

HOW TO MAKE YOUR OWN GENETICALLY-MODIFIED ORGANISM

Pick your problem

Pick your organism

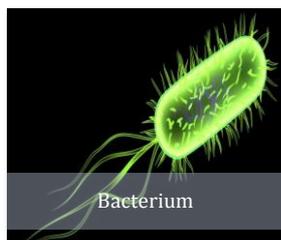
Pick your genes

PROBLEMS:



...or anything else you can think of.

ORGANISMS:



...again, you can pick anything under the sun!

Genes	Activity	Source organism
Promoters		
Constitutive promoter	Switch – on all the time	E. coli
Inducible promoter	Switch – can be turned on by a stimulus	E. coli
Repressible promoter	Switch – can be turned off by a stimulus	E. coli
Protein-coding genes		
1. Energy production		
Photosynthesis	carbon dioxide and water → energy + oxygen and sugar	Synechocystis
Fermentation	Sugar → energy + alcohol (in non-oxygenic environment)	Lactococcus lactis
Methanotrophy	Methane → energy + carbon building blocks for organism's body	Methylococcaceae
Hydrogen production	Water → hydrogen gas and oxygen gas	Clostridium
2. Survival		
Heat tolerance	Survival in high temperatures	Methanococcus thermolithotrophicus
Cold tolerance	Survival in low temperatures	Methanococcus burtoni
Radiation resistance	Survival of high levels of radiation (e.g. ultraviolet and gamma rays)	Deinococcus radiodurans
Spore formation	Spores are a dormant, resistant form that the organism can adopt to survive in bad environmental conditions	Myxococcus xanthus
Antibiotic resistance	Survival of antibiotic treatment	Staphylococcus aureus
Drought tolerance	Survival in low-water conditions	
Pest resistance	Will not be attacked by insects	Bacillus thuringensis

3. Production of useful substances

Green fluorescent protein	Green glow	Aequorea victoria
Apple scent	Will smell like green apples	Green apple
Vitamin biosynthesis	Will produce vitamin (specify which one)	Various
Antibiotic biosynthesis	Will produce antibiotics – organism will be resistant to bacterial infection	Various, including Streptomyces
Plastic biosynthesis	Will produce PHB, a common plastic	Ralstonia eutropha

4. Superpowers

Flagella	Will have ability to move	Helicobacter pylori
Night vision	Different eye structure allows organism to see in the dark	Hedgehog
Infrared vision	Can see heat	Pit viper
Gigantism	Will grow to very large size, due to higher production of growth hormone	Human
Exoskeleton	Exterior of organism will have armor-like strength	Cockroach
Cyanide defence	Will shoot cyanide (a lethal poison) at predators	Dragon millipedes
Limb regeneration	Will re-grow amputated body parts	Salamander