Idris-Aminu Kubura

14/sci05/007

1. Consequences of biofilms in a. Hospitals- biofilms harboring multi-antibiotic-resistant organisms are found at unexpected levels on dry hospital surfaces and could contribute to the risk of infection. b. Medical devices-biofilm formation on medical devices is a serious problem associated with deaths resulting from nosocomial (hospital acquired) infections. c. Nature-biofilms(matrix-enclosed microbial accretions that adhere to biological or non-biological surfaces) represent a significant and incompletely understood mode of growth for bacteria. Biofilm formation appears early in the fossil record (∼3.25 billion years ago) and is common throughout a diverse range. Recent advances show that biofilms are structurally complex, dynamic systems with attributes of both primordial multicellular organisms and multifaceted ecosystems. Biofilm formation represents a protected mode of growth that allows cells to survive in hostile environments and also disperse to colonize new niches. d. Industries-Growth of biofilms in food processing environments leads to an increased opportunity for microbial contamination of the processed product. This increases the risk of reduced shelf life and disease transmission. Microorganisms within biofilms are protected from disinfectants (Frank and Koffi 1990, McCarthy 1992, Ronner and Wong 1993), increasing the likelihood of survival and subsequent contamination of food. EPS associated with biofilms that is not removed by cleaning provides attachment sites and nutrients for microorganisms newly arrived to the cleaned system (Hood and Zottola 1997). Wong (1998) reported that undesirable microorganisms such as Lactobacillus curvatus and Lactobacillus fermentum persisted on milk residues in cheese processing plants even after repeated cleaning, subsequently contaminating products. Reduction in the efficiency of heat transfer (Mittelman 1998) can occur if biofilms become sufficiently thick at locations such as plate heat exchangers. Some microorganisms in biofilms catalyze chemical and biological reactions causing corrosion of metal in pipelines and tanks. Prevention of biofilm. 0. Low-level surface acoustic waves This technique uses low-energy waves produced from a battery powered device. The device delivers periodic rectangular pulses through an actuator holding a thin piezo plate. The waves spread to the surface, in this case a catheter, creating horizontal waves that prevent the adhesion of planktonic bacteria to surfaces. This technique has been tested on white rabbits and guinea pigs. The results showed a lowered biofilm growth. 0. Ozonation- Biofilms form as a way of survival for bacteria in aqueous situations. Ozone targets extracellular polysaccharides, a group of bacterial colonies on a surface, and cleaves them. The ozone cuts through the skeleton of the biofilm at a rapid pace thus dissolving it back to harmless microscopic fragments. Ozone is so effective because it is a very strong oxidant and it encounters biofilms in much larger concentrations than most disinfectants like chlorine. This technique has been employed mainly in the spa and pool industry as a way to purify water. 0. Water purification-when this technique was studied two purification methods were used to treat water. The first was a typical reverse osmosis technique used for pure water. The other was a double reverse osmosis technique with electric deionization which was continuously disinfected with UV light and disinfected weekly with ozone. The tubing it ran through was tested weekly for bacterial colonies. The highly purified water showed a sharp decrease in bacteria colony adherence. Water purification methods are being scrutinized here because it is in this state that contamination is thought to occur and biofilms are formed. 0. Surface modifications-Surface modifications have been a highly studied technique for biofilm prevention. Many methods have been tested and a variety of results have been recorded. These techniques have been the focus of many biomedical studies aiming to reduce harmful biofilm formation on medical devices, especially catheters. The following table is a quick summary of a few surface modification techniques that have been studied. 3. Analysing microbial biofilms-Microscopy and digital image analysis.Images were collected using a Bio-Rad Radiance 2000 MP confocal laser scanning microscope (Bio-Rad, Hemel Hempstead, United Kingdom) equipped with a red diode laser (638 nm), a He/Ne laser (543 nm), and an argon laser (457, 476, 488, and 514 nm). Images for quantification were collected, using a Nikon Plan Fluor 40×/1.40 oil objective and the bundled software LaserSharp 2000, as 8-bit/pixel greyscale or 24-bit/pixel RGB images of 512 by 512 pixels (resolution, 1.65 pixels/μm). A Kalman filter (n = 2) was applied for noise reduction during image recording.