10. MICROBES IN HUMAN WELFARE

MICROBES IN HOUSEHOLD PRODUCTS

- **Lactobacillus or Lactic acid bacteria (LAB):**
  - It converts milk to curd by producing acids that coagulate and partially digest the milk proteins.
  - Fresh milk can be converted to curd by adding some curd containing LAB. It also increases vitamin B_{12} in curd.
  - In stomach, LAB helps to check pathogens.

MICROBES IN INDUSTRIAL PRODUCTS

Chemicals, enzymes & other bioactive molecules

1. **Organic acids:** Acid producer microbes include
   Aspergillus niger (a fungus) : Citric acid
   Acetobacter aceti (a bacterium) : Acetic acid
   Clostridium butylicum (a bacterium) : Butyric acid
   Lactobacillus (a bacterium) : Lactic acid
2. **Alcohol:** Yeast (*S. cerevisiae*) is used to produce ethanol.
3. **Enzymes:**
   - **Lipases:** Used in detergent formulations. Help to remove oily stains from the laundry.
   - **Pectinases & Proteases:** To clarify bottled juices.
   - **Streptokinase:** Produced by ***Streptococcus.*** Used as a '**clot buster**' to remove clots from the blood vessels of patients who have **myocardial infarction.**
4. **Cyclosporine A:** Produced by ***Trichoderma polysporum*** (fungus). Used as an **immunosuppressive agent** in organ transplant patients.
5. **Statins:** Produced by ***Monascus purpureus*** (a yeast). Used as **blood-cholesterol lowering agents**. It inhibits the enzymes responsible for synthesis of cholesterol.

MICROBES AS BIOCONTROL AGENTS

Microbial biocontrol agents

- ***Bacillus thuringiensis (Bt):*** To control butterfly caterpillar. The dried spores of Bt (available in sachets) are mixed with water and sprayed on to vulnerable plants such as brassicas and fruit trees. These are eaten by the caterpillar. In their gut, the toxin is released and the larvae get killed.
  The scientists have introduced *B. thuringiensis* toxin genes into plants. E.g. Bt cotton.
- ***Trichoderma sp*** (fungus): These are free livings present in the root ecosystems. They control several plant pathogens.