

WHAT GOOD ARE MICROBES?

Microbes break down and recycle plant and animal matter in the soil and water of our earth.

They produce enzymes that decompose dead things, and return the building blocks (amino acids, minerals, etc.) to the soil or water. They are absolutely integral part of any waste treatment plant. Soil microbes perform different steps in the “nitrogen cycle”, which, through several steps and requiring several different types of bacteria, ultimately converts N_2 gas in the air into usable forms of nitrate ions (NO_3^-) that roots can absorb.

Oxygen Production

Cyanobacteria live in oceans and produce up to 80% of the world’s oxygen. This is often surprising to students that have learned, incorrectly, that plants make most oxygen for the world (not true). What is key is that photosynthetic organisms make oxygen. Most photosynthetic organisms are bacteria that live in the ocean as part of phytoplankton. They are called “Cyanobacteria” which means “blue-green bacteria”.

Make up the Microbiome of all multicellular organisms

Our body is covered with bacteria and fungus. All of our membranes are covered – our GI tract, our respiratory tract, the reproductive and urinary tracts – all of it! Estimates are that we are outnumbered 10:1 with microbe cells compared to human body cells. Just like an tropical rainforest, we have a delicate biodiversity of normal flora. If we lose diversity (due to diet or antibiotics, for example), then imbalances, especially overgrowth of certain species, may lead to various health problems, ranging from autoimmunity to depression to weight gain to heart disease to joint pain. This is an exciting area of research.

Some microbes, especially fungi, make antibiotics!

Because microbes are constantly competing with one another for space and resources, many of them, particularly fungal molds, have been found to produce chemicals that inhibit bacterial cell division or rapid growth. Scientists (Alexander Fleming being the most famous) then began making antibiotics to treat human bacterial infections.

Hormone or Production

By genetically engineering bacteria (usually *E.coli*), we can force them to produce lots of hormones that we are interested in – for example, insulin or growth hormone.

Food Production

Microbes are used in industry to make many food products by fermenting sugars found in foods – yogurt, sour cream, pickles, bread, sauerkraut, cheese, kimchee, tempeh, vinegar. These foods usually taste sour due to the accumulation of lactic acid as a fermentation byproduct. These fermented foods probably have many health benefits – from delivering probiotics to the gut, to probably containing prebiotics (more are being discovered on a regular basis) that support the growth of those bacteria. Alcoholic fermentation is when the microbes (usually *Saccharomyces cerevisiae*) produce ethanol as a waste product rather than lactic acid.

Agriculture

To make a plant able to resist round-up, or grow faster, etc. genetic engineers can design the plant to express a bacterial. This is the basis of GMOs (genetically modified organisms).

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