Evaluation of the potential of *Geum urbanum* in preventing dysbiosis and associated oral cavity pathogens growth.

The oral cavity is an excellent environment for the growth of microorganisms, and contains over 1,000 different species of bacteria. This diversity makes the human oral microbiota one of the most important microbial communities in the body. The imbalance of microbiota caused by different factors such as poor hygiene, inadequate diet, lifestyle, stress, or taken medicines can lead to hazardous dysbiosis that can cause local disorders and may be a significant factor in systemic illnesses.

Bacteria in the oral cavity create dynamic, three-dimensional communities where specific dependencies occur. These dependencies may be intra- or interspecific, symbiotic, or antagonistic. For this reason, eliminating pathogens from the oral cavity is complicated and needs a multidirectional approach. It should be noted that dysbiosis of human oral microbiota may also promote the growth of some pathogenic bacteria e.g. *Streptococcus mutans* and *Porphyromonas gingivalis*. Therefore, modern therapies should restore and maintain the balance of oral microbiota without killing oral microorganisms broadly. Because oral cavity health has a crucial impact on the whole body's condition, the search for effective methods is a serious public health challenge.

In recent years, increasing attention has been focused on natural products traditionally used in folk medicine. Compared to antibiotics, these products do not increase the risk of spreading multidrug resistance while still being safe, clinically effective, and available to a wide range of communities thanks to affordability. Although plant extracts are promising therapeutic agents in treating diseases with bacterial backgrounds, the exact mechanisms responsible for their beneficial properties remain not fully explained. Natural products contain a wide range of highly specialized compounds that may alter the composition of oral microbiota. At the same time, bacteria in the oral cavity can transform ingredients contained in the preparations. These described mutual relationships may have significant meaning for long-term effects and can play a key role in developing new strategies for treating and preventing oral bacterial diseases.

Geum urbanum L., commonly known as wood avens or St. Benedict's herb, is particularly interesting among natural products used in traditional medicine and has been used for centuries in European and Chinese traditions. Infusions and decoctions from the roots and rhizomes of *Geum urbanum* have been used in treating acute diarrhea, dysentery, indigestion, gastrointestinal tract disorders, inflammations of the mucosa and gums, and as an antimicrobial agent with broad-spectrum. Chewing roots were also recommended in periodontitis as a strengthening agent for gums and teeth. In addition, *Geum urbanum* is used as a flavoring agent for some liquors and beers, so it can be a functional food. Due to the variety of compounds contained in *Geum urbanum* and its proven antibacterial properties, it may be a promising agent in treating and preventing oral bacterial diseases.

The main aim of the submitted project is to justify the use of *Geum urbanum* aqueous extract in the prevention of oral microbiota dysbiosis and related growth of critical oral pathogens by verifying the general hypothesis that tannins contained in *Geum urbanum* beneficially influence microbiota diversity, inhibit *Streptococcus mutans*, and *Porphyromonas gingivalis* growth and stimulate the production of antimicrobial peptides by oral epithelial cells.

The verification of the stated hypotheses will develop the knowledge and give new information about the mechanisms of biological activity of *Geum urbanum*, its interaction with human oral microbiota, pathogens, and oral epithelium. It can have great significance in developing novel effective strategies in the therapy and prevention against the spread of pathogenic bacteria in the oral cavity and thus in the whole body originating from the reintroduction of historically used medicines.