

The influence of air pollution on the metabolic activity, chemical composition and proteins profile of silver birch (*Betula pendula* Roth) allergenic pollen

The presented project refers to the problem of the impact of air pollution on living organisms, especially trees producing allergenic proteins, which can provoke clinical symptoms of inhalant allergy in individuals sensitive to airborne allergens. Epidemiological studies indicate that the symptoms of pollen allergy prevail in people living in the polluted regions, then in the regions of potentially low pollutants contamination. Plants, especially growing in the polluted areas, are permanently exposed to the local imitation, so they are used as bioindicators of different airborne particles.

It is believed that the particles of particulate matter (fractions PM_{2.5} and PM₁₀) including metals (nickel Ni, cadmium Cd, arsenic As, lead Pb) and gaseous contaminants, like sulphur dioxide (SO₂), carbon oxide (CO), nitrogen dioxide (NO₂), ozone (O₃) may be transported on the surface of pollen and modify the morphological structure of exine and molecular structure of proteins. It can result in exacerbating of pollen allergenic potency and immunoreactivity, which is stated as a main factor responsible for the increase in pollen allergy up to 30% of population in Europe, since the 40ties of the 20th century.

The main aim of the study is to determine the relationship between the physiological condition of trees *B. pendula* during the pollen season, and the metabolic activity and chemical composition of pollen, especially its protein profile (including major allergen Bet v 1).

Analyses carried out in Kraków will be evaluated in relation to the plant material collected in the areas of low air pollution in the Malopolska region. The physiological condition of *B. pendula* specimens will be estimated and the analysis of the qualitative and quantitative proteins present in pollen *B. pendula* will be performed using electrophoretic separation methods and chromatography, and the concentration of allergen Bet v1 will be assessed by ELISA immunoassay.

Moreover the chemical composition of pollen will be investigated by FT-IR and/or the FT-Raman spectrometry and the metabolic activity of pollen will be determined by measuring the metabolic heat emission using isothermal calorimetry. The study will be performed to gain a new knowledge in different aspects: physiological, biochemical and molecular on pollen grains existing in the polluted environment.

The authors claimed, that the proposed project will determine the impact of air pollutants on: the physiological tree conditions, which can result in the disturbance of the chemical composition and the metabolic activity of pollen; the fractional content of *B. pendula* pollen proteins, with special attention to the main allergenic protein Bet v1 and the variability of pollen protein spectra in a regional scale, considering the level of air pollution. The obtained results should confirm that pollutants, especially suspended dust may be an additional elements of the inhalant exposure in people sensitive to pollen allergens in Kraków.

The obtained results will supplement relevant knowledge on the impact of anthropogenic air pollution on physico-chemical properties and allergenic features of *B. pendula* pollen and on the biology and physiology of trees in relation to the metabolic conditions of specimens growing in the highly polluted areas. The project including physiological, biochemical and immunological analyses is the complex approach to the estimation of the problem of the air urban pollution effect on the natural sources of the allergenic pollen and related medical risks.