Sri. Y N College (Autonomous)

DEPARTMENT OF MICROBIOLOGY

SEMESTER IV – PAPER V

MICROBIAL INTERACTIONS

- *Microbial Interactions are the effects that organisms in a community have on one another.*
- *Common cooperative interactions seen in microbial systems are mutually beneficial the interactions between the two populations are classified according to whether both population and one of them benefit from the associations(or) one (or) both populations are negatively affected.*
- *There are many sorts of symbiotic relationships such as mutualism, parasitism, amensalism, commensalism and competition, predation, proto-cooperation between the organisms.*

Species A	Species B	Name of Interaction
+	+	Mutualism
–	–	Competition
+	–	Predation
+	–	Parasitism
+	0	Commensalism
–	0	Amensalism

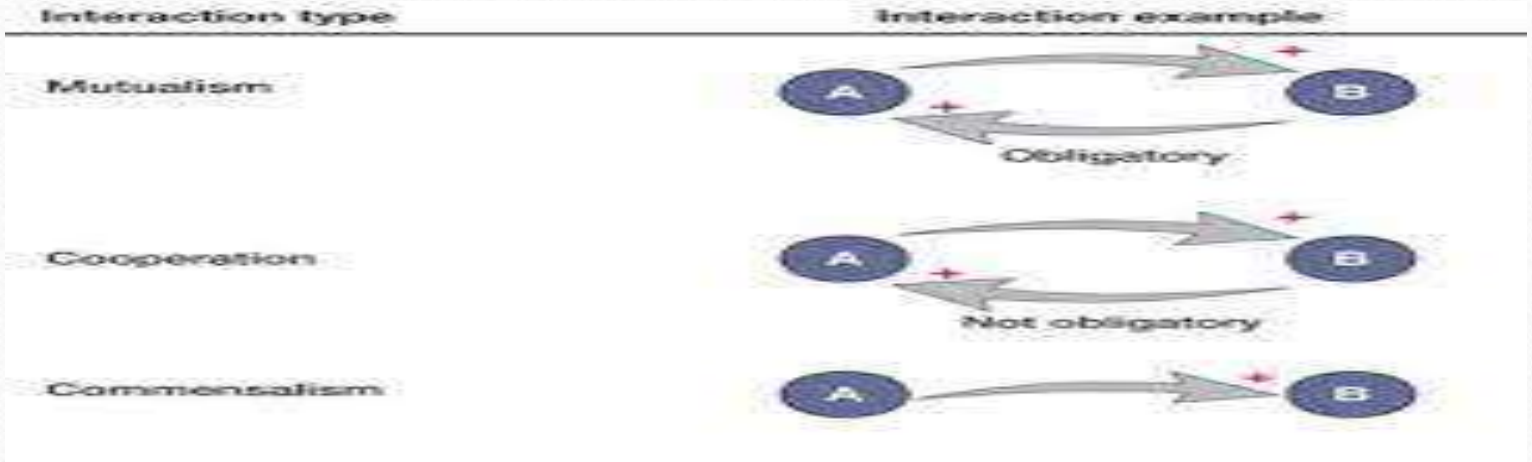
Types of Interactions :-

Positive Interaction	Negative Interaction
Mutualism	Predation
Syntrophism	Parasitism
Commensalism	Competition
Proto-cooperation	Ammensalism

Microbial Interaction

Positive interactions:-

- Positive interactions are cooperative relationships between species that result in better growth, reproduction, and survival for at least one species involved in the interaction, without negatively affecting the other species.
- Positive interactions influence biodiversity by creating alliances between species that allow them to coexist. The benefits of these associations are numerous.
- Positive interactions include mutualism, proto-cooperation, commensalism.



(1) *MUTUALISM* :-

- MUTUALISM is relationship in which both species are mutually benefited. This relationship can either be within the species or between the two different species.
- Mutual relationship is seen in all living organisms including human beings, animals, birds, plants and other microorganisms like bacteria, virus, and fungi.
- Mutualism is a type of relationship between the host and a symbiont, where both organisms benefit and no one is harmed.
- EXAMPLES:- (A) Digestive bacteria and humans - Human beings have"good" bacteria in their digestive systems. That help human to digest food.

  (B)Protozoa lives in the digestive system helps to digest the food that the termites eat.

  (C)Bees get the nectar they need to make honey by traveling between flowers. The bee brings pollen results in pollination.

EXAMPLES:-

(2) *Commensalism:-*

- COMMENSALISM IS A LONG-TERM BIOLOGICAL INTERACTION IN WHICH MEMBERS OF THE SPECIES GAIN BENEFITS WHILE THE OTHER SPECIES IS NEITHER BNEFITED NOR HARMED.
- The commensal—the species that benefits from the association—may obtain nutrients, shelter, support, or locomotion from the host species, which is unaffected.
- The commensal relation is often between a larger host and a smaller commensal. The host organism is essentially unchanged by the interaction, whereas the commensal species may show great morphological adaptation. This relationship can be contrasted with mutualism, in which both species benefit.
- EXAMPLES:-(a) Cattle egrets eat the insects stirred up by cattle when they are grazing. the cattle are unaffected, while the birds gain food.

  (b) Goby fish live on other sea animals, changing color to blend in with the host, thus gaining protection from predators.

Examples:-

(3) *Proto-cooperation*:-

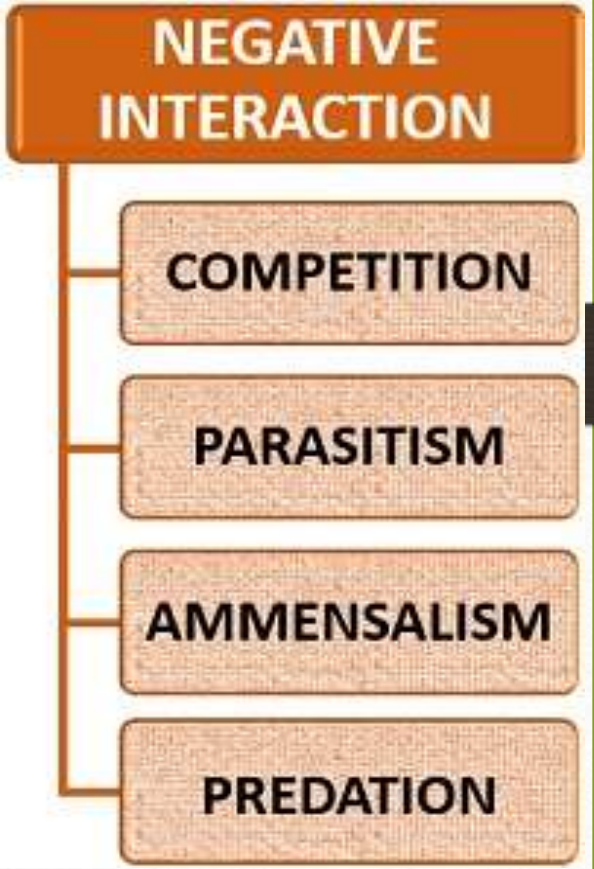
- **Proto-cooperation** is where two species interact with each other beneficially; they have no need to interact with each other.
- They interact purely for the gain that they receive from doing this. It is not at all necessary for proto-cooperation to occur; growth and survival is possible in the absence of the interaction.
- Proto-cooperation is a form of mutualism, but the cooperating species do not depend on each other for survival.
- Example:-(a) Proto-cooperation happens between soil bacteria or fungi, and the plants that occur growing in the soil.

  (b) The flowers of plants that are pollinated by insects and birds benefit from proto-cooperation.

Examples:-

Negative Interactions:-

- In Negative Interactions, **one of the interacting populations is benefited and the other is harmed**.
- In Negative Interaction one population may eat members of the other population, compete for foods or excrete harmful wastes.
- Negative Interactions include amensalism , parasitism, predation and competition.
- Sometimes only one organism or species benefits from Sometimes only one organism or species benefits from an interaction at the expense of another organism or species. This type of negative ecological interaction can come in different forms, such as predation or competition.



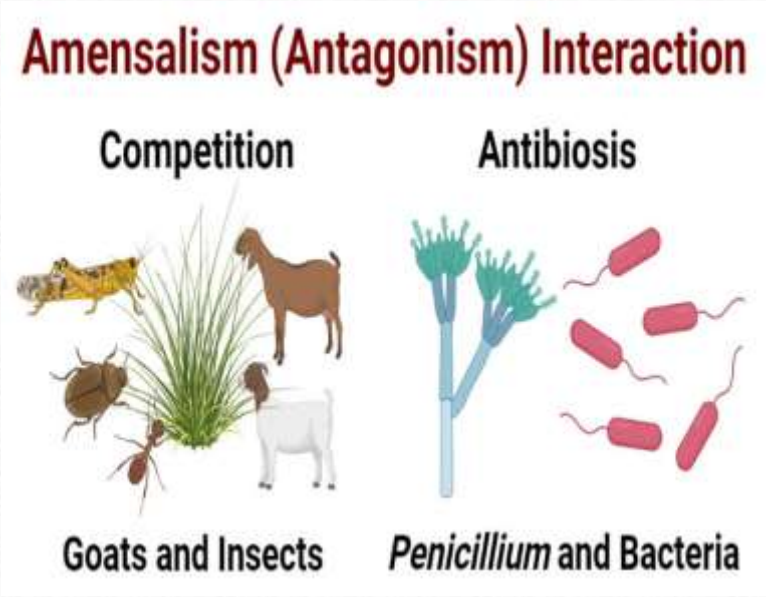
(1) *Amensalism*:-

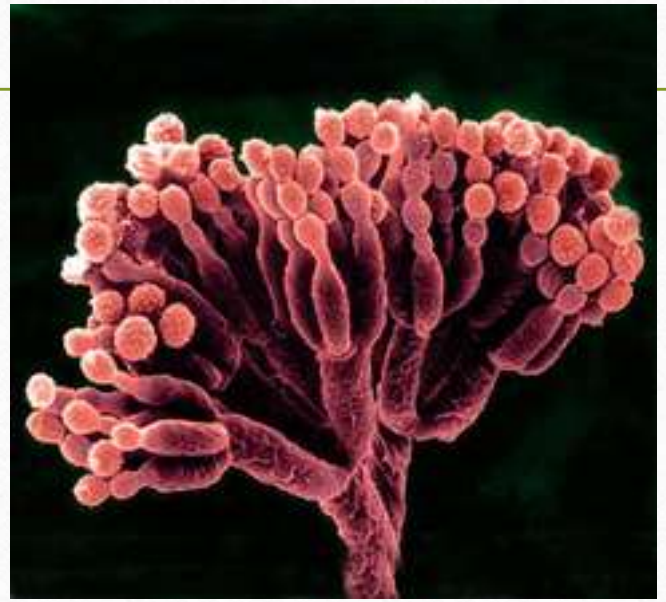
- **Amensalism**, association between organisms of two different species in which one is inhibited or destroyed and the other is unaffected.

- There are two modes of amensalism:-
- **Competition:** A larger, physically stronger organism deprives a smaller, weaker organism from food or space.
- **Antibiosis:** An organism is either damaged or killed by a chemical secretion of another organism.
- Examples:-(a)The mould Penicillium creates the secretion known as penicillin, which is extremely toxic to bacteria.

  (b) When cattle trample on grass, the grass is crushed. However, the cattle do do not benefit from this action nor is harmed in the process.

Examples:-


Amensalism (Antagonism) Interaction
Competition
Antibiosis
Goats and Insects
Penicillium and Bacteria



(2)*parasitism*:-

- Parasitism is a close relationship between species, where one organism, the parasite, lives on or inside another organism, the host, causing it some harm, and is adapted structurally to this way of life.
- Parasites reduce host fitness by general or specialized pathology, from parasitic castration to modification of host behaviour.
- Parasites increase their own fitness by exploiting host for resources necessary for their survival, in particular by feeding on them and by using intermediate (secondary) hosts to assist in their transmission from one definitive (primary) host to another.
- Examples:-(a) Lice are another type of parasite. They live off of the blood of the host animal.

  (b) Aphids are a type of insect parasite that feed on the sap of the host plant.

Examples:-

(3)*predation*:-

- **Predation** is a biological interaction where one organism, the **predator**, kills and eats another organism, its **prey**. It is one of a family of common feeding behaviours that includes parasitism and micropredation (which usually do not kill the host) and parasitoidism.
- Predation has a powerful selective effect on prey, and the prey develop antipredator adaptations such as warning coloration, alarm calls and other signals, camouflage, mimicry of well-defended species, and defensive spines and chemicals.
- Examples:-(a) Spiders spinning webs to trap and kill insects.

  (b) Tigers stalking and killing deer in the forest.

  (c) Bladderworts using negative pressure to suck prey into their bladders.

Examples:-

(4)*Competition*:-

- Competition is a **biological interaction between two or more organisms of the same or different species where the species compete with each other for different resources.**
- Competition can occur between individuals of the same species, called intraspecific competition, or between different species, called interspecific competition.
- Between the two competing organisms, the weaker organism has to either adapt or die out while the stronger organism obtains the resources.
- Examples:-(a) Large aphids vs smaller aphids in compete for cottonwood leaves.

  (b) Plants which are in compete for nitrogen in roots.

  (c)Cheetah and Lions as they both feed on preys.

Examples:-

Thank you