Company presentation

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Enzymes and carbohydrate ingredients for a healthy nutrition

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BD-Manager

evoxx technologies GmbH

Agenda

- **Evoxx technologies GmbH**
  - History, overview, skills and technologies
- **The Alternansucrase Platform**
  - One enzyme – two healthy products
- **Evoxx´s functional carbohydrate ingredients**
  - Maltose-Alternan-Oligosaccharide (MAOS)
  - Alternan (Food & non-Food)

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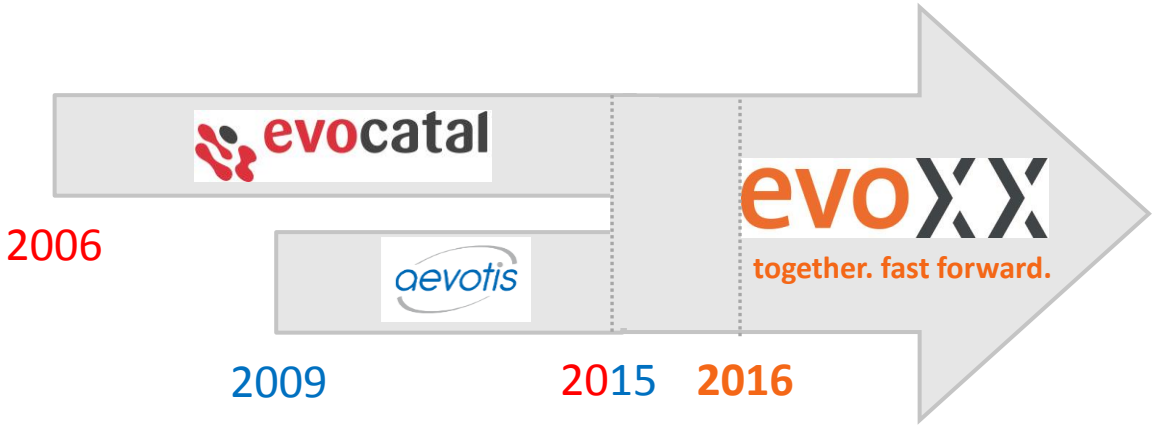
History



“Enzymes & carbohydrate ingredients for a healthy nutrition”

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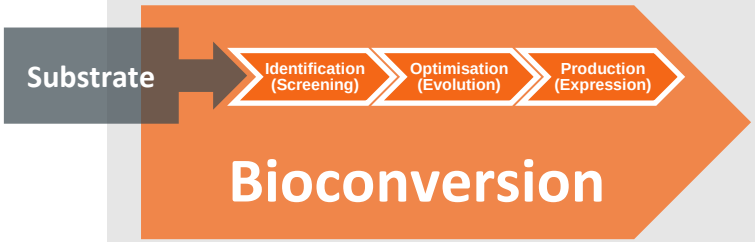
Overview

evoxx technology platform

Unique and strong IP protection



evoxx products

evoxx focus

Healthy nutrition

- Development of unique, proprietary enzymes and ingredients which allow differentiated consumer products.
- Support of customers on their way from early concept to marketable stage including deregulation and production.

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Two Sites – Two Competence (Enzymes & Carbohydrates)

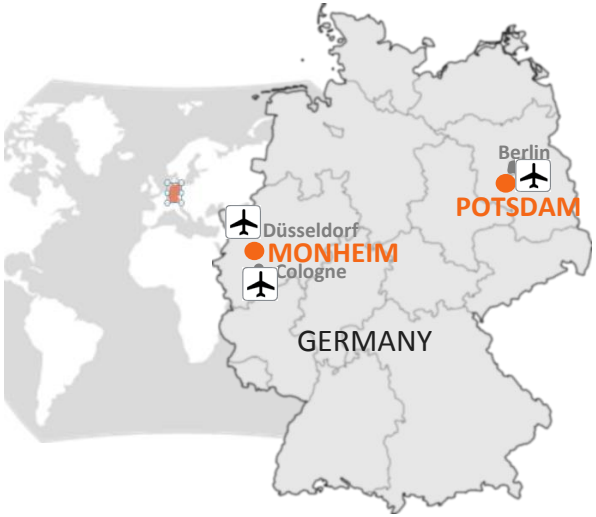
Carbohydrate-Team (Potsdam)

Enzyme-Team (Monheim)

evoxx technologies GmbH, a German Industrial Biotech Company

› Carbohydrate-Team (Potsdam): >800 sqm R&D labs, Pilot Production, Carb.-Analytics

› Enzyme-Team (Monheim): >1,000 sqm R&D labs, Pilot Enzyme Production



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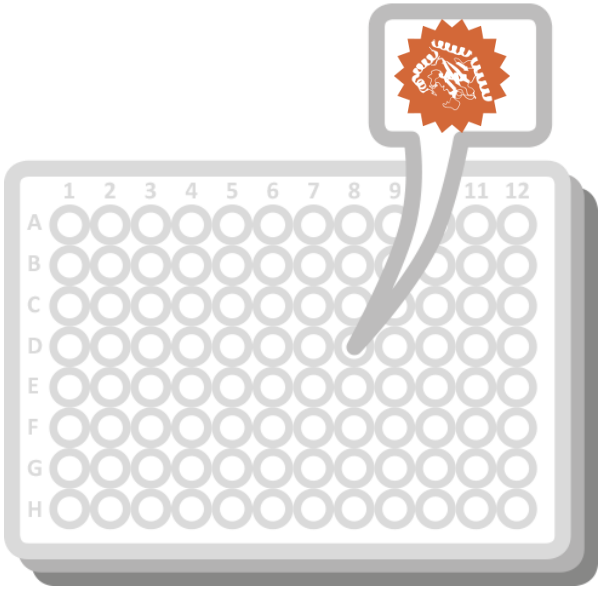
Industrial evozymes



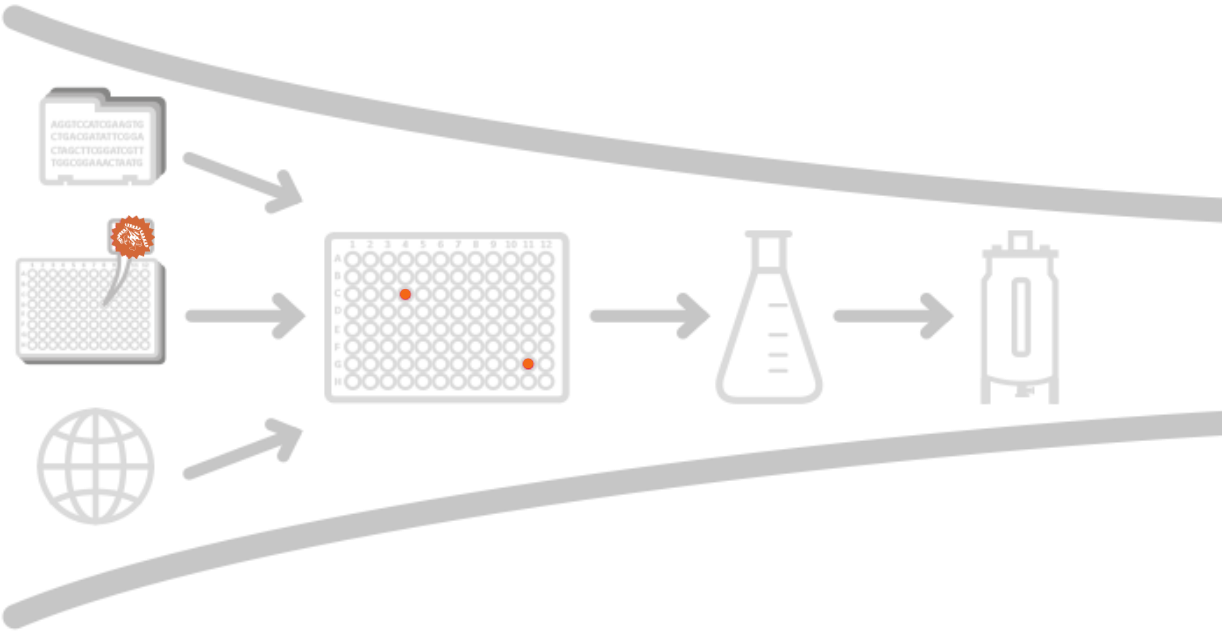
- Alcohol dehydrogenases (kit), transaminases (kit), lipases, esterases
- Oxidases, nitrilases, nitrile hydratases, hydroxy nitrile lyases
- Sulfotransferases, laccases
- Xylanases, epimerases, sucrases

> **550 enzymes** available & still growing…

Tailor-made enzymes that fit customer needs….

The evoxx process:

- Proprietary enzyme-sequences
- Directed enzyme-evolution
- Expression-toolbox
- Proprietary production strains
- Metagenomic libraries



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Metagenome – proprietary source of novel enzymes

Metagenome-Habitates

Industry
(biogas plant, slaughter-house waste, waste water treatment)

River sediments

Animal intestinal flora
(Horse, cow, elephant, termites, earthworm, common ship worm)

Extreme habitates
(Temp., Salt, etc., e.g. deep sea crab, Black Smoker)

› x millions of genes/enzymes,

› from different sources, from mild to wild,

› are ready for SMART screening,

› to be discovered and used commercially,

› for your purpose

› Our Metagenome-DNA libraries enable *in-silico* screening of novel genes/enzymes with fast and efficient hit rate

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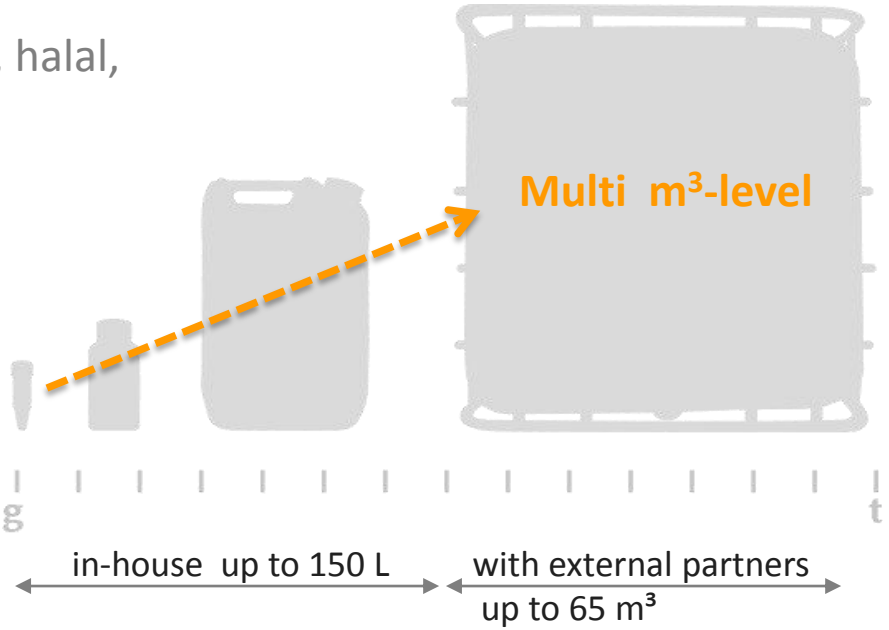
From small to large scale in customer required quality

- Pilot plant inhouse
- Larger productions with external partners
- Customer specific formulation (liquid, lyophilized, spray dried or granulated)
- Customer specific quality (kosher, halal, HACCP, cGMP)
- DNA-/RNA-free
- TSE-/BSE-free
- Global delivery



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Novel Oligo-/Polysaccharides

- **Slowly digestible** and controlled energy release
- **Prebiotic**
- Outstanding **texturizing** and **bulking** properties
- Shortening replacer and low calorie-bulking agent
- Chemically modified derivatives applicable in a wide range of (non-)food applications

The Alternansucrase platform

One enzyme – two healthy products

› **Source:** *Leuconostoc mesenteroides* (gram-positive bacteria)

› A **glycosyltransferase** (EC 2.4.1.140)

› **2057 amino acids (i.e. 228.971 Da)**

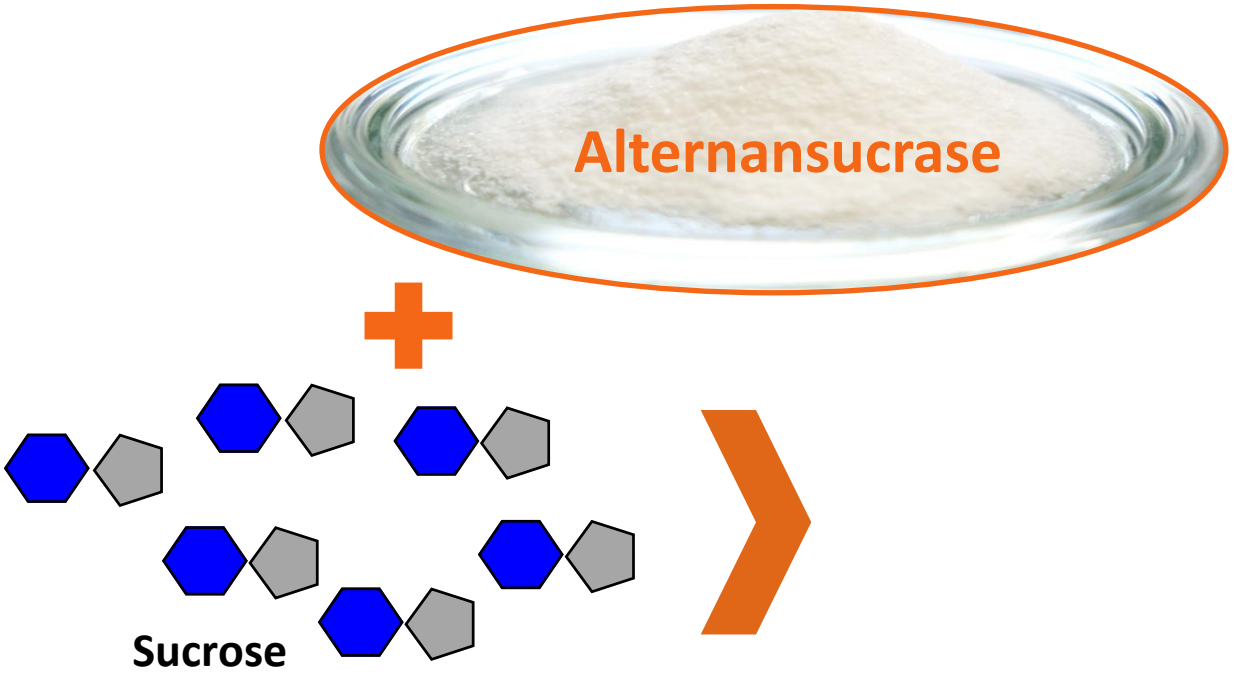
› **Heterologous expression** in *E.coli*

› **N-terminal signal sequence**

› **C-termincal glucan binding domain**

The Alternansucrase platform

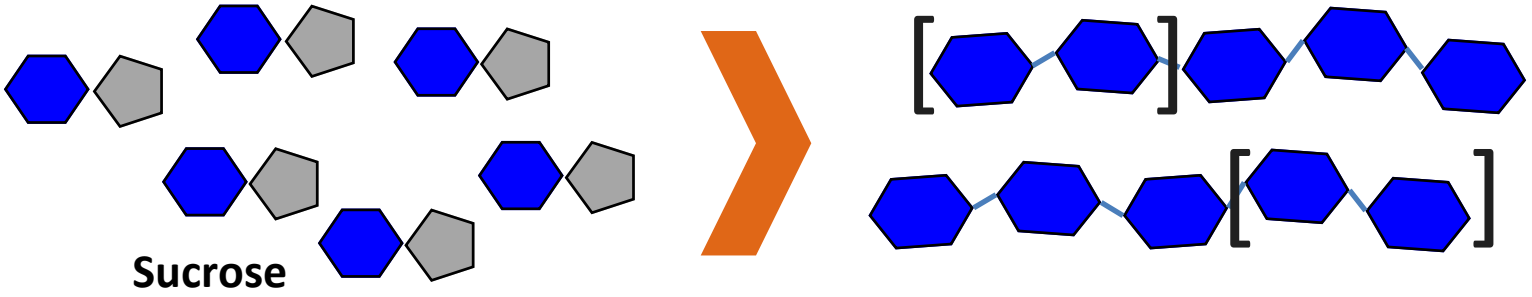
One enzyme – two healthy products



The Alternansucrase platform

One enzyme – two healthy products

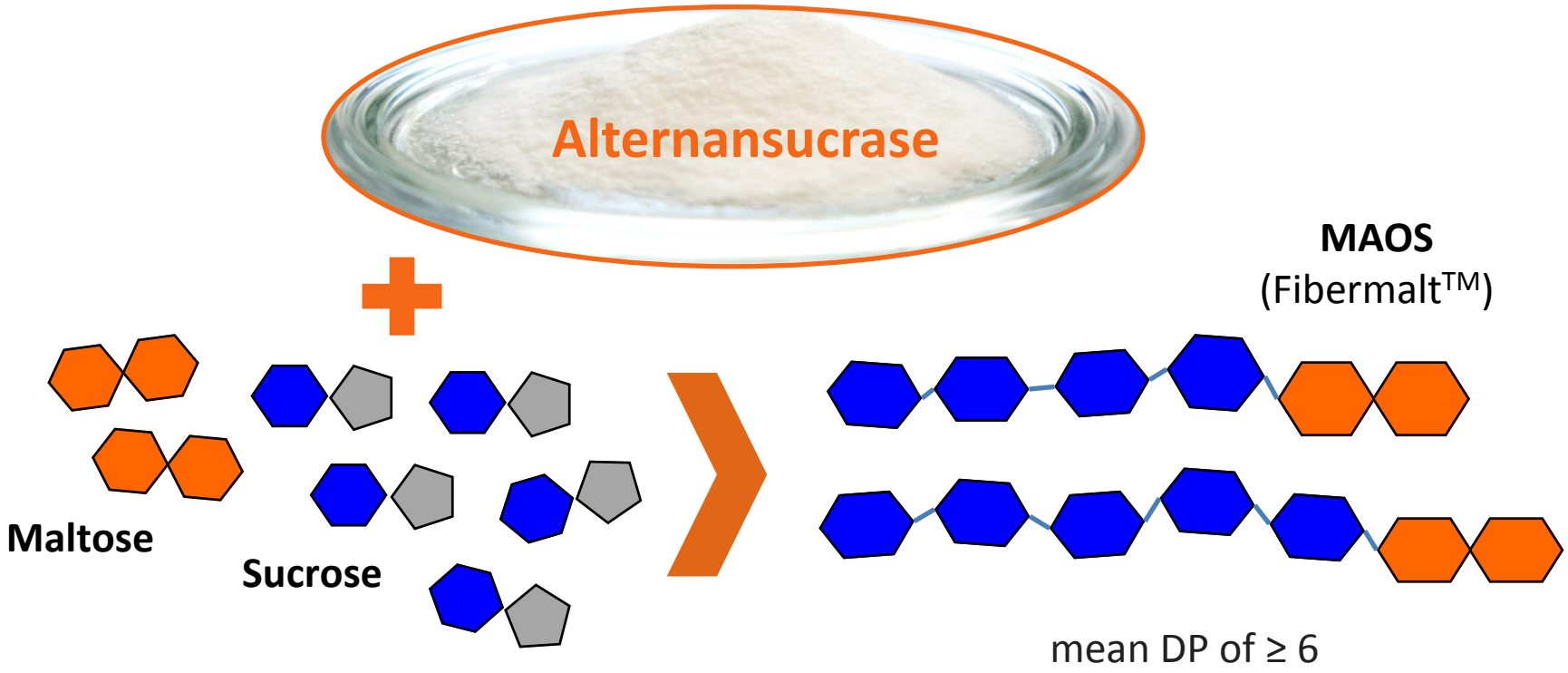
Alternan (α-1,3 and α-1,6)



Molar mass: ~ 40,000,000 g/mol

The Alternansucrase platform

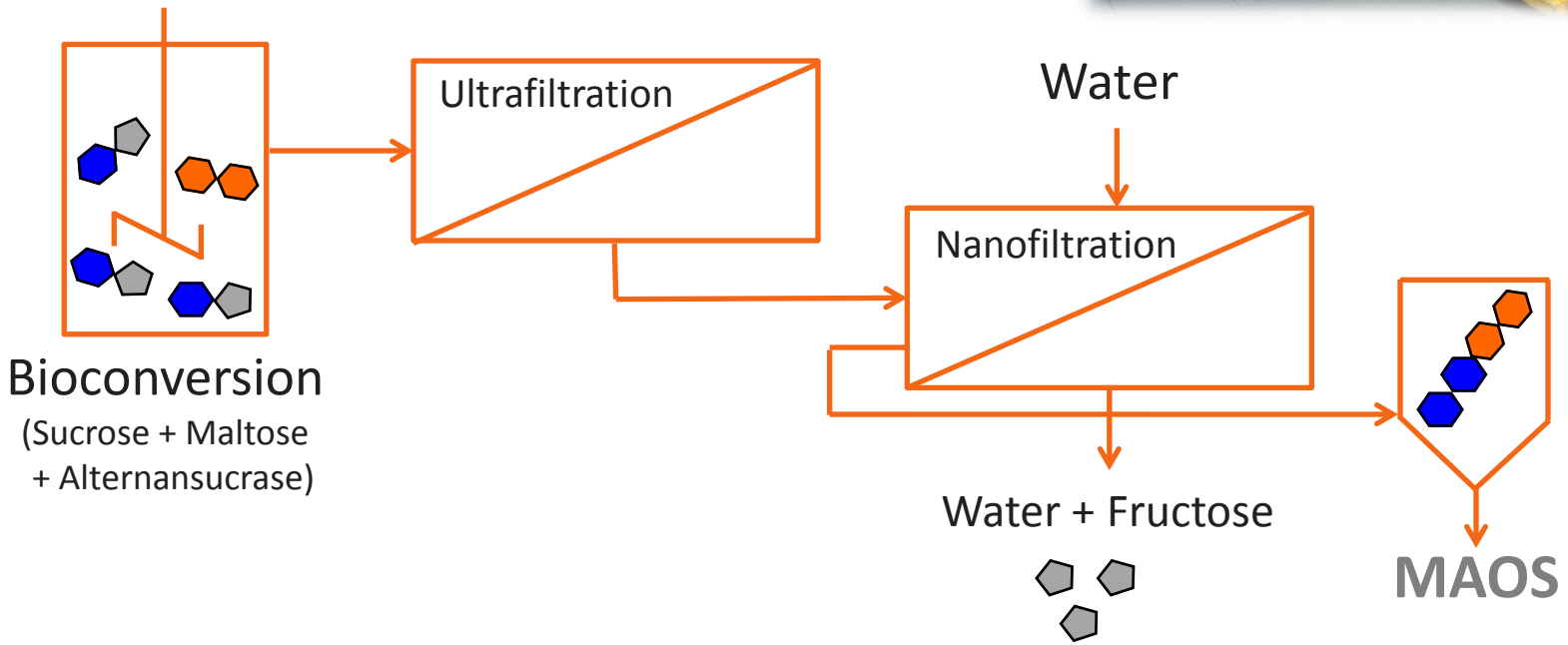
One enzyme – two healthy products



The Alternansucrase platform

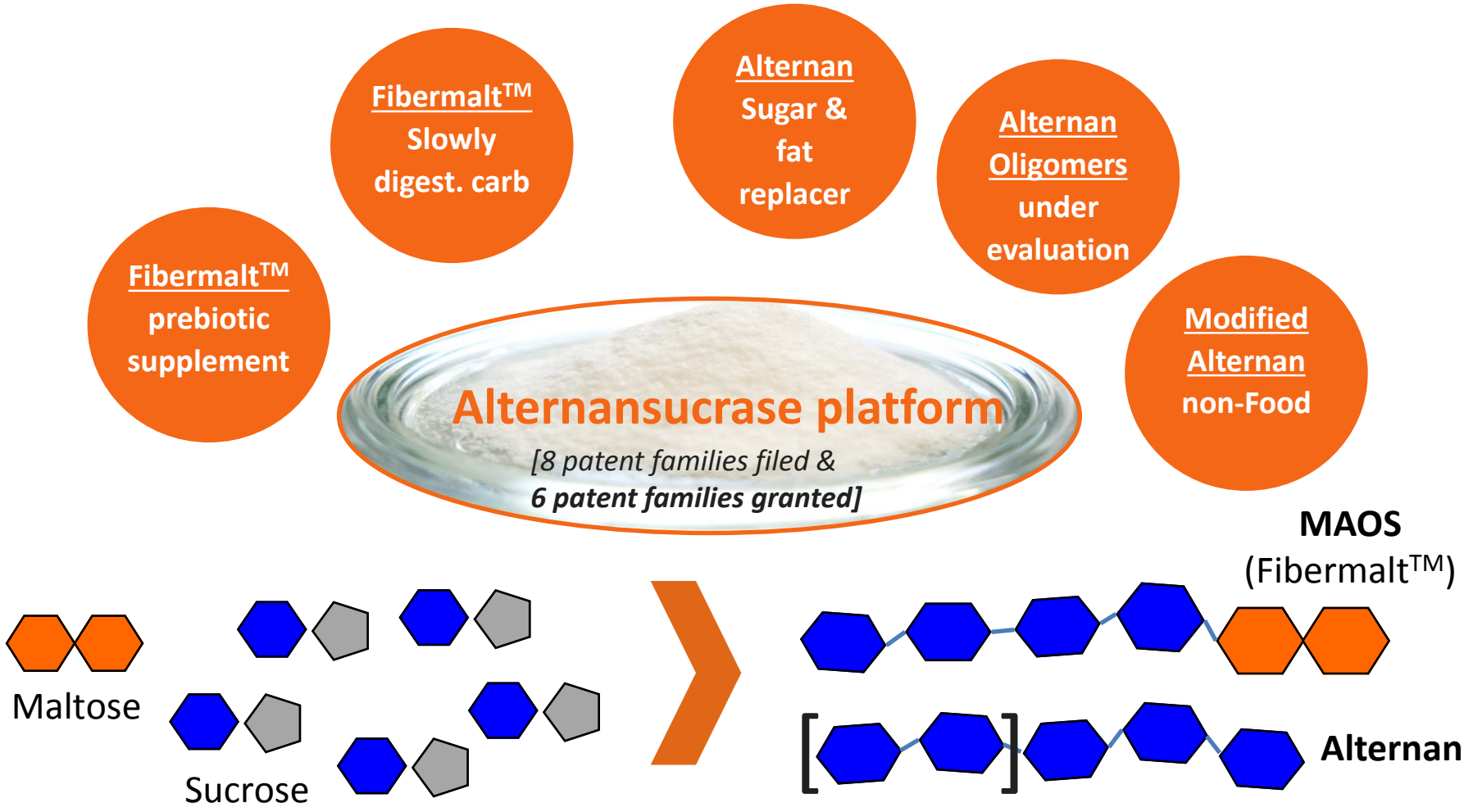
Production of MAOS (Fibermalt™)

- **Sucrose and maltose** as raw materials
- Manufacturing **fully developed to commercial scale**
- **Straight forward downstream processing** with high yields
- Very pure end product (**syrup or spray dried powder**)



The Alternansucrase platform

Functional ingredients for a healthy nutrition



Evoxx´s functional carbohydrate ingredients

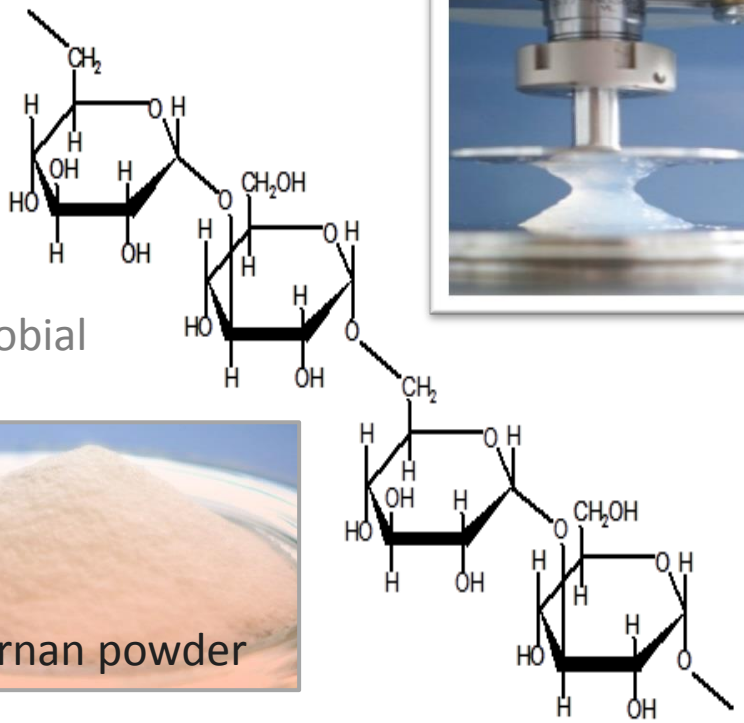
Maltose-Alternan-Oligosaccharide (MAOS)

- **Slowly digestible, slow energy release, no blood sugar peak**
- **Clean taste** / slightly sweet & enhancing product taste (umami effect)
- **pH stable (pH 1,5) - even in carbonated beverages**
- Slightly less caloric than sugar
- **Prebiotic** – promotes beneficial bacteria in the digestive tract (Glenn Gibson)
- **Well tolerated** up to 60 g/day (Maki *et al*., 2012)

Evoxx´s functional carbohydrate ingredients

Alternan – Food

- **Indigestible** and **soluble fiber** (AOAC 2001.03)
- **Non-caloric replacer of fat in bakery products**
- Highly **resistant** to enzymatic degradation /microbial fermentation
- **pH & temperature stable**
- Tasteless, **no flavor**
- **Rheology control**



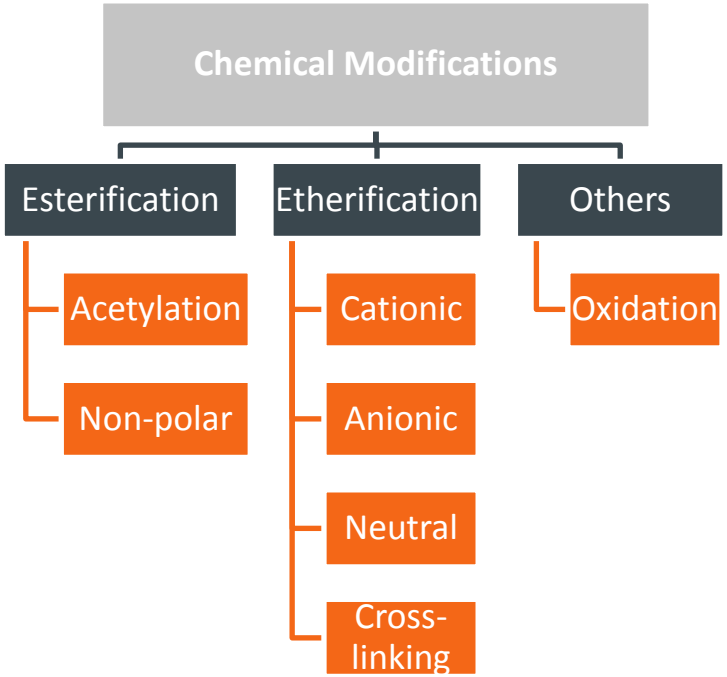
Evoxx´s functional carbohydrate ingredients

Alternan – non-Food

Alternan: non-charged, low viscosity (<10 %)

Chemical Modifications:

- Cationic alternan
- Carboxymethyl alternan
- Hydroxypropyl alternan
- Crosslinked alternan
- Crosslinked hydroxypropyl alternan
- Alternan succinate
- OSA-alternan (octenyl succinic anhydride)



→ New properties for non-Food applications

Summary

- **Functional carbohydrates** like oligo- and polysaccharides can **support a healthy diet**
- **Bioconversion** is a key technology for a sustainable development of functional ingredients
- Ingredients can be developed, which have **both**, **functionality** and **health benefits**

Thank you
for your attention

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