SCIENTIFIC OBJECTIVE: Molybdenum (Mo) is one of the elements with considerable physiological significance as well as numerous applications in many branches of industry. The unique tribological properties of **molybdenum nanoparticles (MoS_2 Mo-NPs)**, resulting from its hexagonal crystal structure, make it widely used as a high-temperature lubricant, both in a dry, solid and liquid form. MoS_2 in a form of powder improves parameters and lifetime of motorcycle and car engines. It is also used as a semiconductor and catalyst in the fuel and petrochemical industries. Uncertainty related to the safety and assessment of exposure to Mo-NPs during their industrial production as well as during work in exposure to MoS_2 results from insufficient knowledge on the mechanism of toxicity of its nanoparticles (NPs). Limited studies on the toxicity of Mo-NPs focus mainly on *in vitro* studies. **The main objective of the project is the use of advanced, specialized analytical methodology allowing for determination of distribution, location and accumulation of Mo-NPs which are present in the working and living environment in tissues. To assess spatial distribution and quantification of Mo content in the nano- and micrometric form, the laser ablation technique combined with inductively coupled plasma mass spectrometry (LA-ICP-MS) will be used. SIGNIFICANCE OF THE PROJECT:** LA-ICP-MS is an analytical technique that has been dynamically developing in the last two decades and is increasingly used in various fields of science. Analytical applications consisting in using LA-ICP-MS have a great potential both in qualitative as well as quantitative analysis in assessment of distribution and concentration of trace elements in various materials. Microsampling allows for determination of distribution of selected elements material (distribution) on the surface of a solid sample (mapping) and measurement of the distribution of elements in the subsurface layers (an analysis into the material under investigation). It is successfully used for marking, inter alia, trace elements and toxic metals in biomedical samples, including clinical ones. Understanding complex biological processes at the tissue level requires appropriate analytical tools with a spatial resolution of the order of nanometers, and such requirements are met by the LA-ICP-MS technique. The research project will complement studies on the evaluation of potential toxic short- and long-term effects of MoS_2 on the respiratory tract and its tissue distribution. Tissue sections will be used to assess distribution, location and concentrations of both Mo forms using the LA-ICP-MS technique as a complementary toxicity assessment tool. The results of the LA-ICP-MS will enable visualization of the structure of the analyzed tissue as an important tool for assessing potential harmful effect being a result of Mo-NPs exposure. So far, no studies on the analysis of spatial distribution of both Mo forms in soft tissues of experimental animals exposed to MoS_2 have been carried out. The use of element-specific bioimaging technique allow us for evaluation of NPs distribution in individual organs based on their distribution in histological preparations, thus, extending knowledge on the activity of nano. Information on the spatial distribution of both toxic as well as vital elements in the tissues enables to get to know and understand processes occurring in the body. We assume that comparison of the local variation in Mo concentration in both forms in the analyzed individual internal organs may constitute an additional, very important element of the potential harmful effects assessment. There are few studies using laser bioimaging techniques that can be very helpful in assessing distribution and concentration of NPs in tissues as an important tool in assessing toxicity. Taking into consideration complexity and multidirectional nature of factors determining toxicity of NPs, biological studies should be carried out in many directions. The results of our study presented at the end of the research project in an IF scientific journal, in the future may constitute a valuable source of knowledge necessary for researchers involved in biomedical studies. The undertaken project has cognitive significance. **PLAN AND METHODOLOGY OF THE STUDIES:** Bioimaging will be carried out by the use of tissues collected from Wistar rats (aged 6-8 weeks and weighing 80-120g) exposed to MoS_2 and Mo in an ionic form as part of the MoS_2 toxicity assessment project. In order to analyze distribution of molybdenum in the selected tissue sections (liver, kidney, brain, lung, spleen), the rats were given a suspension of molybdenum in a nano and micrometer form, at a dose of 1.5. and 5 mg Mo / kg for each form to the trachea once and seven times with 14-day intervals. The studies in the proposed project will be carried out in the following detailed stages: preparation of histological slides; optimization of instrumental parameters of the LA-ICP-MS system; the use of solid standards (NIST 610, NIST 612, NIST 614) for determination of Mo; validation of the analytical method, statistical calculations; development of the calibration stage of a direct soft tissue analysis; elaboration of analytical procedures for the determination of elements in soft tissues collected from the study animals and controls; presentation of the obtained results in a form of maps of the content and distribution of the analyzed elements. The limited number of studies, especially those *in vitro* ones, associated with the assessment of the effect of Mo-NPs does not allow for a precise risk assessment of health effects of exposure to Mo-NPs. Therefore, assessment of distribution as well as a quantitative determination of Mo content in tissue sections of the exposed animals may have important implications in the field of assessing potential toxicity of Mo-NPs.