Reproduction of bacteria pdf

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Bacteria are single-ob microbes. The cellular structure is simpler than that of other organisms because there is no nucleus or membrane bound organelles. Instead, their control center containing genetic information is contained in a single DNA loop. Some bacteria have another ring of genetic material called plasmid. Plasmid often contains genes that give the bacteria some advantage over other bacteria. For example, it may contain a gene that makes a bacterium resistant to a particular antibiotic. Bacteria are divided into five groups according to their basic shapes: spherical (coca), rod (bacilli), spiral (spirilla), comma (vibrios) or corkscrew (spirochaety). They can exist as individual cells, in pairs, strings, or clusters. © ttsz / iStock Various bacterial shapes. Bacteria are found in every habitat on Earth: soil, rocks, oceans and even Arctic snow. Some live in other organisms or on other organisms, including plants and animals, including humans. There are approximately 10 times as many bacterial cells as human cells in the human body. Many of these bacterial cells are found lining the digestive system. Some bacteria live in soil or on dead plant matter, where they play an important role in cycling nutrients. Some types cause food spoilage and crop damage, but others are incredibly useful in producing fermented foods such as yogurt and soy sauce. Relatively few bacteria are parasites or pathogens that cause disease in animals and plants. © gaetan stoffel / iStock 3D illustration escherichia coli How are bacteria reproduced? Bacteria are reproduced by binary fission. In the process, the bacterium, which is one cell, is divided into two identical daughter cells. Binary cleavage begins when the DNA of the bacteria divides into two (replicates). The bacterial cell is then lengthened and divided into two daughter cells, each with identical DNA to the mother cell. Each daughter cell is a clone of the parent cell. When conditions are favorable, such as the right temperature and nutrients are available, some bacteria like Escherichia coli can divide every 20 minutes. This means that in just seven hours, one bacterium can generate 2,097,152 bacteria. After one hour, the number of bacteria increased to a colossal 16,777,216. Therefore, we can quickly get sick when pathogenic microbes invade our bodies. Survival mechanism Some bacteria may form endospores. These are dormant structures that are extremely resistant to hostile physical and chemical conditions such as heat, UV radiation and disinfectants. That makes them very difficult. Many endospor-producing bacteria are nasty pathogens, such as Bacillus anthracis, the cause of anthrax. Videos Microbiology Today: Mycobacteria. Scientific photo library. Building bacterial bridges. B. Reeksting. Explanation of tuberculosis. iStock/Dr_Microbe. Antimicrobial resistance. digicomphoto/Thinkstock. Pseudomonas - friend and enemy. iStock/Dr_Microbe. Streptomyces - amr solution. Amr. Podcasts. Roger Harris/Science Photo Library. Back to top Most bacteria rely on binary cleavage for spread. Conceptually, it is a simple process; the cell simply needs to grow to double its initial size and then split into two parts. However, in order for the bacterium to remain viable and competitive, it must be distributed in the right place at the right time and provide each offspring with a full copy of their essential genetic material. Bacterial cell division is being studied in many research laboratories around the world. These researches reveal the genetic mechanisms that regulate and move the division of bacterial cells. Understanding the mechanics of this process is of great interest because it may allow the design of new chemicals or new antibiotics that specifically target and interfere with cell division in bacteria. Before binary splitting occurs, the cell must copy its genetic material (DNA) and separate these copies to the opposite ends of the cell. Then many types of proteins that make up cell division machines gather at the next dividing point. A key component of this machine is the FtsZ protein. The other components of the dividing apparatus are then assembled on the ftsz circle. This machine is positioned so that the division divides the cytoplasm and does not damage the DNA in the process. As division occurs, the cytoplasm is split into two parts, and in many bacteria a new cell wall is synthesized. The order and timing of these processes (DNA replication, DNA segregation, selection of the division site, invagination of the envelope of the cell and synthesis of the new cell wall) are strictly controlled. Some unusual forms of reproduction in bacteria: There are groups of bacteria that use unusual forms or patterns of cell division to reproduce. Some of these bacteria grow to more than twice their initial cell size and then use multiple divisions to produce multiple cell offspring. Some other bacterial lines reproduce hopefully. Still others form internal offspring that develop in the cytoplasm of larger mother cells. The following are some examples of some of these unusual forms of bacterial reproduction. The production of baeocytes in the cyanobacterium Stanieria Stanieria never breaks down binary cleavage. It starts as a small globu cell with a diameter of approximately 1 to 2 µm. This cell is referred to as baeocyte (which literally means a small cell). Baeocyte begins to grow, eventually forming a vegetative cell with a diameter of up to 30 µm. As it grows, cellULAR DNA is replicated over and over again, and the cell produces a dense extracellular matrix. The vegetative cell eventually turns into a reproductive phase, where it undergoes a rapid sequence of cytoplasmic fission to produce tens or even hundreds of baeocytes. The extracellular matrix eventually tears and releases the baeocytes. Other members of Pleurocapsales (Cyanobacteria Councils) use unusual patterns (see Waterbury and Stanier, 1978). Hopeful in Hopeful bacteria has been observed in some members of Planctomycetes, Cyanobacteria, Firmicutes (aka Low G+C Gram-positive bacteria) and prosthetic Proteobacteria. Although hopeful has been extensively studied in the eukaryotic yeast Saccharomyces cerevisiae, the molecular mechanisms of bud formation in bacteria are unknown. A schematic representation of the hopeful Planctomyces species is shown below. Intracellular offspring production by some Firmicutes Epulopiscium spp., Metabacterium polyspora and segmented fibrous bacteria (SFB) form multiple intracellular offspring. For some of these bacteria, this process seems to be the only way to reproduce. The development of intracellular offspring in these bacteria has properties with the formation of endospores in Bacillus subtilis. In the great Epulopiscium spp. this unique reproductive strategy begins with asymmetric cell division, see Epulopiscium Life Cycle Image. Instead of placing the FtsZ ring in the center of the cell, as well as in binary cleavage, the (A) Z rings are located near both cell poles in Epulopiscium. (B) The division forms a large mother cell and two small offspring cells. (C) Smaller cells contain DNA and are completely absorbed by larger mother cells. (D) The internal offspring grows in the cytoplasm of the mother's cell. (E) Upon completion of the development of the offspring, the mother cell dies and releases the offspring. Our laboratory examines the mechanisms of development of intracellular offspring in Epulopiscium and Metabacterium polyspora. We are interested in what mechanisms are maintained between these unusual reproductive processes and the formation of the endospore. We hope to gain an understanding of how this new form of cell reproduction developed over time and how it benefits these intestinal symbionts. Some selected reviews on the distribution and unusual ways of reproducing alternatives to binary cleavage in bacteria. Angert Emergency. Nature Reviews Microbiology (2005) vol. 3, p. 214-224. Patterns of growth and development in pleurocapsalean cyanobacteria, JB Waterbury and RY Stanier. Microbiological reviews (1978) vol. 42, p. 2 -44. Bacterial mitotic machines. K. Gerdes, J. Møller-Jensen, G. Ebersbach, T. Kruse and K. Nordström. Cell (2004) p. 116, p. 359-366. Division of bacterial cells and septic tank. D. S. Weiss. Molecular microbiology (2004) p. 54, p. 588-597. This is a question and answer forum for students, teachers and general visitors to exchange articles, answers and notes. Answer now and help others. The answer now here is how it works: Anyone can ask a question Anyone can answer The best answers are voted and rise to the top Bacteria are prokaryotic organisms that reproduce asexually. Bacterial reproduction most often occurs by a kind of cell division called binary cleavage. Binary splitting involves dividing a single cell, resulting in the formation of two cells that are Same. In order to understand the process of binary cleavage, it is useful to understand the bacterial cell structure. Binary cleavage is the process by which a single cell divides and forms two cells that are genetically identical. There are three common shapes of bacterial cells: rod-shaped, spherical, and spiral.Common bacterial cell components include: cell wall, cell membrane, cytoplasm, flagella, nucleoid region, plasmids, as well as ribosomes. Binary fracking as a means of reproduction has a number of advantages, the boss among them is the ability to reproduce in high numbers at a very fast pace. Because binary cleavage produces identical cells, bacteria can become genetically more diverse through recombination, which involves gene transfer between cells. Bacteria have different cell shapes. The most common bacteria cell shapes are spherical, rod-shaped, and spiral. Bacterial cells usually contain the following structures: cell wall, cell membrane, cytoplasm, ribosomes, plasmids, flagella and nucleoid region. Cell wall: The outer cover of a cell that protects a bacterial cell and gives it shape. Cytoplasm: A gel-like substance composed mainly of water, which also contains enzymes, salts, cellular components, and various organic molecules. Cell membrane or plasma membrane: Surrounds the cytoplasm of the cell and regulates the flow of substances to and from the cell. Flagella: A long, whip-like protrusion that helps in cellular movement. Ribosomes: Cellular structures responsible for protein production. Plasmids: Gene transfer, circular DNA structures not involved in reproduction. Nucleoid region: an area of the cytoplasm that contains a single bacterial DNA molecule. This involves the color transfer of electron micrograph (TEM) bacteria E. coli in the early stages of binary fission. Credit: CNRI/Getty Images Most bacteria, including Salmonella and E.coli, are reproduced by binary cleavage. During this type of asexual reproduction, a single DNA molecule is replicated and both copies are attached to the cell membrane at different points. As the cell begins to grow and lengthen, the distance between the two DNA molecules increases. Once the bacteria just about doubles its original size, the cell membrane begins to pinch inside in the middle. Finally, a cell wall is formed that separates the two DNA molecules and divides the original cell into two identical daughter cells. This image shows bacteria growing exponentially in a petri dish. One colony can have trillions of bacteria. Wladimir Bulgar/Science Photo Library/Getty Images There are a number of benefits associated with reproduction through binary fracking. One bacterium is able to reproduce in high numbers at a rapid rate. Under optimal conditions, some bacteria can double the population in minutes or hours. Another advantage is that no time is wasted finding a partner because reproduction is asexual. In addition, the daughter's cells resulting from cleavage are identical to the original cell. This means that they are suitable for life in their environment. Binary cleavage is an effective way for bacteria to reproduce, however, it is not without problems. Because the cells produced by this type of reproduction are identical, they are all susceptible to the same types of threats as environmental changes and antibiotics. These dangers could destroy the entire colony. To avoid such dangers, bacteria can become more genetically diverse through recombination. Recombination involves gene transfer between cells. Bacterial recombination is performed by conjugation, transformation or transduction. Some bacteria are able to transfer bits of their genes to other bacteria that contact them. During conjugation, one bacterium connects with another through a protein tube structure called pilus. Genes are transmitted from one bacterium to another through this tube. Some bacteria are able to take DNA from their environment. These DNA residues most often come from dying bacterial cells. During transformation, the bacterium binds DNA and transports it through the bacterial cell membrane. The new DNA is then incorporated into the DNA of the bacterial cell. Transduction is a type of recombination that involves the exchange of bacterial DNA through bacteriophages. Bacteriophages are viruses that infect bacteria. There are two types of transduction: generalized and specialized transfer. When the bacteriophage attaches to the bacterium, it inserts its genome into the bacterium. The viral genome, enzymes and viral components are then replicated and assembled in the host bacterium. After its formation, a new bacteriophageal lyse or split opens the bacterium and releases the replicated viruses. However, during the assembly process, some of the host bacterial DNA may become encapsulated in a viral capside instead of a viral genome. When this bacteriophage infects another bacterium, it injects a dna fragment from a previously infected bacterium. This DNA fragment is then inserted into the DNA of the new bacterium. This type of transduction is called generalised transduction. In specialized transduction, fragments of the DNA of the host bacterium are incorporated into the viral genomes of new bacteriophages. DNA fragments can then be transferred to any new bacteria that infect these bacteriophages. Reece, Jane B., and Neil A. Campbell. Campbell biology. Benjamin Cummings, 2011.