NANOCARRIER-CARGO TECHNOLOGY FOR ENGINEERING NUCLEUS AND ORGANELLE GENOMES

François Eudes
Agriculture and Agri-Food Canada, Lethbridge Research Centre, P.O. Box 3000, Lethbridge, AB T1J 4B1, Canada
E-mail: francois.eudes@agr.gc.ca

Abstract: Short peptides with property to translocate across cell barriers and target specifically subcellular localizations have been discovered. These peptides also form hydrogen bounds with cargo molecules such as nucleic acid and protein, and transport them specifically to one of three subcellular destinations: the nucleus, the chloroplast and the mitochondria. Three distinct classes of nanocarrier can be described based on the charge and hydrophilicity of their peptide sequences. Complementary to the nanocarrier, the cargo can be designed using nucleic acid and proteins, forming blocks that conjugate in a relatively predictable manner. cargo translocations across the plasma membrane have been studied in wheat, triticale, and canola microspores. ssDNA binding proteins such as RecA, Rad51, SSB and VirD2 were used to form cargoes with properties to either increase the integrity of stable integration of donor ssDNA or target site specific integration in the haploid plant genome of microspore. The distinct ability of these short peptides to deliver functional macromolecules specifically in one of the three organelles has led to development of a novel nanocarrier-mediated gene and protein delivery methods in microspores. Nanocarrier mediated transfection in plant microspore opens new possibilities for precision genetic engineering of the three organelles of plant, specifically genome editing.