

Bacteria - the Workhorses of Biotechnology

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Introduction. “Microbe” is merely a convenient name for any hundreds of thousands of species of microscopic organisms that flourish on earth. The most numerous are the ones we call bacteria.

With clever coaching from microbiologists, bacteria and other “bugs” are being put to work in wondrous ways. People have always been good at domesticating plants and animals. Now we are learning to domesticate bacteria. Some microbes serve as factories – making could live without. They make what we want, and they get rid of what we don’t want. They are the workhorses of biotechnology. pharmaceuticals, pesticides, solvents, and plastics. Some help make the snow at your ski resort. Some separate gold and copper from ores, reducing the need for chemicals like cyanide. Some rejuvenate tired oil wells. Some make the enzymes for snipping DNA, the first step in genetic engineering. Some are our fermenters, converting sugar into bread, beer, sauerkraut, cheese, yogurt, vinegar, wine. And some microbes, of course, are age-old enemies, the invisible messengers of tuberculosis and cholera and other scourges. But those are relatively few. Only one microbe in a thousand is a pathogen – what we think of as a germ. The rest, neither we nor the planet

Bacteria are used in industry in a number of ways that generally exploit their natural metabolic capabilities. They are used in manufacture of foods and production of antibiotics, probiotics, drugs, vaccines, starter cultures, insecticides, enzymes, fuels and solvents. In addition, with genetic engineering technology, bacteria can be programmed to make various substances used in food science, agriculture and medicine. The genetic systems of bacteria are the foundation of the biotechnology industry discussed below.

The biotechnology industry uses bacterial cells for the production of biological substances that are useful to human existence, including fuels, foods, medicines, hormones, enzymes, proteins, and nucleic acids. The possibilities of biotechnology are endless considering the gene reservoirs and genetic capabilities within the bacteria. Pasteur said it best, "Never underestimate the power of the microbe."

Biotechnology has produced human hormones such as insulin, enzymes such as streptokinase, and human proteins such as interferon and tumor necrosis factor. These products are used for the treatment of a various medical conditions and

diseases including diabetes, heart attack, tuberculosis, AIDS and SLE. Botulinum toxin and BT insecticide are bacterial products used in medicine and pest control, respectively.

Conclusion. It should not be overlooked that industrial, pharmaceutical and food microbiology are applications of biotechnology. Archaea and bacteria are involved in production of biofuels. Bacteria are the main producers of clinically useful antibiotics; they are a source of vaccines against once dreaded diseases; they are probiotics that enhance our health; and they are primary participants in the fermentations of dairy products and many other foods.