THE BIOFILM MODE OF LIFE : MECHANISMS AND ADAPTATIONS. pdf

1: Professor Jeremy S Webb | Biological Sciences | University of Southampton

This book, written by leading international scientists, presents an overview of the most recent and exciting new research into the mechanisms that underpin the biofilm mode of life.

Bacterial adaptation Bacteria have been designed to be adaptable. Their surrounding layers and the genetic information for these and other structures associated with a bacterium are capable of alteration. Some alterations are reversible, disappearing when the particular pressure is lifted. Other alterations are maintained and can even be passed on to succeeding generations of bacteria. The first antibiotic was discovered in Since then, a myriad of naturally occurring and chemically synthesized antibiotics have been used to control bacteria. Introduction of an antibiotic is frequently followed by the development of resistance to the agent. Resistance is an example of the adaptation of the bacteria to the antibacterial agent. Antibiotic resistance can develop swiftly. For example, resistance to penicillin the first antibiotic discovered was recognized almost immediately after introduction of the drug. Meanwhile, other bacteria remain susceptible to penicillin. An example is provided by Group A Streptococcus pyogenes, another Gram-positive bacteria. The adaptation of bacteria to an antibacterial agent such as an antibiotic can occur in two ways. The first method is known as inherent or natural resistance. Gram-negative bacteria are often naturally resistant to penicillin, for example. This is because these bacteria have another outer membrane, which makes the penetration of penicillin to its target more difficult. Sometimes when bacteria acquire resistance to an antibacterial agent, the cause is a membrane alteration that has made the passage of the molecule into the cell more difficult. The second category of adaptive resistance is called acquired resistance. This resistance is almost always due to a change in the genetic make-up of the bacterial genome. Acquired resistance can occur because of mutation or as a response by the bacteria to the selective pressure imposed by the antibacterial agent. Once the genetic alteration that confers resistance is present, it can be passed on to subsequent generations. Acquired adaptation and resistance of bacteria to some clinically important antibiotics has become a great problem in the last decade of the twentieth century. Bacteria adapt to other environmental conditions as well. These include adaptations to changes in temperature, pH , concentrations of ions such as sodium, and the nature of the surrounding support. An example of the latter is the response shown by Vibrio parahaemolyticus to growth in a watery environment versus a more viscous environment. In the more viscous setting, the bacteria adapt by forming what are called swarmer cells. These cells adopt a different means of movement, which is more efficient for moving over a more solid surface. This adaptation is under tight genetic control, involving the expression of multiple genes. Bacteria react to a sudden change in their environment by expressing or repressing the expression of a whole lost of genes. This response changes the properties of both the interior of the organism and its surface chemistry. A well-known example of this adaptation is the so-called heat shock response of Escherichia coli. The name derives from the fact that the response was first observed in bacteria suddenly shifted to a higher growth temperature. One of the adaptations in the surface chemistry of Gram-negative bacteria is the alteration of a molecule called lipopolysaccharide. Depending on the growth conditions or whether the bacteria are growing on an artificial growth medium or inside a human, as examples, the lipopolysaccharide chemistry can become more or less water-repellent. These changes can profoundly affect the ability of antibacterial agents or immune components to kill the bacteria. Another adaptation exhibited by Vibrio parahaemolyticus, and a great many other bacteria as well, is the formation of adherent populations on solid surfaces. This mode of growth is called a biofilm. Adoption of a biofilm mode of growth induces a myriad of changes, many involving the expression of previously unexpressed genes. As well de-activation of actively expressing genes can occur. Furthermore, the pattern of gene expression may not be uniform throughout the biofilm. Evidence from studies where the activity of living bacteria can be measured without disturbing the biofilm is consistent with a view that the bacteria closer to the top of the biofilm, and so closer to the outside environment, are very different than the bacteria lower down in the biofilm. A critical aspect of biofilms is the ability of the adherent bacteria to sense their environment and to convert this information into signals that trigger gene expression or inhibition. Bacteria within a biofilm and bacteria found

in other niches, such as in a wound where oxygen is limited, grow and divide at a far slower speed than the bacteria found in the test tube in the laboratory. Such bacteria are able to adapt to the slower growth rate, once again by changing their chemistry and gene expression pattern. When presented with more nutrients, the bacteria can often very quickly resume the rapid growth and division rate of their test tube counterparts. Thus, even though they have adapted to a slower growth rate, the bacteria remained "primed" for the rapid another adaptation to a faster growth rate. A further example of adaptation is the phenomenon of chemotaxis, whereby a bacterium can sense the chemical composition of the environment and either moves toward an attractive compound, or shifts direction and moves away from a compound sensed as being detrimental. Chemotaxis is controlled by more than 40 genes that code for the production of components of the flagella that propels the bacterium along, for sensory receptor proteins in the membrane, and for components that are involved in signaling a bacterium to move toward or away from a compound. The adaptation involved in the chemotactic response must have a memory component, because the concentration of a compound at one moment in time must be compared to the concentration a few moments later. See also Antiseptics; Biofilm formation and dynamic behavior; Evolution and evolutionary mechanisms; Mutations and mutagenesis Cite this article Pick a style below, and copy the text for your bibliography.

THE BIOFILM MODE OF LIFE : MECHANISMS AND ADAPTATIONS. pdf

2: Anti-biofilm Activity as a Health Issue

This book, written by leading international scientists, presents an overview of the most recent and exciting new research into the mechanisms that underpin the biofilm mode of life. Essential reading for anyone interested in biofilms.

The use, distribution or reproduction in other forums is permitted, provided the original author s or licensor are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms. This article has been cited by other articles in PMC. In addition, sessile bacteria have a high tolerance to exogenous stress including anti-infectious agents. Biofilms are highly competitive communities and some microorganisms exhibit anti-biofilm capacities such as bacterial growth inhibition, exclusion or competition, which enable them to acquire advantages and become dominant. The deciphering and control of anti-biofilm properties represent future challenges in human infection control. These cells frequently express phenotypes different from their non-adherent planktonic counterparts, with a high capacity to colonize new surfaces and a high tolerance to exogenous stress Donlan and Costerton, ; Macfarlane and Dillon, Some bacterial biofilms, such as the intestinal microbiota, also play protective and functional roles. Intestinal commensal and beneficial bacteriaâ€”bacteria interactions are directly involved in host homeostasis Wrzosek et al. Interference interactions have already inspired the design of alternatives to antibiotics in the fight against pathogenic microorganisms Rasko and Sperandio, Many medical device-associated and persistent infections can be attributed to biofilm-associated microbes. To tackle the overarching public health issue of the contribution of biofilms to health care-associated infections it was suggested that clinicians and health care workers should be more closely involved in their detection and treatment. It was also suggested that the applied science of biofilm formation and prevention would provide greater knowledge of the contamination of medical devices. In this review, after establishing a definition of the term anti-biofilm, we will focus on bacterial anti-biofilm activities with examples of probiotic and pathogenic bacteria. With reference to clinical examples, we will then discuss the use, challenges and limitations of anti-biofilm strategies. What Does it Mean? Biofilms were initially defined as structured communities of bacterial cells enclosed in self-produced polymeric matrices and adherent to inert or living surfaces Costerton et al. Later, it became obvious that biofilms exhibit altered phenotypes compared with corresponding planktonic cells, especially with regard to gene transcription Lindsay and von Holy, Biofilms are increasingly recognized by the public health community as an important source of pathogens Donlan and Costerton, ; Wingender and Flemming, They are involved in specific infectious diseases such as osteomyelitis, otitis media, peridontitis, and dental caries Costerton et al. They are also involved in nosocomial infections due to opportunistic pathogens, especially urinary tract, lower respiratory tract, and surgical site infections and bacteremia, and mostly when invasive medical device are being used.

THE BIOFILM MODE OF LIFE : MECHANISMS AND ADAPTATIONS. pdf

3: The Biofilm Mode of Life by (ISBN:) Hardback Book | Bookwire

A biofilm is a complex aggregation of microbes usually attached to a solid surface. Traditional studies of bacteria sometimes implied that microbes live as single organisms.

The role of polyhydroxyalkanoate biosynthesis by Pseudomonas aeruginosa in rhamnolipid and alginate production as well as stress tolerance and biofilm formation. Microbiology, 10 , Cell death in pseudomonas aeruginosa biofilm development. Journal of Bacteriology, 15 , Green fluorescent protein as a novel Indicator of antimicrobial susceptibility in Aureobasidium pullulans. Applied and Environmental Microbiology, 67 12 , Fungal colonization and biodeterioration of plasticized polyvinyl chloride. Applied and Environmental Microbiology, 66 8 , Plasticizers increase adhesion of the deteriogenic fungus Aureobasidium pullulans to polyvinyl chloride. Applied and Environmental Microbiology, 65 8 , Influence of surfaces on sulphidogenic bacteria. Biofilm formation by pseudomonas aeruginosa. Model Organism, Pathogen, Cell Factory pp. Biofilms on living surfaces. Differentiation and dispersal in biofilms. Intracellular residency of Staphylococcus aureus within mast cells in nasal polyps: Journal of Allergy and Clinical Immunology, 6 , Toxin-anti toxin system and applications thereof Toxin-anti toxin system and applications thereof Patent No. Current and future therapies for Pseudomonas aeruginosa infection in patients with cystic fibrosis. Editorial Board member, Nature Scientific Reports, present. Conference organisation Invited to host and chair the Scientific Organising Committee for the international conference Biofilms 4, Winchester, UK, Sept 1â€”3 , attended by over delegates from 37 countries.

4: Bacterial Adaptation | www.enganchecubano.com

A biofilm is a complex aggregation of microbes usually attached to a solid surface. Traditional studies of bacteria sometimes implied that microbes live as single organisms; it is now clear that in nature microbes usually live in co-operative groups attached to surfaces.

Dispersal[edit] Biofilm Dispersal Dispersal of cells from the biofilm colony is an essential stage of the biofilm life cycle. Dispersal enables biofilms to spread and colonize new surfaces. Enzymes that degrade the biofilm extracellular matrix , such as dispersin B and deoxyribonuclease , may contribute to biofilm dispersal. Secreted by Pseudomonas aeruginosa , this compound induces cyclo heteromorphic cells in several species of bacteria and the yeast Candida albicans. Nitric oxide has the potential for the treatment of patients that suffer from chronic infections caused by biofilms. However, recent studies have shown that the physiology of dispersed cells from Pseudomonas aeruginosa biofilms is highly different from those of planktonic and biofilm cells. Dispersed cells are found to be highly virulent against macrophages and Caenorhabditis elegans, but highly sensitive towards iron stress, as compared with planktonic cells. Given sufficient resources for growth, a biofilm will quickly grow to be macroscopic visible to the naked eye. Biofilms can contain many different types of microorganism, e. However, some organisms will form single-species films under certain conditions. This matrix encases the cells within it and facilitates communication among them through biochemical signals as well as gene exchange. The EPS matrix also traps extracellular enzymes and keeps them in close proximity to the cells. Thus, the matrix represents an external digestion system and allows for stable synergistic microconsortia of different species Wingender and Flemming, Nat. Some biofilms have been found to contain water channels that help distribute nutrients and signalling molecules. Bacteria living in a biofilm usually have significantly different properties from free-floating bacteria of the same species, as the dense and protected environment of the film allows them to cooperate and interact in various ways. In some cases antibiotic resistance can be increased a thousandfold. However, biofilms are not always less susceptible to antibiotics. For instance, the biofilm form of Pseudomonas aeruginosa has no greater resistance to antimicrobials than do stationary-phase planktonic cells, although when the biofilm is compared to logarithmic-phase planktonic cells, the biofilm does have greater resistance to antimicrobials. This resistance to antibiotics in both stationary-phase cells and biofilms may be due to the presence of persister cells. The longest raised mat area is about half a meter long. Biofilms are ubiquitous in organic life. Nearly every species of microorganism have mechanisms by which they can adhere to surfaces and to each other. Biofilms will form on virtually every non-shedding surface in non-sterile aqueous or humid environments. Biofilms can grow in the most extreme environments: Biofilms can be found on rocks and pebbles at the bottoms of most streams or rivers and often form on the surfaces of stagnant pools of water. Biofilms are important components of food chains in rivers and streams and are grazed by the aquatic invertebrates upon which many fish feed. Biofilms are found on the surface of and inside plants. They can either contribute to crop disease or, as in the case of nitrogen-fixing Rhizobium on roots, exist symbiotically with the plant. This was supported mainly with the fact that the two most abundantly produced molecules by the immune system also support bio-film production and are associated with the bio-films developed in the gut. This is especially important because the appendix holds a mass amount of these bacterial bio-films. In the human environment, biofilms can grow in showers very easily since they provide a moist and warm environment for the biofilm to thrive. Biofilms can form inside water and sewage pipes and cause clogging and corrosion. Biofilms on floors and counters can make sanitation difficult in food preparation areas. Biofilm in soil can cause bioclogging. Biofilms in cooling- or heating-water systems are known to reduce heat transfer. Bacterial adhesion to boat hulls serves as the foundation for biofouling of seagoing vessels. Once a film of bacteria forms, it is easier for other marine organisms such as barnacles to attach. Stromatolites are layered accretionary structures formed in shallow water by the trapping, binding and cementation of sedimentary grains by microbial biofilms, especially of cyanobacteria. Stromatolites include some of the most ancient records of life on Earth, and are still forming today. Dental plaque[edit] Within the human body, biofilms are present on the teeth as dental plaque , where they may cause tooth decay and gum

disease. These biofilms can either be in an uncalcified state that can be removed by dental instruments, or a calcified state which is more difficult to remove. Removal techniques can also include antimicrobials. The accumulation of microorganisms subjects the teeth and gingival tissues to high concentrations of bacterial metabolites which results in dental disease. An ecologic shift away from balanced populations within the dental biofilm is driven by certain cariogenic microbiological populations beginning to dominate when the environment favours them. The shift to an acidogenic , aciduric, and cariogenic microbiological population develops and is maintained by frequent consumption of fermentable dietary carbohydrate. The resulting activity shift in the biofilm and resulting acid production within the biofilm, at the tooth surface is associated with an imbalance between demineralization and remineralisation leading to net mineral loss within dental hard tissues enamel and then dentin , the sign and symptom being a carious lesion. By preventing the dental plaque biofilm from maturing or by returning it back to a non-cariogenic state, dental caries can be prevented and arrested. A peptide pheromone quorum sensing signaling system in S. This system is optimally expressed when S. Many different bacteria form biofilms, including gram-positive e. Bacillus spp, Listeria monocytogenes , Staphylococcus spp, and lactic acid bacteria , including Lactobacillus plantarum and Lactococcus lactis and gram-negative species e. Escherichia coli , or Pseudomonas aeruginosa. Pseudomonas putida , Pseudomonas fluorescens , and related pseudomonads which are common plant-associated bacteria found on leaves, roots, and in the soil, and the majority of their natural isolates form biofilms. Cryptococcus laurentii [60] and microalgae. Among microalgae, one of the main progenitors of biofilms are diatoms , which colonise both fresh and marine environments worldwide. Although many techniques have developed to identify planktonic bacteria in viable wounds, few have been able to quickly and accurately identify bacterial biofilms. Future studies are needed to find means of identifying and monitoring biofilm colonization at the bedside to permit timely initiation of treatment. The patients with biofilms were shown to have been denuded of cilia and goblet cells , unlike the controls without biofilms who had normal cilia and goblet cell morphology. In other words, the cultures were negative though the bacteria were present. This sub-therapeutic level of antibiotic may result from the use of antibiotics as growth promoters in agriculture, or during the normal course of antibiotic therapy. The biofilm formation induced by low-level methicillin was inhibited by DNase, suggesting that the sub-therapeutic levels of antibiotic also induce extracellular DNA release. CSP also functions as a quorum-sensing peptide. It not only induces biofilm formation, but also increases virulence in pneumonia and meningitis. It has been proposed that competence development and biofilm formation is an adaptation of S. No matter the sophistication, microbial infections can develop on all medical devices and tissue engineering constructs. For example, many sewage treatment plants include a secondary treatment stage in which waste water passes over biofilms grown on filters, which extract and digest organic compounds. In such biofilms, bacteria are mainly responsible for removal of organic matter BOD , while protozoa and rotifers are mainly responsible for removal of suspended solids SS , including pathogens and other microorganisms. Slow sand filters rely on biofilm development in the same way to filter surface water from lake, spring or river sources for drinking purposes. What we regard as clean water is effectively a waste material to these microcellular organisms. Biofilms can help eliminate petroleum oil from contaminated oceans or marine systems. The oil is eliminated by the hydrocarbon-degrading activities of microbial communities, in particular by a remarkable recently discovered group of specialists, the so-called hydrocarbonoclastic bacteria HCB. One bacteria that can be found in various industries and is a major cause of foodborne disease is Salmonella. Salmonella is also found in the seafood industry where biofilms form from seafood borne pathogens on the seafood itself as well as in water. These new forms of cleaning procedures also have a profound effect on the environment, often releasing toxic gases into the groundwater reservoirs. In the marine environment, biofilms could reduce the hydrodynamic efficiency of ships and propellers, lead to pipeline blockage and sensor malfunction, and increase the weight of appliances deployed in seawater. Phototrophic biofilms Along with bacteria, biofilms are often initiated and produced by eukaryotic microbes. The biofilms produced by eukaryotes is usually occupied by bacteria and other eukaryotes alike, however the surface is cultivated and EPS is secreted initially by the eukaryote. Biofilms of fungal origin are important aspects of human infection and fungal pathagenicity, as the fungal infection is more resistant to antifungals. One key area of research is

fungal biofilms on plants. For example, in the soil, plant associated fungi including mycorrhiza have been shown to decompose organic matter, protect plants from bacterial pathogens. The exact purpose of these biofilms is unknown, however there is evidence that the EPS produced by diatoms facilitates both cold and salinity stress.

5: Professor Staffan Kjelleberg | UNSW Research

Request PDF on ResearchGate | On Jan 1, , S. Atkinson and others published The biofilm mode of life: mechanisms and adaptations For full functionality of ResearchGate it is necessary to enable.

6: The Biofilm Mode of Life: Mechanisms and Adaptations - CRC Press Book

A biofilm is a complex aggregation of microbes usually attached to a solid surface. In nature, microbes usually live in co-operative groups attached to surfaces. This book presents an overview of the research into the mechanisms that underpin the biofilm mode of life.

7: The Biofilm Mode of Life: Mechanisms and Adaptations

The Biofilm Mode of Life: Mechanisms and Adaptations by Kjelle Giuskov, Staffan Kjelleberg (Editor), Michael Givskov (Editor) starting at. The Biofilm Mode of Life: Mechanisms and Adaptations has 0 available edition to buy at Alibris.

8: Biofilm - Wikipedia

Title / Author Type Language Date / Edition Publication; 1. The biofilm mode of life: mechanisms and adaptations: 1.

9: The biofilm mode of life: mechanisms and adaptations, Biology

use the following search parameters to narrow your results: subreddit:subreddit find submissions in "subreddit" author:username find submissions by "username" site:www.enganchecubano.com

THE BIOFILM MODE OF LIFE : MECHANISMS AND ADAPTATIONS. pdf

Chapter 4. The devil you know Nginx designing and deploying microservices The cold dish A manifesto to the peoples of the East Narrative history of Remsen, New York Ethical issues in health promotion research John Santelli Ace certification study guide Ramona (Signet Classics) Lucifer in harness Pioneers! O Pioneers! Modern hplc for practicing scientists by michael w dong A glossary of genetics and cytogenetics, classical and molecular. Encyclopaedia of witches and witchcraft. The Destiny Stone (War of Powers, Book 3) Sexual equality in an integrated Europe Microsoft creator 2006 Harris Connecticut Manufacturers Directory Identification of the gifted Mansions shorter French and English dictionary Movieland directory Covalent bond practice worksheet The Jesus films: the 1960s Complete Reiki handbook The Metropolitan jubilee souvenir Water level indicator and controller project Roots of reaction Introduction to japanese politics hayes Pounds poetic self-portraits A term of second order in the perturbation parameter cannot always be neglected in comparison with the fi Its great to be my age Literary rights contracts Web Writing/Web Designing Mindfulness: taming the chattering mind Criminal and regulatory law International outsourcing and incomplete contracts Asynchronous PCR Caifu Chen, David Ruff, and Jason Halsey Treasure of the Keys (Heartsong Presents #229) Deck Officer Study Guide, Set Creating a Business Plan Pocket Mentor) Ethnic relations in Malaysia