Applied microbiology

Health & Medicine

Lecturer: Applied Microbiology Biofilm Formation Biofilms are made by community of bacteria that may form in surfaces of living tissues or physical surfaces under certain conditions. Biofilms form when bacteria attach to surfaces in damp conditions and excrete sticky substances with great adhesive force that anchors the bacteria to the surface of materials. Biofilms are readily formed by most known pathogens and consist of extracellular polysaccharide encased micro-colonies. Biofilms enclosure within the polymer matrix restricts the diffusion of antimicrobial through the diffusion barrier. The negative charge on the polysaccharide protects cells from the positively charged antimicrobial therefore restricting their permeability. The barrier prevents the antimicrobial from acting on the intended cells. The cells within the biofilms differ from planktonic cells metabolically and biochemically due to their increased expression of beneficial genes, phenotypic changes in the colony morphology and the in the production of extracellular polymers (Khan, p45). Examples include the streptococcus spp. in dental caries, the Fusobacterium in chronic wounds and the Fusobacterium nucleatum in periodontitis all which have proved their resistance to the action of antibacterial.

2.

PAH are products of incomplete combustion of materials like fossil fuels that are highly hydrophobic in nature and resistant to environmental degradation posing health risks. It is possible to breakdown PAH using the ability of microorganisms and to remediate contaminated soils. Degradation can be either biological or chemical. Biological process involves degradation by microorganisms, biodegradation and metabolism and factors like PH, moisture, temperature, oxygen and molecular weight get considered.

Chemical degradation involves altering the PAH nomenclature through chemical processes by the use of UV rays and reactions aimed at oxidation-reduction with factors such as sunlight exposure, PH level, and PAH structure in consideration. BTEX have highly soluble characteristics and are made up of contaminants that make up petroleum products. The solubility of the petroleum components makes it the predominant agent in ground water contamination. Bioremediation relies on biodegradation activity of soil microorganisms that involves the indigenous bacteria and fungi. Microorganisms break down organic components to water and carbon dioxide to help in the remediation. For the process to be successful, it is important to ensure that the contaminated materials get detoxified to prevent recontamination and to establish the effectiveness of the remediation. Several tests including the daphnia-based, algae and bacteria based will be used to check for reduced toxicity and a balanced PH (Kim, p26)

3.

Microbial control in both artificial and natural environments fundamentally makes use of environmental monitoring (Kim, p30). Controlled environments provide effective control measures. However, in natural environments with balanced nature, inundate release, or classical biocontrol is used. That involves introducing a natural agent of a target pathogen to give a long-term control. Strategy used in the natural environments includes the microbial control strategy that addresses the microbiological attributes and the impact of microorganisms. It involves identification of control measure, monitoring the process, interactions, and remediating in case of drift from standard control. In the artificial environment influenced by human upsets, bio-

pesticide approach is used. That involves applying a biocontrol agent when necessary or when required. The most effective strategy used, in this case, is the control strategy involving a planned set of controls usually derived from understanding current product and process to minimize the variability impact in case it occurs. It is aimed at consistency. Risk management strategy although not very effective can be used as well. The risk management strategy involves accessing the risks and employing the mitigation controls.

4.

Bioremediation of marine oil spill can be naturally cultivated or spurred by the addition of elements to increase stimulation. Bioremediation of the oil spill happens in situations where oil has moved to the subsurface. Exogenous microorganisms are used in bio-augmentation. These are genetically engineered microbes strains from an external source, usually used specifically to degrade targeted contaminants or specific waste compounds in the oil that may be more harmful. The indigenous microorganisms add oxygen and other inorganic nutrients to stimulate biodegradation of the contaminants and to mitigate the adversity of the oil. They are within the system. Both act to detoxify the oil components but the difference comes with the effectiveness.

The exogenous remediation is fixed and does not change in its action. The endogenous remediation uses the components of the spill to find a solution hence can be bio-medically effective (Salar, et al. p15).

Works Cited

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