Studying the long-term effects of the nuclear Chernobyl accident on a radiosensitive plant, *Pinus sylvestris*

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Following the nuclear accidents in the Chernobyl (1986) and Fukushima Dai-Ichi (2011) nuclear power plants, vast areas of land were contaminated with radionuclides, leading to a long-term exposure of the environment to enhanced levels of ionizing radiation. In the forests near the Chernobyl reactor, some of the Scots pine trees (*Pinus sylvestris*) that received a sub-lethal dose of radiation began to portray morphological changes resembling those seen when a plant loses its apical dominance, i.e. growth of the pine trees from two or more emerging branches instead of growing along a single primary trunk as usual. Similar abnormal growth patters were recently observed in young Japanese red pine (*Pinus densiflora*) in the Fukushima Exclusion Zone. The mechanisms behind the radiation-induced morphological abnormalities in these plants has up to date not been elucidated. However, it is known that plant hormones, specifically cytokinins and auxins, play important roles in cell division and cell differentiation during growth of the plant apex, thereby dictating the plant's growth habit. More recently, a strong correlation has been observed between auxin accumulation and DNA methylation. There is also evidence that radiation can induce changes to DNA methylation in plants. In light of these findings, we suggest that radiation leads to a disturbed hormone balance or transport which in turn leads to morphological changes in *Pinus sylvestris*. It is also proposed that changes to DNA methylation may lie at the basis of the disturbance of the plant hormone metabolism.

In collaboration with the Belgian Nuclear Research Centre, these hypotheses will be investigated by providing answers to the following research question:

1. To what extent do the hormone balances contribute to the changed phenotype observed in *P. sylvestris* after exposure to ionizing radiation?

2. How do the proteome and the transcriptome of *P. sylvestris* respond after exposure to ionizing radiation

3. Do changes in DNA methylation or in the activity of transposable elements contribute to the observed responses in *P. sylvestris*?

Taken together, the findings obtained during this running project can shed light on the abnormal growth patterns seen in irradiated pine trees, thereby giving fundamental insight on the effects of radiation on plant growth. In frame of the MP project, one of these three research questions will be tackled.