***Arabidopsis thaliana* Poly(ADP-ribose) polymerases** **ADP-ribosylate DNA oligonucleotides**

Aigerim Kuanbay1, Sabira Taipakova1, Izat Smekenov1, Murat K. Saparbaev 2, Alexander A. Ishchenko2, Amangeldy K. Bissenbaev1

*1SRI problems of Biology and biotecnology, al-Farabi Kazakh National University, 530038, Almaty, Kazakhstan.*

*2Group "DNA Repair", CNRS UMR8200, , Gustave Roussy Cancer Campus, F-94805 Villejuif Cedex, France.*

The *Arabidopsis thaliana* genome contains three known genes encoding PARPs (AtPARP1-3). Both AtPARP1 and AtPARP2 localize to the nucleus and in the presence of damaged DNA transfer ADP-ribose moieties from NAD+ to themselves (automodification) and to acceptor proteins *in vitro* and *in vivo.*

Here, we report that PARP1 and PARP2 proteins from Arabidopsis can directly ADP-ribosylate DNA oligonucleotides. AtPARP1 preferentially catalyzes covalent attachment of ADP-ribose units to the ends of recessed DNA duplexes containing 5’- phosphate and also to 5’-phosphate of a single stranded oligonucleotide as compared to nicked/gapped DNA duplexes. Similar to mouse PARP2, AtPARP2 prefers gapped and nicked duplexes as compared to a recessed DNA and preferentially PARylates the 5’-phosphorylated recessed strand in the nicked or gapped DNA duplexes with a 5’-phosphate residue located at the double-strand termini. Importantly, AtPARP2 has higher DNA-ADP-ribosylation activity as compared to AtPARP1, but forms shorter chains containing up to 20 ADP-ribose units. Characterization of the nature of the PAR-DNA adducts by MALDI-TOF mass spectrometry analysis confirm formation ADP-ribosylated DNA adducts.

In conclusion, our *in vitro* data suggest that plant PARPs utilize DNA termini as an alternative to protein acceptor residues to catalyze PAR chain.