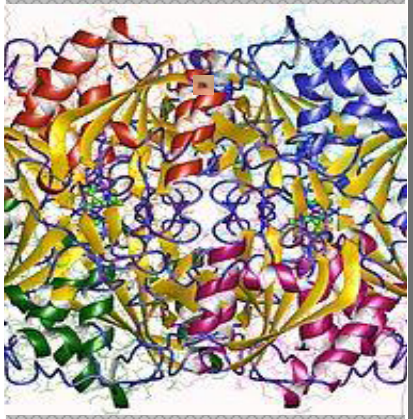

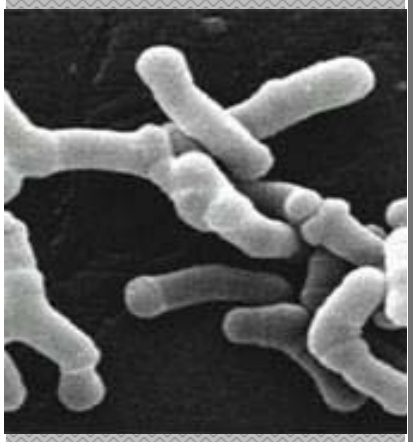

EMGEN Newsletter

Vol. 6, Issue 2

IN THIS ISSUE:

Eastern Mediterranean Health Genomics and Biotechnology Network (EMGEN) was created in 2004 with collaboration of representatives of selected centers of excellence in (health related) molecular biology, biotechnology & genomics in the Eastern Mediterranean region by recommendations and efforts of WHO/EMRO. Sponsored by Iran Biotechnology Development Council.

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FERMENTATION TECHNOLOGY

Concept of fermentation

Fermentation is labeling as the act of yeast on the residuals of fruit or malted grain. The boiling occurrence in this is due to the creation of carbon dioxide bubbles created by the anaerobic catabolism of the sugars current in the extract. By any means, fermentation has come to have different meaning to biochemists and to industrial microbiologists. By fermentation biochemists mean an energy-making procedure in which organic mixtures act as together electron donors and final electron receivers that is an anaerobic procedure.

The alcohol creation through the action of yeast on fruit or malt juice has been done on a huge size for too many years and was the earliest 'industrial' successful procedure for the manufacture of a microbial metabolite. Thus, industrial scientists have expanded the term 'fermentation' to express any procedure (aerobic or anaerobic) for the production of the product by the mass culture of microorganisms. Also fermentation widely can be described as the use of culture of nominated strains of microorganisms, animal or plant cells, for the production of some useful products, or to gain insights into the physiology of these cell types.

Bioreactor and fermentor

Bioreactor is a vessel in which a chemical procedure is carried out that includes organisms (microorganisms or animal/plant cells), or biochemically active materials resulting from such organisms to obtain a favorite product. To evade pollution and loss of product, bioreactors can be pasteurized with steam under pressure or with other ways. While the additions of media or inoculate aseptically and keeping all the equipment under a minimum pressure of 0.1 bar are needed through the whole operation. Bioreactors are generally cylindrical but ranging in size from lab scale to industrial level.

Under optimum conditions the organisms are reproducing at an optimum rate. The vessel's ecological circumstances as well as temperature, pH, dissolved oxygen, nitrogen, carbon dioxide, agitation speed and circulation amount need to be closely monitored and controlled since the circumstances come from the natural setting without any bio-repair programs to avoid the changes which could make risk in the process. The term 'Fermentor' is actually the same as the term 'fermentation tank' which can be used for 'bioreactor'. However, 'Fermentor' commonly used for the fermentation vessel of microbial cells.

Types of bioreactor

Various types of bioreactor are in use, some of most usages are discussed following. One of the most common type of bioreactor in use today, is the STR (stirred tank reactor). This bioreactor essentially comprises a container with an aspect ratio of around 3:1, cooling or heating jacket and a mixing system typically driven through the head plate, although with some steam in-place systems the mixing will be driven through the base. The head plate will have ports that allow for the addition of probes, acid/base, antifoam, reagents and gas as well as the take out of samples. Some alternatives to the STR are introduced following. Tower fermentors, as the term proposes, are containers categorized by a great height-to-diameter ratio, anywhere from 6: 1 to 15: 1. They are aerated by gas sparging via a humble sparger typically situated close to the fermentor station. These fermentors can be activated endlessly by the formation of relaxing regions by help of blades, which permit the yield to be removed and the cells reflex in the core form of the container. In airlift fermentors the blending machine (impellors, driveshaft and motor) is replaced by a continuous current of gas (air, pure oxygen or carbon dioxide) conducted to a riser pipe. In the grow container that, as the gas increases and then the culture comprising cells falls, ensure thorough mixing. The airlift container may be baffled to improve mixing. These containers deliver a mild phlegm, and thus are principally suitable for cells that are very snip delicate to be blended by a prompter. Vacant fiber spaces are employed in order to grow anchorage-dependent cells. This bioreactor consists of a bundle of fibers and the cells grow within the extra capillary spaces (ECS) within a cartridge. Medium and gas perfuse through the capillary lumea to the ECS. Where nutrients and gas are available to the cells. The size of the lumea may be selected such that any product is retained in the ECS or permits over the lumea such that the system performs as a perfusion bioreactor. Employing microcarriers in a stirred tank reactor, would be a substitute to hollow fiber spaces. Microcarriers are typically chromatographic grade DEAE sepadex beads. The beads are positively charged, and so are attracted to negatively charged animal cells and provide a suited surface to grow of the cells. According to the style of procedure, a bioreactor can be categorized as constant, fed batch or batch. Batch bioreactors are the simplest kind of mode of bioreactor process. In this mode, the bioreactor is filled with media and the fermentation is allowed to proceed. When fermen-

has finished the contents are emptied for downstream processing. The bioreactor is then cleaned, re-filled, re-inoculated and the bio-process starts again. In constant bioreactors, fresh medium is constantly added and bioreactor fluid is constantly removed. As a result, cells continually receive fresh media and products, and by-products, waste products and cells are constantly removed for processing. The bioreactor can thus be operated for long periods of time without needing to be shut down. Constant bioreactors can be more prolific than the batch model. This is fairly owing to the fact that the growth rate of the bacteria in the bioreactor can be more easily controlled and optimized and likewise because of that the reactor does not have to be shut down frequently. In addition, cells can also be immobilized in constant reactors, to prevent their removal and thus further increase the productivity of these bioreactors. The fed batch bioreactor is the usual kind of bioreactors applied in industry. In this bioreactor, fresh culture is continuously surcharged to the bioreactor, dissimilar to a constant bioreactor, there is no endless elimination. The fermentor is unloaded or partially emptied when the bioreactor is full or fermentation procedure is over. As with the constant reactor, it is possible to achieve high productivities due to the fact that the growth rate of the cells can be optimized by controlling the flow rate of the feed entering the reactor.

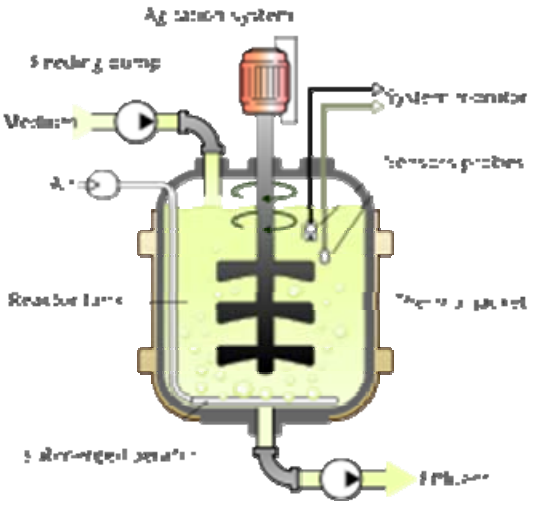

Fig. 1: General structure of a continuous stirred-tank type bioreactor.

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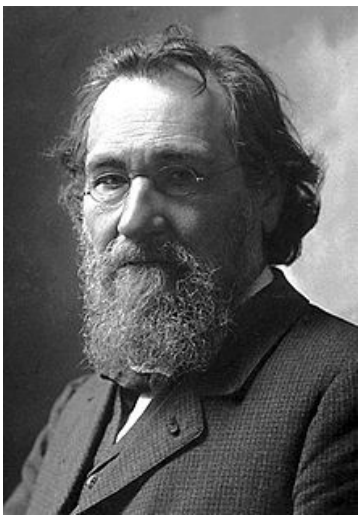
PROBIOTICS FUNCTIONING AS BENEFICIAL MICROBES

We are encircled by a worthwhile biological system of germs that live on or in the humanoid body and are helpful. This biological system is the humanoid microbiome. It has been known for a time that the humanoid body is inhabited by at least 10 times further bacteria than the number of humanoid cells in the body, and that the majority of those bacteria are found in the humanoid gastrointestinal tract. The composition of the gut microbiota varies during childhood until the individual reaches adulthood. The relationship between the host and the gut microbiota is symbiotic. Further, the animal or plant can be the host of these helpful microbes. The conceptualization of probiotics perhaps dates back to 1908, when Noble Prize Winner Eli Metchnikoff suggested that the health and long life of Bulgarian peasant populations resulted from their consumption of fermented milk products, such as yogurt. The word 'probiotic' was initially applied in 1965, by Lilly and Stillwell for explaining constituents discharged by one creature which foment the growth of another. The name was resulted from the Greek word, sense 'for life'. In an extensive description, probiotics are described as microbial dietary adjuncts that beneficially affect the host physiology by modulating the immune system as well as improving nutritional and microbial balance in the gastrointestinal tract. An expert panel commissioned by the Food and Agriculture Organization of the United Nations (FAO) and World Health Organizations (WHO) determined probiotics as 'live micro-creatures' which, when administered in suitable quantities, deliberates a well-being on the host. Also, it can be distinct as 'microbial preparation or components of microbial cells that have a beneficial effect on health and well-being'. Recently, the mainly accepted description states probiotics should be live or viable germs.



At present, a range of germs, characteristically lactic acid bacteria (LAB) and *Bifidobacteria* have been used for their probiotic possibility and are practiced as helpful additives in several kinds of food crops or beneficial preparations; even though other bacteria and certain yeasts are beside used. To be beneficial to humanoid health, a probiotic must fulfill several criteria; for example, it must be non-pathogenic and non-toxic likewise probiotics should survive passage through the upper gastrointestinal tract (GIT) and must have antagonistic activity against bacterial pathogens and be able to function in the gut environment. Probiotics also need to possess the ability to survive and be viable in the product, during food production processes and storage. The mainly commensal intestinal microbiome contributes to the enhancing resistance against infections, stimulate

of the host immune system, biosynthesis of definite nutrients, e.g. short-chain fatty acids, vitamins, and other molecules. Probiotics have been developed for a wide variety of health aims. Probiotic products can target both healthy and ill individuals. The expected effects can be of a preventive or curative nature. Some probiotics have been used for illness avoidance as well as curing the necrotizing enterocolitis in newborns, some cure bacterial vaginitis and some of them for the debarment and therapy the children diarrhea, traveling-related diarrhea and diarrhea initiated by consumption of antibiotics and similarly for avoiding upper respiratory infections, etc. These organisms have been widely reported to exert many beneficial effects, such as debarment of cancer cell growth and maintenance of mucosal integrity. Recently, probiotic products have constantly increased in importance and aroused rising interest in animal nutrition. Antibiotics are applied extensively to enhance the animal crops. Nevertheless, the consumption of dietary antibiotics caused public difficulties as well as progress of drug resilient bacteria, drug remain in the body of the birds and imbalances the normal microflora. Probiotic bacteria are applied in a wide range of nutritional techniques in order to support the host organism during physiological growth, to reduce stress, and improvement of health and subsequently enhancement of quantity and quality of animal crops for example milk, meat and egg.

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BIOFERTILIZERS AND BIOPESTICIDES

A popular saying expresses ‘health comes from the farm, not the pharmacy’. Due to the growing of human population, which leads to a higher demand of agricultural harvests, growth in farming output is a main goal to attain the human requests. It is known that pesticides and mucks have played a crucial role in growing of farming. There are two categories of mucks and pesticides chiefly chemical and organic. However, due to the shortage of soil, the people have stopped using natural mucks and are using the chemical mucks and chemical pesticides to access more output in a very short time that is fatal. Generally, the soil is observed as a natural supply which has numerous profits for humanoid while at the same time provides a habitat for many living organisms that many of them are beneficial. However, the condition of soil has changed and the main causes of losing soil fertility and soil degradation are due to chemical mucks and chemical pesticides. These chemical substances that are used for cultivating vegetables, fruits and crops poses toxicity to the human body and can cause contamination for both surface and ground water. Nitrate has a big influence on triggering ecological imbalance and such serious disorders as tumor, changes to the immune system, newborn mortality, hypertension, methemoglobinemia complication and etc. Methemoglobinemia is a disease triggered polluted water with nitrate. In these illnesses nitrite alters hemoglobin to methemoglobin by oxidizing the Fe^{2+}in heme to Fe^{3+}, which cannot transport oxygen; and subsequently leads to oxygen shortage in tissues. The oxygen-shortage happens in maim and sometimes finishes by death, especially for children. The term "bio-muck" might be distinct as materials which comprise living germs which colonizes the rhizosphere or the interior of the plants and enhances development by raising the resources or accessibility of the key nutrients to the objective crops, when they are added to the soils or plant surfaces. Bio-mucks have an ability to mobilize nutritionally important factors from unusable to usable form. These microorganisms require organic substance for their growth and activity in soil and provide important nutrients to the plant. Likewise, Bio-mucks are a supplement of chemical mucks and they are finding an importance role because of cut down the use of chemical mucks, the proper maintenance of soil health and minimize environmental pollutions. In reality, bio-mucks are compounds that enrich the nutrient quality of the soil by using germs that establish synergistic interactions with the plants which generate plant nutritional elements like nitrogen and phosphorous via their roots in the soil.

Bio-pesticides are certain types of pesticides originated from such natural materials as plants, animals, bacteria, and certain minerals. Bio-pesticides can also be defined as biochemical pesticides that are natural materials that affects the pests by nontoxic procedures. Bio-pesticides can be living organisms or their products which can be used for the management of pests that are harmful for plants. A main group of pesticides are insecticides. There are two important financial problems triggered by insects. The first concerns the loss of output that results from harm to yields and for the health of human and domestic animals, the second concerns the price of attempting to prevent or decrease such production losses. Mosquitoes and black flies are a steady threat to health and comfort, and the chemical pesticides employed to control them have created serious ecological corners.

Useful pests and normal predators have been devastated, consequently, the number of resistant parasites and black flies has emerged and ecological contamination increased worldwide. Today, organic regulation is extensively observed as a necessary method for controlling bugs, due to its negligible ecological effect and it's evading of problems of resistance in the farming pests and vectors. Organic control may be defined as the use of a specially chosen living organism to control a particular pest. This chosen organism might be a predator, parasite or infections, which attack the sensitive insects. Entomopathogens have been proposed as controlling factors of bug pests for over a century and belong to species of fungi, viruses, bacteria, and protozoa. Of these, viruses, bacteria, and some fungi, for their recognized efficiency and the comparative absence of poisoning or pathogenicity to other plants and animals, have been established into commercial manufacturing. Dissimilar to a majority of pesticides, organic controls are typically very precise for an exact pest. There is less danger of impact on the environment and water quality and they offer a more eco-friendly alternative to chemical insecticides. They could be used where pests have acquired resistor to usual pesticides too. Specific bio-toxin making strains of *Bacillus thuringiensis* var. *israelensis* or *B. sphaericus* have been applied to reduce or remove the larval phases of bugs, mostly where malaria, filariasis or definite arboviruses are existing. *Bacillus thuringiensis* var. *israelensis* is moreover operative against the larval phases of *Simulium* spp., vectors of river blindness in man (onchocerciasis) in Africa, and the reason of acute 'fly worry' in domestic livestock in some of areas of the world. Pertaining to the precise control planned, chemical larvicide's can hamper or shift to the use of *Bacillus*. *Bacillus thuringiensis* (Bt.) grow normally in the soil and on plants. Diverse varieties of this bacterium secrete a crystal protein that is toxic to specific groups of insects.

The entomopathogenic microorganism *Bacillus thuringiensis* is one of the most promising organic control agents for pest and insect management since many strains are toxic specifically for *Lepidopteran* and strain *Bacillus thuringiensis* serotype H-14 is highly toxic to *Dipterans*.

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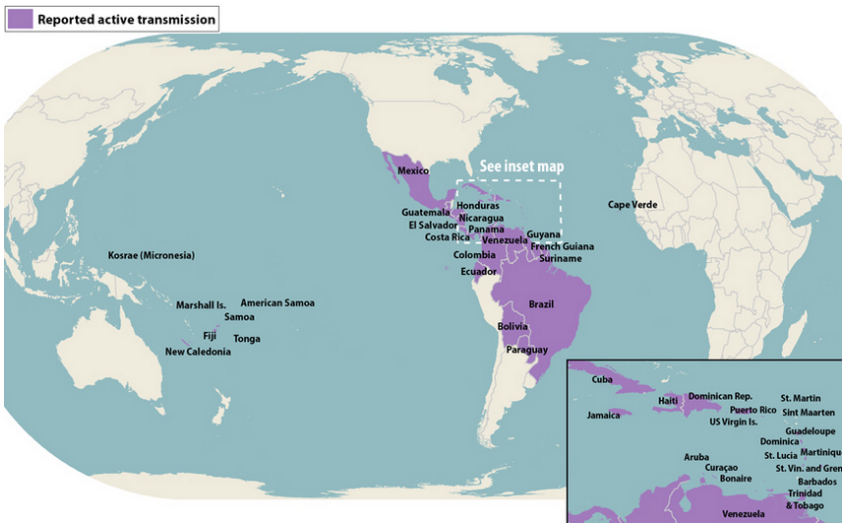
ZIKA FEVER

Zika is an illness produced by the Zika virus that is open out to individuals largely via the sting of a putrefied *Aedes* species gnat. Additionally, this gnat spread three additional vector-based infections Chikungunya, dengue, and yellow fever across humid regions on all sides of the world. The most common symptoms of Zika are fever, rash, joint pain, and red eyes. This disease is often moderate with indications permanent for some days to a week after being snapped by a gnat that is putrefied by Zika virus. Individuals normally don't get sick too much to go to the hospital, and they hardly decease of Zika, but Zika virus is a cause of microcephaly and some other neurological problems in children. Zika virus was first discovered in 1947 and its name comes from the Zika Forest of Uganda. In 1952, the primarily humanoid diseases of Zika were spotted and after that, prevalence of Zika have been observed in humid Africa, Southeast Asia, and the Pacific Islands. Zika prevalence have possibly happened in various places. Before 2007, at least 14 cases of Zika had been recognized. From 2007 until now, the virus spread progressively.



Zika infection and microcephaly

Microcephaly is a rare disorder whose reasons can be genetic or environmental. It is labelled as a situation at birth in which the newborn's skull perimeter is less than normal for age and sex and usually they have injured brains. These indications have varying grades of harshness and in some circumstances may be life-threatening. Pregnant women can be ill with the Zika virus via the bite of a diseased bug or by her sex diseased wife and illness can be delivered from a pregnant woman to her embryo by pregnancy and resulting in microcephaly. The most reliable route to evaluate that an infant has microcephaly is to measure head perimeter at birth and over 24 hours after that. There is no cure for microcephaly. Yet, care is focused on follow-up, promotion and exten-

Birth outcomes of Zika infection

The recent growth in the occurrence of Zika virus in Brazil has been accompanied by an unseen growth in the number of children being born with microcephaly. In addition, several countries, including Brazil, described an unexpected ingravescent in Guillain -Barré syndrome- a neurological ailment that could lead to paralysis and death. According to the research results, there is logical agreement that the Zika virus is a reason of Guillain-Barré syndrome and microcephaly and other acute embryonic brain faults and some of them, as well as eye weaknesses, hearing loss, and disharmonious growth. Unfortunately, there is no vaccine to avoid or drug to cure Zika infections.

Public health alert

In May 2015, the Pan American Health Organization (PAHO) released an alert regarding the primarily verified Zika virus illness in Brazil and on Feb 2016, WHO acknowledged that the Zika virus is a public health disaster of global concern. Aboriginal spread has been stated in many other countries and regions. Zika virus likely will remain to spread to new regions. The best method of avoidance is safety against bug bites.

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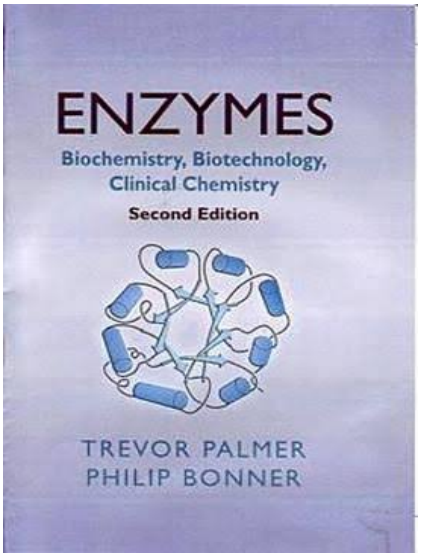
Book Alert

ENZYMES: BIOCHEMISTRY, BIOTECHNOLOGY AND CLINICAL CHEMISTRY



Author: Trevor palmer, Philip L.R. Bonner

Publisher: Horwood publisher

ISBN: 9781904275275

INTRODUCTION TO CANCER BIOLOGY

Author: Momna Hejmadi

Publisher: Bookboon Publishing

ISBN: 978-87-7681-478-6

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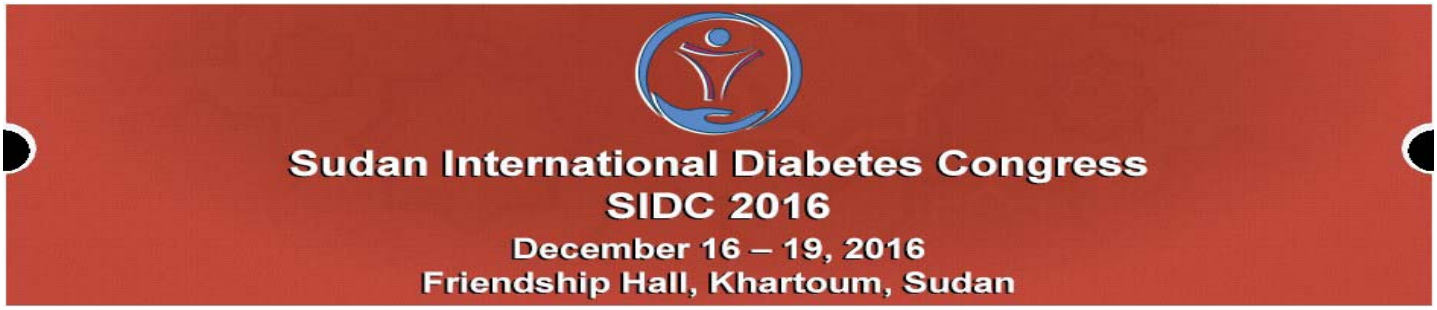

http://www.sidconf.com/index.html

SREPTOCOCCUS SALIVARIUS SUBSP. *THERMOPHILES*

Streptococcus salivarius subsp. *Thermophile*s is a Gram-positive bacteria and a homo fermentative facultative anaerobe. It is a member of the *viridans* cluster and is not vacillant and cannot produce endospores; and correspondingly, is categorized as a lactic acid bacterium. *S. thermophilus* is existent in fermented milk goods, and is normally applied in making yogurt, alongside *Lactobacillus delbrueckii* subsp. *bulgaricus*. The two types are relative and are confirmed to have helpful probiotic health efficacies.

Reference: https://en.wikipedia.org/wiki/streptococcus_thermophilus

ASPARAGINASE

Asparaginase is an enzyme that speeds up the conversion of asparagine to its acidic form, aspartate. This enzyme is generated by germs and were applied in nourishment generating, and in the treatment of tumors. These remedial enzymes are on the WHO's list of vital drugs. Different from the conventional chemotherapy drugs, asparaginase may be administrated as an intramuscular, subcutaneous, or intravenous shot without dread of tissue inflammation.

Reference: https://en.wikipedia.org/wiki/Asparaginase

BIFIDOBACTERIUM LONGUM

Bifidobacterium longum is a gram positive, non-motile, non-spore forming and rod-shaped bacterium present in the human gastrointestinal tract. It is a microaerotolerant anaerobe and considered to be one of the earliest colonizers of the gastrointestinal tract of infants. While *B. longum* is not meaningfully extant in the adult stomach region, it is considered part of the gut flora and is non-pathogenic and its production of lactic acid is believed to prevent the growth of pathogenic organisms. *B. longum* is often added to food (commonly dairy) products for its helpful probiotic properties. *B. longum* as well as their probiotic effects can inhibit colorectal

tumor by producing bile acid and cholesterol metabolites that decrease the intestinal pH. By hosting genes into *B. longum* that generate antitumor enzymes, *B. longum* may be able to act as the vector in tumor gene therapy. *B. longum* is an ideal vector, as its actions should remain tumor-specific, it is nonpathogenic, and is generally easily killed by antibiotics, unlike other potential anaerobic vectors such as *Salmonella* or *Clostridium*.

Reference: https://microbewiki.kenyon.edu/index.php/Bifidobacterium_longum

AEDES MOSQUITO

Aedes is a parasite initially discovered in humid and subtropical regions, nonetheless, now found on all over the world excluding Antarctica. Some classes of this genus spread severe illness, comprising dengue fever, yellow fever, the Zika virus, and Chikungunya. In Polynesia, the species *Aedes polynesiensis* is the cause for the spread of humanoid lymphatic filariasis.

Reference: https://en.wikipedia.org/wiki/Aedes