Bacterial biofilm is a complex multicellular structure consisting of cells bound by a complex network of extracellular polymers including: proteins, polysaccharides (mainly cellulose), lipids and nucleic acids. The ability to form biofilm structures is a natural property of most bacteria and is much more common than the occurrence of bacteria in the form of single isolated cells, i.e. in the planktonic form. This is due to the numerous benefits of the functioning of bacteria in the biofilm, the most important of which are: increased resistance to aggressive environmental factors and increased resistance to nutrient deficiencies. The ability to form biofilms is also very common in pathogenic bacteria that often cause chronic and recurrent infections. In the case of pathogenic microorganisms, the ability to create a biofilm protects bacterial cells against the action of antibiotics and the host's immune system. Infections caused by biofilm-related bacteria require much more intensive treatment with multi-antibiotic therapies. As a consequence, resistance to the drugs used increases among bacteria. Therefore, new therapeutic strategies are needed to effectively combat pathogenic bacterial biofilm. For this purpose, it is necessary to understand the structure of the bacterial biofilm and the mechanism of its formation.

Urinary tract infections (UTIs) are among the most common in the human population. Annually, they affect 150 million people around the world, generating very high medical costs. Over 50% of women experience UTIs at least once in their lives, and 30% of them are recurrent infections. 80-90% of UTI cases are caused by uropathogenic *E. coli* strains (UPECs). Research shows that the biofilm formation capacity is demonstrated by over 60% of clinical UPEC isolates and is a very important virulence factor. One of the UPEC strains that has been researched since the 1980s is UPEC IH11128, which causes, among others, cystitis in children and pyelonephritis in pregnant women. A characteristic feature of this strain is the ability to produce Dr adhesive structures. Due to these structures, bacteria specifically recognize receptor proteins on the surface of the bladder epithelium and can cause urinary tract infections. Because of the biological role of the main receptor protein, its concentration is physiologically increased in pregnant women. This makes this group of persons particularly susceptible to infections caused by the UPEC strains that produce Dr fimbriae. The aim of this project is to understand the structure and mechanism of biofilm formation by the UPEC IH11128. It is planned to use advanced research methods, such as: immunofluorescence, confocal microscopy or mass spectrometry, in relation to the metabolome and proteome of bacteria. From a scientific point of view, it is particularly important to answer the question whether and how the ability to produce Dr fimbriae predisposes bacteria to form biofilm structure. Together with the results of previous studies, the data from the proposed project will allow the determination of a more complete model of the pathogenesis of UTIs caused by the UPEC IH11128. In the future, this model will allow for the rational design of new, effective drugs targeting uropathogenic strains of *E. coli*, which is so important in the era of rapidly growing antibiotic resistance observed in the bacterial world.

The duration of the project is planned for 4 years. Scientific teams from the Medical University of Gdańsk and the Gdańsk University of Technology will take part in the research. During the studies unique research equipment of both research units will be used. Students of doctoral schools from both universities will also participate in the research, which means that the project also has an important aspect related to the training of young scientists.