

Pentose transporters – increasing C5 (arabinose and xylose) transport

Market Sectors: Chemical, Oil, Agriculture, Bio-Fuel

Type of Opportunity: Licensing

Researchers from Leiden and Utrecht University have identified specific L-arabinose and D-xylose transporters from *Aspergillus niger*. Such transporters are able to increase pentose uptake in micro-organisms for increased fermentation, protein production, or bio-ethanol production.

Today utilization of crude carbon sources (mainly plant biomass) is receiving an increasing interest from industry, both for established fermentations, as well as for novel products such as bio-ethanol. These carbon sources not only contain hexoses that can efficiently be fermented by *Saccharomyces cerevisiae* but also other compounds, in particular pentoses (L-arabinose and D-xylose), which can not be fermented by classical *S. cerevisiae* strains.

Although modified *S. cerevisiae* strains which are capable of growth on and fermentation of D-xylose have been designed, the growth rate is still poor. Development of improved yeast strains is strongly pushed by the emphasis on pentose to ethanol fermentations for biofuel production. In addition, better utilization of pentoses by other industrial fungi such as *Aspergillus* and *Trichoderma* is likely to improve fermentations on crude substrates, widening the possible applications of host with modified pentose transport.

Eukaryotic transporters which are able to transport D-xylose typically have a higher specificity for D-glucose than for D-xylose. Until today, no eukaryotic L-arabinose transporters have been identified.



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Recently, researchers in Leiden and Utrecht University have been able to identify specific L-arabinose and D-xylose transporters from *Aspergillus niger*. Such transporters may be used to increase pentose uptake in fungi such as *S. cerevisiae* for improved fermentation, protein production, and production of bio-ethanol from plants. The advantage of this new discovery is that expressing heterologous pentose transporters would result in strains in which both hexoses and pentose sugars (e.g. D-glucose and D-xylose) are utilized simultaneously, allowing for a more efficient use of raw biomass, improved growth and fermentation, and increased yields.

Stage of development

- Genes coding for broad spectrum pentose transporters have been identified, cloned, and expressed.
- Substrate specificity studies have been conducted.
- Patent applications have been filed.

Key Benefits

- Increased pentose uptake in fungi and yeast.
- High growth rates by utilizing simultaneously two or more sugars.

Applications

- Homologous – modification of pentose uptake/ utilization in *A. niger* by disruption or overexpression
- Heterologous – increased pentose uptake in other fungi and yeast, such as *S. cerevisiae* to improve pentose utilization for biofuel production and other applications.

Opportunities

Evaluation licenses including delivery of materials are available to test the transporters in your production strains. Exclusive licensing opportunities may be negotiated to use the technology in the field or territory of interest. Alternatively, partnering opportunities may be discussed in which you get to collaborate with academic experts in this field including an option to license the technology for your purposes.

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