

# Séminaire de Biologie des Plantes

Les séminaires ont lieu sur le Campus Montpellier SupAgro/INRA de La Gaillarde (2, place P. Viala Montpellier)

Contact UMR B&PMP :

Sabine Zimmermann (zimmerma@supagro.inra.fr)

Marc Lepetit (lepetit@supagro.inra.fr.inra.fr)

Corinne Dasen (dasen@supagro.inra.fr)

Chantal Baracco (baracco@supagro.inra.fr)

**Lundi 16 mars 2009**  
**Amphi 208 (Cœur d'Ecole) à 14 h00**

**Sam Zeeman**  
(ETH Zurich)

## **What plants do in the dark: new insights into the metabolism of transitory starch in *Arabidopsis* leaves**

Starch is a primary product of photosynthesis in leaves. In most plants, a large fraction of the photo-assimilated carbon is stored transiently in chloroplasts as starch for use during the subsequent night. Starch is composed primarily of branched glucans (amylopectin) with an architecture that allows the formation of insoluble, semi-crystalline granules. Functional genomic studies in *Arabidopsis* and other species have greatly advanced our understanding of leaf starch breakdown. Our data suggest that starch is hydrolysed to maltose and glucose via a pathway that requires recently-discovered proteins in addition to well-known glucan hydrolases (amylases). Discoveries made in the last decade show that transient glucan phosphorylation is required for starch degradation. Amylopectin is phosphorylated by a class of glucan dikinases. The phosphate groups probably serve to disrupt the semi-crystalline packing of the granule and thereby facilitate hydrolysis. Multiple isoforms of beta-amylase and debranching enzyme (isoamylase and limit dextrinase) then act in concert with disproportionating enzyme to degrade the granule and oligosaccharide intermediates yielding predominantly maltose and some glucose. Simultaneous dephosphorylation of the partially degraded glucans to remove the phosphate groups added by the dikinases is also required for complete breakdown. Surprisingly, some well characterised enzymes such as alpha-amylase (important in cereal seed germination) and alpha-glucan phosphorylase (important in animal glycogen metabolism) appear to have only minor or specialised roles. Maltose and glucose are exported from the chloroplast on distinct transporters and metabolised in the cytosol to support sucrose synthesis, respiration and growth.

CONTACT :

Bertrand MULLER

Equipe SPIC

Laboratoire d'Ecophysiologie des Plantes sous Stress Environnementaux (LEPSE),  
(IBIP, bât 7)

2, place Viala, 34060 Montpellier cedex 1 France

<http://www1.montpellier.inra.fr/ibip/lepse/equipes/spic.htm>

[muller@supagro.inra.fr](mailto:muller@supagro.inra.fr)

tel 33 (0)4 99 61 29 58

fax 33 (0)4 67 52 21 16

SEMINAIRES A VENIR :

Jeudi 2 avril : Marjolaine Baldot, GATC Biotech: Nouvelles technologies de séquençage (454, Solexa), (contact : Benoît Lacombe, [lacombeb@supagro.inra.fr](mailto:lacombeb@supagro.inra.fr))