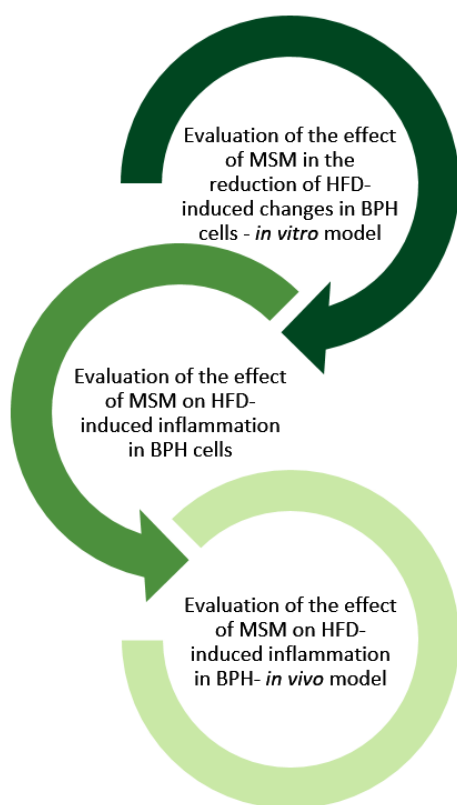


Sulfur is the fourth most common element in our body. It is necessary for the proper structure and functioning of our body: it is responsible for the condition of nails, hair and skin, and is part of enzymes. **Methylsulfonylmethane (MSM)**, known as organic sulfur, is an organic sulfur compound found in fresh fruit, vegetables, tea and cow's milk. Scientific research shows that organic sulfur has **anti-inflammatory properties** and reduces oxidative stress in the body. At the molecular level, it **regulates gene transcription and the production of pro-inflammatory cytokines**.

Benign prostatic hyperplasia (BPH) affects 50% of men older than 50 years and almost 90% of men in their eighth decade of life. Taking into consideration the elderying of the human population as well as the extending time of life, the incidence of this disease will be increasing in the next years. There are a few factors that might contribute to BPH. The most important are: changes in **hormonal balance, inflammation**, diet, lifestyle, obesity and metabolic syndromes. **Unfortunately, the detailed molecular mechanism of BPH is not known.** The most possible is the theory where a few factors contribute to BPH induction. Prostate is very sensitive to hormonal changes, especially androgens (testosterone, dihydrotestosterone, DHT). Although testosterone is usually responsible for prostate cells proliferation, the changing with age androgen: estrogen ratio plays a crucial role in BPH. Increased concentration of estrogens and prolactin causes increased concentration of DHT, which binds to androgen receptors (AR) and stimulates proliferation of prostate cells. **High-fat diet (HFD)**, a characteristic of the Western diet, is considered as one of the **risk factors** for not only metabolic diseases but also prostate diseases, including BPH. **HFD is reported to induce inflammation** in prostate stromal and epithelial cells, which in consequence might participate in BPH induction and progression. HFD seems to act as one of the most **frequent causative factor of civilizational diseases**.



Our previous research has shown that MSM induces apoptosis of prostate cancer cells as well as potential acts as a sensitizer of known cytostatic in cancer cells. Preliminary studies that we conducted confirmed our assumption that MSM may reduce migration and invasion of prostate cancer cells induced by inflammation. Hence, we speculate that **MSM may reduce the inflammation induced by the high-fat diet in BPH by regulating the proliferation and death of prostate cells**, and may also directly affect inflammation in cells.

To confirm our hypothesis, we will conduct a series of *in vitro* and *in vivo* experiments aimed at confirming our hypothesis as well as indicating the molecular mechanisms of MSM activity. Based on our previous experience and literature data, we assume that the PI3K / Akt / mTOR, MAPK and NFκB signal transduction pathways may be involved in the operation of MSM. Using selective chemical inhibitors and the CRISP / Cas9 gene silencing method, we will try to verify our hypothesis. In the last stage of the research, using the BPH mouse model, we will check whether MSM can affect the initiation of BPH.



If our research hypothesis is confirmed, the obtained results will not only significantly contribute to the study of the **molecular mechanisms of BPH**, but may constitute as an introduction to clinical studies on the potential **use of MSM in the alleviation of HFD-induced inflammation** in the pathogenesis and course of BPH.