benefits to each other. In other words, one cannot exist without the other. In this regard, it is very difficult to isolate and produce such organisms individually.

Lactobacillus plantarum and *Streptococcus faecalis*
pteroylglutamic acid phenyl alanine

Associations Between Bacteria

- **Commensalism**

- In this type of coexistence, one microorganism benefits and the other is neither benefited nor harmed after the association.
- If a second microbe is found in an environment that can decompose the substance that the first microorganism cannot decompose, then the food substance is decomposed by the second microorganism. The first microorganism also benefits from the intermediate substances formed. Thus, both microbes continue to survive. However, the second does not provide any benefit from the first.

S. faecalis

E. coli

Arginine —————> ornitine —————> putresin

Associations Between Bacteria

Synergism

- Synergism refers to a phenomenon, infection or condition in which two or more microorganisms form together by supporting each other's effects. None of these factors alone can produce the same result. Some of the mixed infections seen in humans and animals are caused synergetically. That is, two or more microorganisms work together to cause the disease.
- *Mycoplasma* spp. + *Pasteurella multocida* / *M. haemolytica*

Associations Between Bacteria

- **Antagonism**

Some microorganisms;

- Either may cause the growth of other microorganisms
- or prevent their development
- or kill them

by the direct (toxic substances, antibiotics, antifungal substances, bacteriocin, pyocyanin, etc.) or indirect effects (change of pH, osmotic pressure, surface tension, etc.) of some soluble substances they release into the environment in which they grow.

Associations Between Bacteria

- **Parasitism**

- Some microorganisms benefit from the host they live on or in.
- They have no benefit to the host and even have direct or indirect harmful effects.
- In these respect, we can consider these agents that cause disease in humans and animals (bacteria, viruses, fungi, helminths, etc.) as parasites.

Associations Between Bacteria

- **Opportunism**
 - Bacteria that normally live in various systems (digestive, respiratory, urogenital, etc.) or various parts of humans and animals, those can not cause any disease,
 - Or may cause disease as a result of the deterioration of the host's health or changes in environmental conditions!

Associations Between Bacteria

Competition

- It is a lifestyle that occurs when two factors compete for the same food, receptor, substrate, etc., one replacing the other!