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# MICROORGANISMS - ESSENTIAL FOR HUMAN LIFE

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**ABSTRACT**

Life has been evolved since ages. Various organisms from simple prokaryotes to complex eukaryotes living in our biosphere have some reason for their existence. Since Bacteria, virus, yeast and fungi has been seen as pathogenic (causes diseases).These micro-organisms have significant impact on both human life and to our environment. The role of bacteria has been high in the economic field. Bacteria can be used by humans in a number of ways like in agriculture, horticulture, chemical industry, food production and Pharmaceutical products. Similarly fungi and virus is also beneficial to humans. Virus being beneficial? Some viruses offer to cure cancer, genetic disorders or fight pathogenic viral infections. This study presents a brief overview of the beneficial role and application of microorganisms in human health.

## INTRODUCTION

"If you don't like bacteria, you're on the wrong planet."

**- Stewart Brand**

Microorganisms take most of the part of our earth as they are found around us and also inside our bodies. These complex communities of microbes that include bacteria, fungi, viruses and other microbial and eukaryotic species provide a tremendous enzymatic capability and play a vital role in controlling most aspects of host physiology. Over the past few years, the field of immunology and microbiology has been revolutionized by the growing understanding of the fundamental role of the microbes in the induction, education and function of the human immune system. Some of them are pathogenic and some are useful. Microbes help to maintain the atmosphere of our environment (1). Each organism has their own type of cellular composition, morphology, mode of nutrition, movement and reproduction. Most of the organisms live as free living, parasitic or as host. Microorganisms require basic nutrients for their growth and development. Some microbes are beneficial in decomposing organic material, providing nutrition, production of oxygen and etc. Microorganisms have paved the way for the future in medicine, industry and research.

Nature uses microorganisms to carry out fermentation processes, and for thousands of years mankind has used yeasts, moulds and bacteria to make food products such as bread, beer, wine, vinegar, yoghurt and cheese, as well as fermented fish, meat and vegetables. Fermentation is one of the oldest transformation and preservation techniques for food. This biological process allows not only the preservation of food but also improves its nutritional and organoleptic qualities (relating to the senses ; taste, sight, smell, touch). A well conducted fermentation will favour useful flora, to the detriment of undesirable flora in order to prevent spoilage and promote taste and texture.The first realisation that microorganisms were involved in food production processes was in 1837, when scientists discovered the role of yeast in an alcoholic fermentation.

Later, when the world renowned French chemist and biologist Louis Pasteur was trying to explain what happened during the production of beer and vinegar in the 1860es, he found that microorganisms were responsible. However, it wasn't until after the Second World War that the food industry began to develop the biotechnological techniques we rely on today to produce a wide variety of better, safer foods under controlled conditions.

### Befriend to Bacteria

**Live and let live:** The human body is teeming with bacteria. In each person, there are about 10 times as many bacterial cells as human cells. Bacteria live on skin, in the respiratory tract and throughout the digestive tract. The digestive tract alone is home to between 500 and 1,000 bacterial species. While some bacteria cause infections, most species are harmless or perform beneficial functions, such as aiding digestion. These beneficial bugs are called commensal bacteria. One of the most important functions of commensal bacteria is boosting the immune system. It is becoming more and more evident that these microbes are important for human health, but also disease. Inflammatory bowel disease, gastric ulcers, colonic cancer and obesity are examples of conditions for which the composition of the microbiota has been indicated to play a role. In order to maintain the microflora in the gut, the immune system must be taught to tolerate foreign bacteria(2). Commensals also contribute to the post-natal development of the immune system that in turn contributes to their containment. Studies performed in animals raised in the absence of live microbes referred to as germ-free (GF), revealed that the microbiota plays a critical role in secondary and lymphoid structure development. The immune system is not only controlled by its symbiotic relationship with the microbiota but is also exquisitely sensitive to the nutritional status of the host (3). Evidence now exists for a multi-directional interaction between the diet, immune system and commensal microflora.

### Role of probiotics in treating human diseases

Probiotics are proposed to prevent and treat a variety of health conditions, such as:

- diarrhea (including diarrhea caused by antibiotics)
- irritable bowel syndrome ulcerative colitis and Crohn's disease
- Dental caries
- Periodontal diseases
- Common cold
- Infant colic
- Sepsis in infants
- Atopic dermatitis
- Upper respiratory infection
- Urinary tract infection

### Uses of Microorganisms in the Food Industry

Currently, more than 3500 traditionally fermented foods exist in the world. They are of animal or vegetable origin and are part of our daily life. Alcoholic drinks are not the only fermented drinks; cocoa beans, coffee grains and tea leaves are fermented after harvest in order to develop their typical flavour profiles (4). Different strains of bacteria are also used in production of various food and dairy products. Strains of Streptococcus, Lactobacillus Bifidobacterium, Erwinia etc. are used in the production of fermented food and dairy

products (Table.1). Streptococcus thermophilus and Lactobacillus bulgaricus are used to produce yogurt. Alcoholic beverages as beer are produced by fermentation of cereals and grains using different strains of yeasts.

**Table.1 Role of Microorganisms in food Industry**

| Microorganisms | Economical importance and Uses |
|---|---|
| Carnobacterium glutamicum | The food additive monosodium glutamate (MSG) is produced in the form of glutamic acid. |
| Enterococci | Important for ripening and aroma development of cheese and sausages |
| Weissella | Plays an important role in food fermentations of vegetables or meat as substarte. |
| Streptococcus thermophilus | Widely used in food fermentations and used as seed in yogurt production |
| Saccharomyces cerevisiae | used for the fermentation of Wine and improves the consistency, Bread making |
| Saccharomyces uvarum | Beer production |
| Acetobacter | Vinegar production |
| Cyanobacteria | Excellent nutritional value since they contain complete protein, fiber, and sometimes high levels of omega-3 fatty acids |
| Leuconostoc mesenteroides, Streptococcus faecalis, Lactobacillus fermentum and Bacillus amyloliquefaciens | The predominant bacteria responsible for souring and leavening of idly and dosa batter. |

**Role of Microorganism in Agriculture**

Microbes include fungi, bacteria and viruses. Farmers and ranchers often think of microbes as pests that are destructive to their crops or animals (as well as themselves), but many microbes are beneficial. Soil microbes (bacteria and fungi) are essential for decomposing organic matter and recycling old plant material. Some soil bacteria and fungi form relationships with plant roots that provide important nutrients like nitrogen or phosphorus. Fungi can colonize upper parts of plants and provide many benefits, including drought tolerance, heat tolerance, resistance to insects and resistance to plant diseases (5). About half the plants have viruses, but most don't seem to be sick at all. The viruses seem to be living in the plants without doing any harm (Table.2).

**Table: 2. Role of Microorganism in Agriculture**

| Microorganisms | Agricultural Uses |
|---|---|
| Rhizobia | They provide the major source of nitrogen input in agriculture soils and exert plant growth promoting traits |
| Mycorrhiza | The fungus assists in the absorption of minerals and water from the soil and defends the roots from other fungi and nematodes. |
| Mucor, Aspergillus | These fungi which help in the decomposition of organic matter. |
| Nocardia, Monospora | They play a major role in decomposition of organic residues they prefer alkaline and well aerated soil for their growth and development. |
| arbuscular mycorrhizal fungi (AMF), Trichoderma spp | bio-fertilizer or biological control agents |

**Role of Microorganisms in Human health**

These microbiomes support and maintain your health but also, when the microbiome is disturbed in some aspects, have been linked to hundreds of ailments such as cancers, and autoimmune and cardiovascular diseases. Hence it is not surprising that the human microbiome is an important avenue of health research (Table.3). It is one with crucial implications for our health. Preterm birth, a condition where women give birth before 37 weeks of pregnancy, is the second most common cause of neonatal death worldwide. Preterm birth instances also vary significantly by population. Because a pregnant woman's healthy vaginal microbiome is closely associated with the healthy birth of an infant. Prediabetes is a health condition where a person's blood sugar levels are elevated, but not sufficiently high enough to warrant a Type2 Diabetes diagnosis (6). This happens because both prediabetic and Type2 Diabetes individuals usually suffer from insulin resistance, where the body no longer responds to the hormone's signals to move glucose out of the bloodstream and into cells. Almost 70% of the prediabetic population will become diabetic in their lifetime. Healthy participants had different gut microbiome makeup than those with prediabetic symptoms, thereby already setting up these prediabetic patients with a possibly diminished or unhealthy microbiome. Bacterial pharmaceutical products include antibiotics, antitumor agents, immunomodulators, and enzyme inhibitors. Other bioactive products of bacterial origin are coccidiostatic agents, nematicides, and insecticides(7).

**Table3. Role of Microorganisms in Human health**

| Microorganisms | Products and Health Implications |
|---|---|
| Saccharomyces cerevisiae | An attractive expression platform for production of biopharmaceuticals. Dozens of pharmaceutical proteins, such as insulin, vaccines and blood factors. |
| Lactic bacteria | Lactic bacteria are used in many different tablets and capsules sold as supplements in the healthfood industry. |
| Penicillium notatum | Penicillin |
| Bacillus subtilis | Bacitracin |
| Streptomyces griseus | Streptomycin |
| Streptomyces nodosus | Amphotericin B |
| Micromonospora purpurea | Gentamycin |
| Cephalosporium acremonium | Cephalosporins |

**DISCUSSION AND CONCLUSION**

It is becoming more and more evident that these microbes are important for human health. Bacteria are economically important as these microorganisms are used by humans for many purposes. The beneficial uses of bacteria include the production of traditional foods such as yogurt, cheese, and vinegar. Microbes are also important in agriculture for the compost and fertilizer production. Microbes used as tool in genetic engineering and drug research. This area of research has led to the integration of the microbiota as an intrinsic regulator of all immune responses. Current evidence shows promise for further developing health benefits and the efficacy of probiotics and probiotic-derived factors on the regulation of host homeostasis, including immune health. There is today an explosion of discoveries associated with the growing understanding of the role of communities of microbes, keystone bacterial species, commensal derived products or metabolites and more particularly of the link between some of these components and disease states in humans. This provides scientists and clinicians with a unique opportunity to develop an integrated exploration of human health that includes ecologists, nutritionists, geneticists,

microbiologists, biochemists and immunologists.

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