

Biotechnology and genetic modification

Biotechnology

Why bacteria are useful

Rapid reproduction Make complex molecules

Plasmids and ethics **Supplement**

Few ethical concerns Plasmids carry genes

Yeast

Anaerobic respiration Ethanol biofuel CO₂ makes bread rise

Pectinase

Breaks down pectin More, clearer juice

Washing powders

Protease, lipase, amylase Work at low temperature

Lactase **Supplement**

Lactose to glucose + galactose Lactose-free milk

Fermenters **Supplement**

Insulin, penicillin, mycoprotein Temperature, pH, oxygen Nutrients, waste

Genetic modification

Definition

Remove, change, insert genes

Examples

Human protein in bacteria Herbicide resistance Insect resistance Improved nutrition

Making human protein **Supplement**

Restriction enzymes Sticky ends DNA ligase Recombinant plasmid

Bacteria multiply and express gene **Supplement**

Protein made

GM crops **Supplement**

Soya, maize, rice Higher yield Gene spread risk