

Project in plant biotechnology

Master thesis or Advanced course

Div. of Pure and applied biochemistry

Cellular localization of plant hemoglobins *in vivo*

Hemoglobins (Hb) are usually associated with blood in humans. However, these proteins are widely distributed among living organisms. In plants the most known group are the leghemoglobins. Still, other Hbs that do not participate in symbiosis are also found. They are known as nonsymbiotic Hbs (nsHbs).

Three nsHbs were found in sugar beet. One of them, BvHb1.1 carries information to be translocated into chloroplasts. The gene of this Hb has a long N-terminal region that has been identified as a chloroplast transit peptide (cTP) (Leiva Eriksson, 2014). This means that BvHb1.1 is synthesized as a precursor protein that is later transported to the chloroplast where this extension is cleaved. This finding is of particular importance since chloroplasts are the major site of heme biosynthesis in higher plant cells (Cornah et al. 2002).

In this project we aim to determine the localization of Hbs in plant cells that are transiently transformed with BvHb1.1 fused to green fluorescent protein (GFP) using confocal microscopy. The methodologies included are gene cloning, expression in bacteria, plant transformation and expression, and cellular localization analysis. The project is carried out in collaboration with the group of Dr. Ulrike Bechtold from the University of Essex (School of Biological Sciences) in UK. So, the student will spend some time working there in UK.

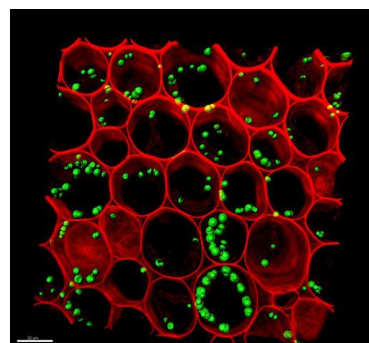
The candidate student should preferably be at a bachelor level, with a background in biotechnology/biochemistry. The candidate is expected to have finished courses in biochemistry, gene technology, protein engineering, or other equivalent courses.

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References

Cornah, J.E., Roper, J.M., Pal Singh, D. and Smith, A.G. (2002) Measurement of ferrochelatase activity using a novel assay suggests that plastids are the major site of haem biosynthesis in both photosynthetic and non-photosynthetic cells of pea (*Pisum sativum* L.). *Biochem. J.* 362: 423–432.

Leiva-Eriksson N., Pin P., Kraft T., Dohm J., Minoche A., Himmelbauer H., Bülow L. Differential Expression Patterns of Non-Symbiotic Hemoglobins in Sugar Beet (*Beta vulgaris* ssp. *vulgaris*). *Plant and Cell Physiol*, Volume 55, Issue 4, 1 April 2014, Pages 834–844, DOI: doi.org/10.1093/pcp/pcu027.



Rendered 3D projection of a confocal z-series taken of rhizome. The green objects represent reconstructed chloroplasts; cell walls are shown in red.

<http://www.cellimagelibrary.org/images/40405>