	GL leader	**Prof. Jiří Fajkus, PhD**
1	**CEIPEX RESEARCH TOPIC LEVEL2**	**Genomics & Proteomics of Plant Systems: stress in plant system**
2	**RESEARCH GROUP**	Chromatin Molecular Complexes
3	**TOPICS/FOCUS**	**Environmental "double trouble": Elucidating plant molecular responses to heavy metal and PFAS co-contamination**
4	**SUMMARY**	As sessile organisms, plants face continuous exposure to environmental pollutants that are readily absorbed from soil and water, harming plant health and posing health risks to livestock and humans through bioaccumulation in edible plant parts. It is estimated that approximately 14 to 17% of farmland globally exceeds safe agricultural thresholds for at least one heavy metal (HM), exposing over a billion people living in those regions to the consequences of HM pollution (*1*). However, heavy metal pollution is not the only concern for farmland. Per- and polyfluoroalkyl substances (PFAS)—man-made organic compounds with broad industrial applications—are persistent pollutants with long half-lifes, strong bioaccumulative properties, long-range transport potential, and known adverse effects on biota (*2*–*4*). Although some PFAS, such as perfluorooctanoic acid (PFOA), are being phased out, replacement PFAS compounds, like GenX, exhibit similarly concerning adverse effects (*5*, *6*). These two types of contaminants likely co-occur, especially in industrialized areas. Therefore, understanding their combined effects is essential for crop improvement to reduce PFAS uptake and its transport to edible parts in co-contaminated environments with HMs. The project will investigate molecular responses of plants to co-contamination with cadmium (Cd) and selected PFAS compounds. Using *Arabidopsis thaliana* and *Oryza sativa*, plants will be grown under environmentally relevant concentrations of these contaminants on agar plates and in hydroponic systems. A wide range of methods will be employed: transcriptome profiling, biochemical assays, photosynthetic performance metrics, phenotypic analysis, ionomics, as well as spatially resolved spectroscopy techniques such as laser ablation-inductively coupled plasma-mass spectrometry (LA-ICP-MS) and laser-induced breakdown spectroscopy (LIBS). These approaches will enable investigation of PFAS and Cd uptake, translocation under co-contamination, and their effects on nutrient composition. Integrating transcriptomic and ionomic data through systems biology approaches will allow identification of candidate genes involved in pollutant transport and stress response for downstream functional validation. Analysing phylogenetically distant species is expected to reveal conserved

		mechanisms, potentially transferable to other plants, while species-specific effects may apply to closely related crops. This study is expected to provide novel insights into the mechanisms of PFAS translocation in plants and their interactions with heavy metals, offering targets for crop improvement in contaminated environments.
5	**RG WEBPAGE/CONTACT**	https://www.ceitec.eu/chromatin-molecular-complexes/rg51