Our project's aim is to study the chemical composition and biological activity of sea buckthorn seeds, and the effect of thermal processing on these parameters. We will determine if they have anticoagulant, anti-platelet, antioxidant, and anticancer properties. Moreover, we will check if they are safe to use and do not damage our healthy cells.

We have prepared extracts from regular and roasted seeds, which will be fractioned (to obtain parts of the extract with different chemical content). Individual chemical compounds will be isolated from the fractions. We will collect blood from healthy volunteers, add the preparations from sea buckthorn to the blood samples, and use various molecular biology methods to check if they have anticoagulant, anti-platelet (preventing blood platelet activation) or antioxidant activity, and if they damage healthy or cancer cells and their DNA. In our research, we will use full blood, plasma, blood platelets and lymphocytes isolated from full blood, and two commercial cancer cell lines.

Sea buckthorn is a tree or shrub with small, bright orange berries. It originated from sandy or mountainous areas of Europe and Asia, where it has been known for its medicinal properties for thousands of years. Nowadays, researchers have found many beneficial effects of sea buckthorn fruits, pulp oil, and seed oil, but far less is known about leaves, twigs, bark, and the seeds themselves. As seeds contain only 12-13% oil, there is still much to be discovered about their content and activity. Moreover, seeds are often seen as waste by the food industry and are discarded in the process of juice, jam, or oil production, even though they contain large amounts of beneficial compounds that could be extracted and reclaimed.

Patients suffering from cardiovascular diseases, like ischemic heart disease, often must take anti-clotting medications. Unfortunately, prolonged use of this type of drugs may cause side effects, like bleeding from the gastrointestinal tract. For this reason, researchers are still searching for new anti-clotting substances that could be used in pharmacotherapy. Our previous research and preliminary data suggest that sea buckthorn seeds might contain compounds with anticoagulant or antiplatelet properties, therefore we want to check if they are indeed present.

Oxidative stress is implicated in many diseases, like ischemic heart disease or cancer. Antioxidant properties of sea buckthorn seeds were already proven, but the effect of thermal processing on these properties hasn't been studied yet. Seeds, as a component of food, are often exposed to high temperatures. This can increase or decrease the strength of a particular biological effect. For this reason, thermal stability is an important factor to consider while studying plant-derived compounds. Our preliminary data showed, that high temperature does not impair antioxidant activity of sea buckthorn seeds.

There have been reports of anti-cancer activity of sea buckthorn seeds against breast cancer and melanoma, and various parts of sea buckthorn, including seed oil, have shown anti-tumor properties as well. We want to check their effect on two cell lines – lung cancer and leukemia. As thrombotic events are a common occurrence and a major risk factor in these types of cancer, examining sea buckthorn seeds' anticoagulation and antitumor activity might lead to the discovery of substances that can combat these two pathological conditions, improving the outcomes of cancer patients by acting on many levels at once.

If sea buckthorn seed extracts, fractions, or individual compounds have anticoagulant, antiplatelet, antioxidant, or anticancer properties, this project could become a base for further studies that could lead to the implementation of sea buckthorn seeds, or the compounds isolated from them as food additives, nutraceuticals, or pharmaceuticals that would be used in disease prevention or treatment.