# MYCOREMED

## Arbuscular mycorrhizae and radiocaesium uptake by plants

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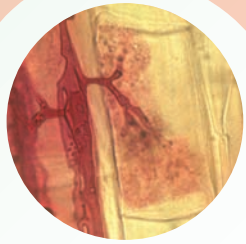

## Aims of the EU MYCOREMED Project

- To identify genes encoding transport proteins catalysing radiocaesium (Cs) uptake by mycorrhizal roots and Cs translocation from roots to shoots in *Medicago*
- To assay the expression of genes encoding K/Cs transporters in mycorrhizal and nonmycorrhizal plants in the presence and absence of Cs
- To determine the impact of specific K/Cs transporters on Cs uptake by mycorrhizal roots and Cs translocation from roots to shoots

## Radiocaesium Isotopes:

- arise from human activities (nuclear weapons; nuclear power)
- have long half lives ($^{134}$Cs = 2y, $^{137}$Cs = 30y)
- emit harmful β and γ radiation during decay
- contaminate land worldwide
- are rapidly incorporated into biological systems
- enter the food chain through vegetation

## Radiocaesium uptake by mycorrhizal roots

Plants acquire Cs from the soil solution, either directly or indirectly via arbuscular mycorrhizal (AM) fungi. Proteins facilitate the uptake of Cs across the plasma membrane of root cells (Figure 1). Caesium follows a symplastic pathway across roots to the stele, where proteins catalyse Cs loading into the xylem. AM fungi influence Cs accumulation by plants (Declerck et al., 2003). Therefore, it is important to investigate the mechanisms for Cs uptake to evaluate the radioecological significance of AM fungi on the accumulation of Cs in plants.

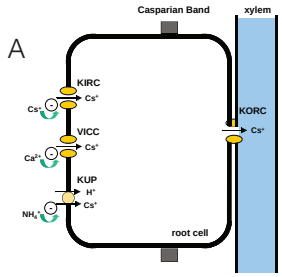


Figure 1: (A) The inward-rectifying K (KIR), outward-rectifying K (KOR) and voltage-insensitive cation (VIC) channels are all permeable to Cs and high-affinity K/H symporters (KUP) also transport Cs. (B) VIC channels mediate most of the Cs uptake and KUPs contribute the remainder. KORCs may mediate Cs loading into the xylem (White & Broadley, 2000).

## Methods

An *in vitro* system is used to grow *Medicago truncatula* in symbiosis with *Glomus intraradices* (Figure 2). This system was developed by Dupré de Boulois et al. (2006). The organisms will be grown on media with and without Cs to investigate the influence of AM fungi on Cs uptake by plants. Gene expression will be determined using the Affymetrix GeneChip® Medicago Genome Array and interesting changes in gene expression will be verified by using quantitative PCR techniques. The functional significance of these changes will be determined through pharmacological and transgenic approaches.

Figure 2: Photograph of the Arbuscular Mycorrhizal-Plant *in vitro* culture system (Dupré de Boulois et al., 2006).

References:
Declerck S *et al*., 2003. *Environmental Microbiology* 5, 510-516
Dupré de Boulois H et al., 2006. *Environmental Microbiology* 8, 1926-1934
White PJ & Broadley MR, 2000. *New Phytologist* 147, 241-256

Acknowledgement
This research project has been supported by a Marie Curie Early stage Research Training Fellowship of the European Community's Sixth framework Programme under contract number MEST-CT-2005-020387.

MYCOREMED project: http://emma.agro.ucl.ac.be/cesamm/projects/index.php