Novel mechanism revealed for increasing recombinant protein yield in tobacco

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Elastin-like polypeptides (ELPs) cause plants to store GM proteins in special 'protein bodies', insulating them from normal cellular degradation processes and increasing the overall protein yield. Researchers writing in the open access journal *BMC Biology* have visualised the mechanism by which the synthetic biopolymer increases the accumulation of recombinant proteins.

Rima Menassa worked with a team of researchers from Agriculture and Agri-Food Canada in London, Ontario, to develop and test the ELP tags by targeting an ELP-green fluorescent protein (GFP) fusion to various organelles in the leaves of the tobacco plant. Tobacco is well-suited as a production system for recombinant proteins but the mechanism by which ELP fusions increase production yields in transgenic tobacco leaves was previously unknown. Menassa said, "ELP was shown to almost double the yield of GFP to 11% of total soluble protein when hyperexpressed in the endoplasmic reticulum (ER)".

Based on their confocal and electron microscopy analyses, the researchers suggest that ELP fusions targeted to the ER induce the formation of novel mobile protein body-like structures in leaves, which appear similar in size and morphology to the prolamin-based protein bodies naturally found in plant seeds. These bodies may be responsible for ELP's positive effect on recombinant protein accumulation by excluding the heterologous protein from normal physiological turnover.

The researchers targeted their ELP fusions to the cytoplasm,

chloroplasts, apoplast and ER in Nicotiana benthamiana tobacco plants. They found that the ER was the only intracellular compartment in which the ELP significantly enhanced recombinant protein accumulation. They conclude, "An ER-targeted ELP fusion approach provides an effective strategy for depositing large amounts of concentrated heterologous protein within the limited space of the cell".

More information: Induction of protein body formation in plant leaves by elastin-like polypeptide fusions; Andrew J Conley, Jussi J Joensuu, Rima Menassa and Jim E Brandle; *BMC Biology* (in press); www.biomedcentral.com/bmcbiol/

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