# Unit One Biofilms: Microbial Life on Surfaces

A biofilm is an assemblage of microbial cells that is irreversibly associated (not removed by gentle rinsing) with a surface and enclosed in a matrix of primarily polysaccharide material. Noncellular materials such as mineral crystals, corrosion particles, clay or silt particles, or blood components, depending on the environment in which the biofilm has developed, may also be found in the biofilm matrix. Biofilm-associated organisms also differ from their planktonic (freely suspended) counterparts with respect to the genes that are transcribed. Biofilms have great importance for public health because of their role in certain infectious diseases and importance in a variety of device-related infections. Biofilms may form on a wide variety of surfaces, including living tissues, indwelling medical devices, industrial or potable water system piping, or natural aquatic systems. The water system biofilm is highly complex, containing corrosion products, clay material, fresh water diatoms, and filamentous bacteria. The biofilm on the medical device, on the other hand, appears to be composed of a single, coccoid organism and the associated extracellular polymeric substance (EPS) matrix. Research on microbial biofilms is proceeding on many fronts, with particular emphasis on elucidation of the genes specifically expressed by biofilm-associated organisms, evaluation of various control strategies (including medical devices treated with antimicrobial agents) for either preventing or remediating biofilm colonization of medical devices, and development of new methods for assessing the efficacy of these treatments. Research should also focus on the role of biofilms in antimicrobial resistance, biofilms as a reservoir for pathogenic organisms, and the role of biofilms in chronic diseases. The field of microbiology has come to accept the universality of the biofilm phenotype. Researchers in the fields of clinical, food and water, and environmental microbiology have begun to investigate microbiologic processes from a biofilm perspective. As the pharmaceutical and health-care industries embrace this approach, novel strategies for biofilm prevention and control will undoubtedly emerge. The key to success may hinge upon a more complete understanding of what makes the biofilm phenotype so different from the planktonic phenotype.

## Adapted from:

Donlan R. M. 2002. Biofilms: Microbial Life on Surfaces. Emerging Infectious Diseases. 8(9):881-890

## Comprehension:

- 1. Give a suitable definition to biofilm.
- 2. Propose an appropriate title to the text above.
- 3. Describe how biofilm could contribute to the development of antimicrobial resistance.
- 4. Give sentences with the same meaning to the following:

**B**iofilms have great importance for public health because of their role in certain infectious diseases and importance in a variety of device-related infections.

**I** The field of microbiology has come to accept the universality of the biofilm phenotype.

Definitions and Immunology presentation

Read the following definitions:

## Definitions

## Natural sciences

Natural science includes physics, chemistry, **biology** and other cross-disciplines. Mathematics, statistics, and computer science may not be regarded as natural sciences but they are essential tools and framework in natural sciences. *Word origin:* Middle English, from Old French, from Latin *nātūrālis*, from *nātūra*, nature; science.

## **Biological sciences**

Any of the branches of natural science dealing with living things, such as their structure, behavior, organization, life processes, as well as their interactions with each other and with the natural environment.

## What is immunology?

Immunology is the study of the immune system and is a very important branch of the medical and biological sciences. The immune system protects us from infection through various lines of defense. If the immune system is not functioning as it should, it can result in disease, such as autoimmunity, allergy and cancer. It is also now becoming clear that immune responses contribute to the development of many common disorders

You know what I love about Immunology?

It is violent when needed.. \*rawr\*



Immunology is the study of the immune system and is a very important branch of the medical and biological sciences. The immune system protects us from infection through various lines of defense. If the immune system is not functioning as it should, it can result in disease, such as autoimmunity, allergy and cancer. It is also now becoming clear that immune responses contribute to the development of many common disorders not traditionally viewed as immunologic, including metabolic, cardiovascular, and neurodegenerative conditions such as Alzheimer's.

# Why is immunology important?



Make peace, not war

From Edward Jenner's pioneering work in the 18th Century that would ultimately lead to vaccination in its modern form (an innovation that has likely saved more lives than any other medical advance), to the many scientific breakthroughs in the

19th and 20th centuries that would lead to, amongst other things, safe organ transplantation, the identification of blood groups, and the now ubiquitous use of monoclonal antibodies throughout science and healthcare, immunology has changed the face of modern medicine. Immunological research continues to extend horizons in our understanding of how to treat significant health issues, with ongoing research efforts in immunotherapy, autoimmune diseases, and vaccines for emerging pathogens, such as Ebola. Advancing our understanding of basic immunology is essential for clinical and commercial application and has facilitated the discovery of new diagnostics and treatments to manage a wide array of diseases. In addition to the above, coupled with advancing technology, immunological research has provided critically important research techniques and tools, such as flow cytometry and antibody technology.

## Exercise

At the highlight of the previous, write a small paragraph summarizing the importance of Immunology

## Paragraph: