

marine biotechnology

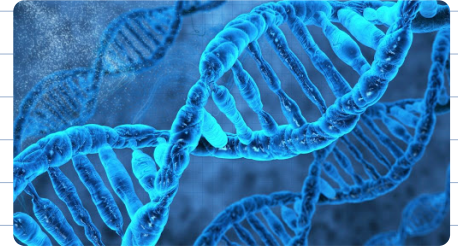
biotechnology is the industrial application of biological processes

Examples of this process:

- Egypt - electron micrographs have revealed the remains of bread contained yeast.
- India and Pakistan - records indicate the production of yogurt using bacteria.

Selective breeding - the process which humans pick desirable traits in animals and plants.

- Cows - for profitable gain (production of more milk) than the desired.
- Dogs - continual breeding of desirable traits (wrinkles found on a Bulldog's face)
- These approaches to biotechnology may help preserve the stocks of our oceans and reduce malnutrition but consequences are unknown.



biotechnology

describe the use of microorganisms as biotechnology to clean up any oil spills

• complete tables of examples of how biotechnology is presently being used.

- **oil-digesting bacteria.**
- oil spills from offshore drilling platforms and oil tankers can have devastating effects on the marine environment.

• as a result, injuring and killing many species of organisms.

• many methods are used to contain,

disperse, and also remove the oil as well.

• **Bioremediation** is the term given to the decomposition of pollutants by microbes (method uses microbials to remove oil).



• Organisms are buried under rock without oxygen and subjected to extreme pressures and temperatures → petroleum (aka crude oil)

• By physically breaking up the oil slick and dispersing it in the water - the chances of contact increase between the bacteria and the oil (speeding up the breakdown)

• These dispersants are toxic and environmentalists believe cause damage than oil → death to many marine organisms (sea turtles, whales, dolphins).

• **Fertilizers** are sprayed onto the beaches and in the water.

• Encouraging microbe growth and speeding up the breakdown of the oil.

What happens to the oil and the bacteria?

• Hydrocarbons that are broken down by the bacteria are used in aerobic respiration.

• Contains a mixture of many different hydrocarbons.

Many compounds in crude oil only contain the elements carbon and hydrogen.

• Some species of naturally occurring bacteria are able to use hydrocarbons in crude oil as an energy source - breaking down and removing oil in water.

• Other species of bacteria specialize in metabolizing or breaking down a few of the various components of oil.

• They use hydrocarbons during respiration, releasing carbon dioxide and water as waste products. Example: various types of bacteria are needed to breakdown and remove an oil spill.

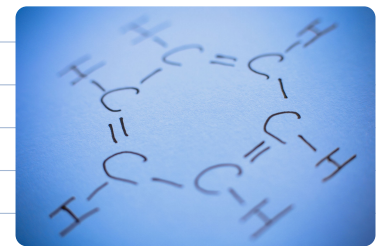
- Factors affecting speed at which bacteria breakdown and remove oil.

Methods using bacteria to remove oil spills

• In addition to physical methods employed to contain and remove a spill, bacteria growth is often encouraged.

• **Suspension of live bacteria** are sprayed onto the affected beaches and directly into the water.

• **Dispersants** (chemicals) are used (sprayed from airplanes to aid in the break up of the oil spill and often used to protect beaches and coastlines).



- Waste products → CO₂ and water
- Bacteria are natural components of marine food chains, therefore, they are consumed by other organisms.
- 2010 deepwater horizon oil spill – Gulf of Mexico
- By 2015 large quantities of the oil had been removed and digested by bacteria although a lot still remained on the sea bed in deep water areas.

