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#### New insights into Nod factor biosynthesis through CO and LCO analyses

N itrogen fixation results from a successful and complex interaction between bacteria (*rhizobia*) and a family of crops (legumes). This process is an endosymbiosis as the bacteria invade the root hairs and dedicated root organs: the nodules. One crucial signal to start this interaction is a family of lipochito oligosaccharides (LCO) called Nod factors (1). The variety of the backbone decorations and the length of the fatty chain are keys to the specific recognition of the host. The plant recognizes one precise design, allowing protecting itself from the invasion of pathogens. Their structure has been studied in detail in recent decades and encoding genes (almost located on a plasmid (pSym)) have been determined (2). However, the time-course of their biosynthesis is a recent discovery (2016). This could only be achieved by combining site-directed mutagenesis on a *rhizobium* model (here Sinorhizobium sp. IRBG) with highly specific and sensitive LC/MSMS analyses (MRM, EPI and EMS) of LCOs and COs. The last are chitooligomers without lipid chain, which are synthesis intermediates that could be analyzed in parallel to the Nod factors (3). These advances in analytical techniques provided a new point of view on the biosynthesis of LCOs. Actually, even if some decoration genes are in the same locus than the one encoding the skeleton and even some other genes encoding for sugar moieties are located in distant loci, le sugar backbone is synthesized completely first and decorated later.



#### **Recent Publications**

- 1. D'Haeze W, Holsters M (2002). Nod factor structures, responses, and perception during initiation of noduledevelopment. Glycobiology.12:79R-105R.
- 2. Poinsot V, Crook MB, Erdn S, Maillet F, Bascaules A, Ané JM (2016) New insights into Nod factor biosynthesis: Analyses of chitooligomers and lipo-chitooligomers of *Rhizobium* sp. IRBG74 mutants. Carbohydrate Research. 434:83-93.
- 3. Poinsot V, Couderc F (2017) Formation of Lipochitin Oligosaccharide Signaling Molecules. In "Handbook of Hydrocarbon and Lipid Microbiology Series. Biogenesis of Fatty Acids, Lipids and Membranes" (Ed. O. Geiger), Springer, pp.64-71.

#### Biography

Dr Verena Hauke-Poinsot is a Research Director of the CNRS (National Scientific Research Center). She published over 60 rank-A papers, based on separation techniques hyphenated with mass spectrometry for the structural elucidation of biological active compounds. Recruted in 1997 by the CNRS in Toulouse, she became within ten years a world expert of the LCO analyses. From 2012-2017, she was involved in a big project financed by the Bill and Melinda Gates foundation (ENSA: Engineering the Sym pathway of cereals for recognition of nitrogen fixing bacteria). She is one of the discoverers of the Myc factors keys for the mycorrhization (Nature paper in 2011).

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