Infectious diseases are today the second cause of death in developed countries after cardiovascular diseases and the first in developing countries. Disease-causing microorganisms and viruses have plagued mankind since the dawn of time, and only recently, with the great progress of medicine and related sciences, including the invention of antibiotics in the twentieth century, we have begun to effectively defend against them. Effective antibacterial and antiviral agents significantly contributed to the extension of life and improved the comfort of life. However, the last two years have shown the whole world, that we do not yet completely control the problem of infectious diseases and there is much work to be done. Infectious agents are constantly changing and there is a constant need to look for new treatment and prevention options. It can be said that at present we have mastered the synthesis of effective antibacterial drugs quite well, while in the case of antiviral and antifungal medications we meet with much greater difficulties.

The therapeutic possibilities for fungal infections are limited. This is due to the small number of available drugs and numerous limitations related to their use (route of administration, toxicity, side effects, drug interactions, bioavailability). This is further complicated by fungal resistance to antimycotics, especially the presence of multi-drug-resistant species and strains.

The aim of this project is to test the antifungal properties of a new group of chemical compounds as potential preparations for the treatment of mycoses. These will be positively charged polymers, polycations, and in particular derivatives of β-glucans, which have recently been widely used in medicine. These sugars have proven beneficial effects on the immune and cardiovascular systems, but have not yet been studied after modification to give a positively charged macromolecules. This new group of structures may have very interesting and valuable biological properties.

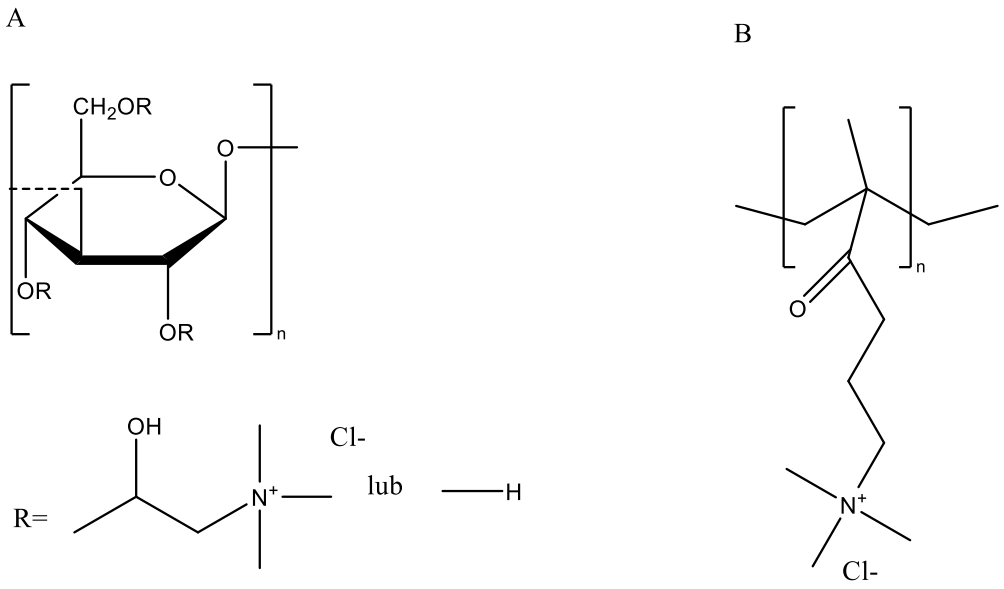

Figure 1. Two base structures studied in the project: left (A) representative of cationic β-glucans , right (B) synthetic polymer based on methacrylamido propyl trimethyl ammonium chloride (PMAPTAC).

The idea of an in-depth study of these compounds arose from our preliminary observations obtained in *in vitro* studies, which showed the antimycotic activity of the new polycations against some pathogenic fungi. This project will allow us not only to identify the most active antifungal chemical structures, but also to preliminarily assess their overall toxicity and the transformations they will undergo in the human body. The effect of the research, if successful, will be the development of a new group of drugs, another tool in the fight against fungal diseases. This will be possible mainly due to the establishment of an interdisciplinary team consisting of chemists, microbiologists, immunologists and biologists. In this way, within one project it will be possible to perform not only basic but also preclinical research of high value and importance for the pharmaceutical industry.

The last fact worth noting here is a new disturbing observation related to the Covid-19 pandemic indicating a greater susceptibility to fungal infections of the sick and the recovered, as well as the rest of the population subjected to draconian sanitary regimes,. This makes the development of new effective antifungal drugs a necessity so that the present pandemic will not be followed by another, this time associated with fungal diseases.