

Natural sugar reduction in fermented dairy products by combined application of lactase, stevia sweeteners and extra mild starter cultures

presented by

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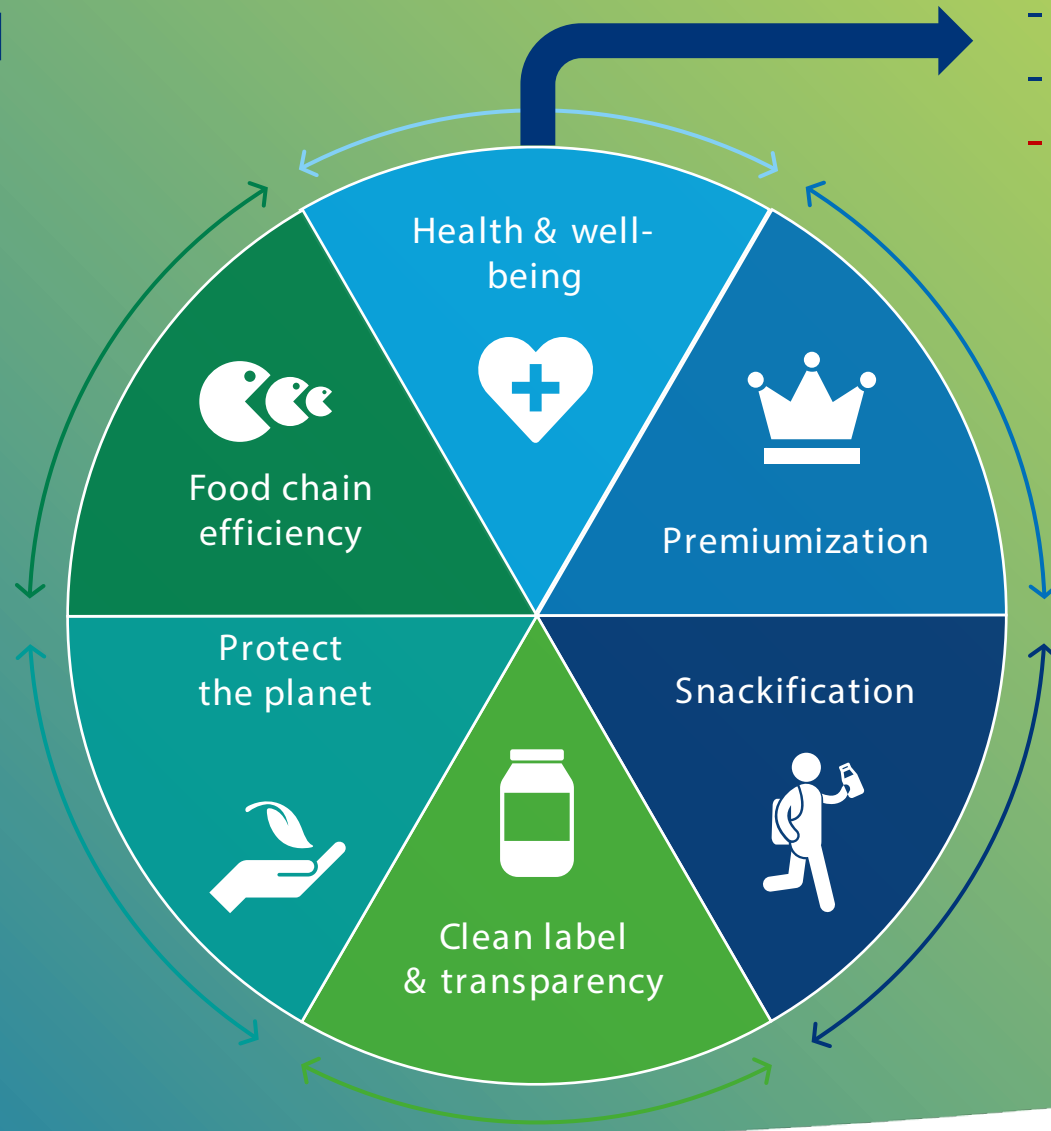


Content:

- Dairy market trends and sugar-reduced products
- Sugar reduction concepts inspired by nature:
 - Sweetness enhancement by lactase
 - Reduced sweetening need by extra mild startercultures
 - High level sugar reduction by high-quality stevia sweetener
 - Synergetic effects of combined application of these concepts
- Summary



6 main dairy market trends can be identified



- Protein is king
- Digestive wellness
- Naturally functional
- **Sugar is the bad carb**



Sugar is the bad carb

- Fear of sugar – the ultimate "bad carb" – is now mainstream

80%

of US consumers say
they are limiting or
avoiding sugar
in their diet

Consumers are cutting
sugar in many ways
and are open to all
types of sweeteners

Possible sugar strategies

1. Reduce, replace, eliminate
2. "Natural sugars"
3. Sugar for energy

→ Consumers can forgive high-sugar brands that are honestly indulgent

→ But they are more demanding about products and categories that are marketed as healthy

High protein level & natural sweetness is a trend in yogurt, often targeting men with high protein snack



USA– Dannon – Oikos triple zero

Featuring NFL football star

Claims: high protein, no added sugar, no artificial sweeteners, no fat



Finland – Arla - Protein

Featuring Finnish hip-hop star

Claims: low added sugar, lactose-free, no fat, rich in protein, no artificial sweeteners

Main sugar reduction effects by combined application of lactase, stevia sweeteners and extra mild starter cultures



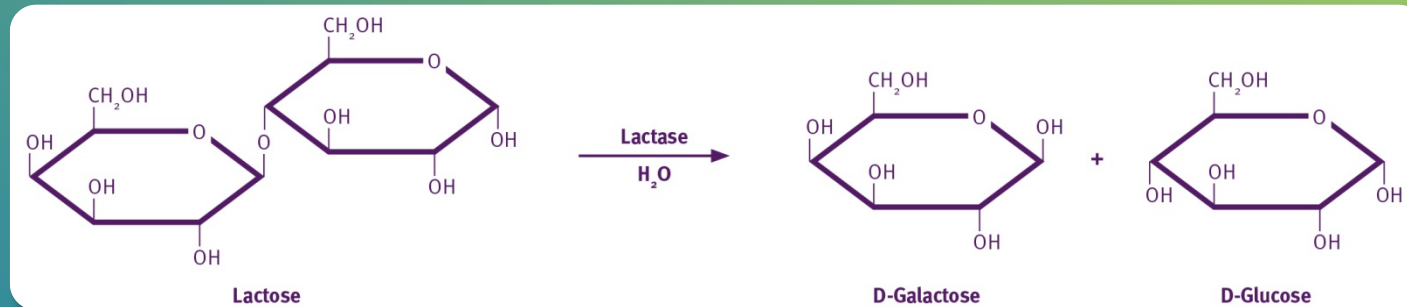
	Maxilact® lactase	+ natural sugar flavors + extra mild starter culture Delvo®Fresh YS040 or FVV122	+ high-quality steviol glycosides AVANSYÆverSweet
Total sugar reduction potential	approx. 10% (1-2g sucrose / 100g)	up to 30%	50% - 100%
Advantages	<ul style="list-style-type: none"> Natural way of reducing sugar Processing aid 	<ul style="list-style-type: none"> Suitable for natural sugar reduction No additional labeling in flavored yoghurt 	<ul style="list-style-type: none"> High level sugar reduction potential Non-artificial sweetener produced by yeasts, without bitter or licorice off-notes
Disadvantages	<ul style="list-style-type: none"> Limited sugar reduction potential 		<ul style="list-style-type: none"> Labeling of stevia glycosides required
Claims	<ul style="list-style-type: none"> Low/ no/ reduced lactose 	<ul style="list-style-type: none"> Sugar reduction claim 	<ul style="list-style-type: none"> Sugar reduction claim No added sugar

Lactase enzyme enhances the natural sweetness of dairy

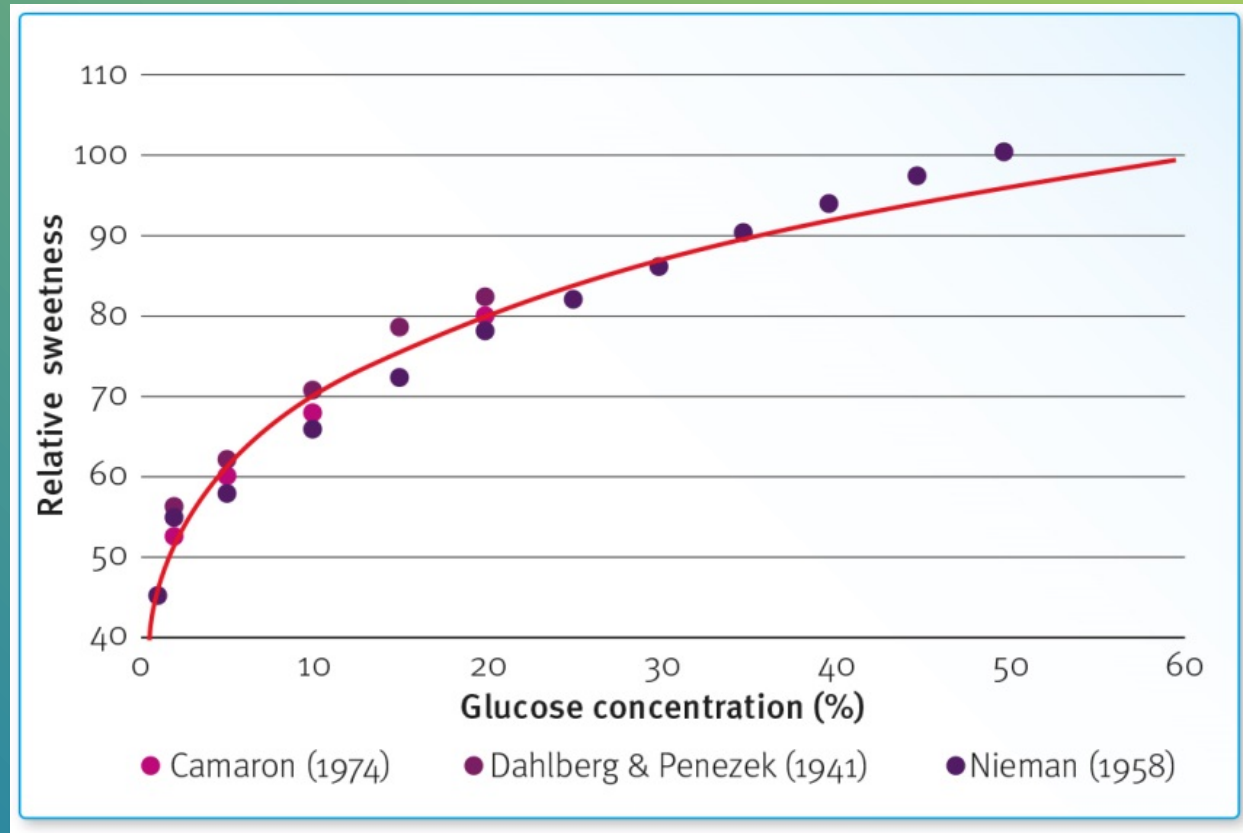
- Lactase breaks down lactose into better digestible and sweeter forms of sugar
- These components have a higher relative sweetness than lactose
- This allows for a sugar reduction of 1-2g / 100g in sweetened yogurt (10%-20%)

Relative Sweetness

Sucrose	100	
Lactose	22	←
Glucose	45	
Galactose	42	
Fructose	135	



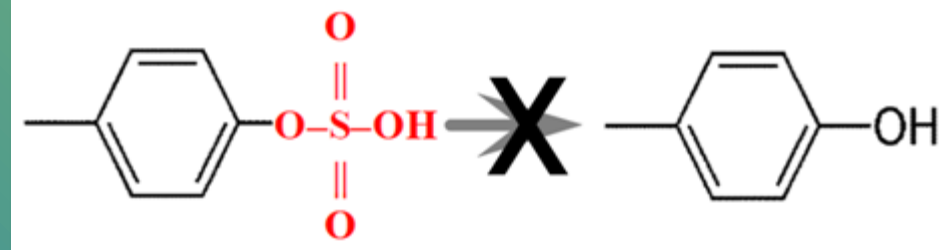
Invertase -free lactase like Maxilact[®] prevents effective sweetness losses by sucrose hydrolysis



Relative Sweetness	
Sucrose	100
Lactose	22
Glucose	45
Galactose	42
Fructose	135

Off-notes prevention by highly purified lactases like MAXILACT® assures clean sweetness profile

- Enzyme-catalyzed formation of p-cresol can cause unpleasant cowy/ phenolic off-notes in lactose-free dairy products
- Completely arylsulfatase-free lactases like Maxilact® prevent the formation of p-cresol from components naturally present in many milks

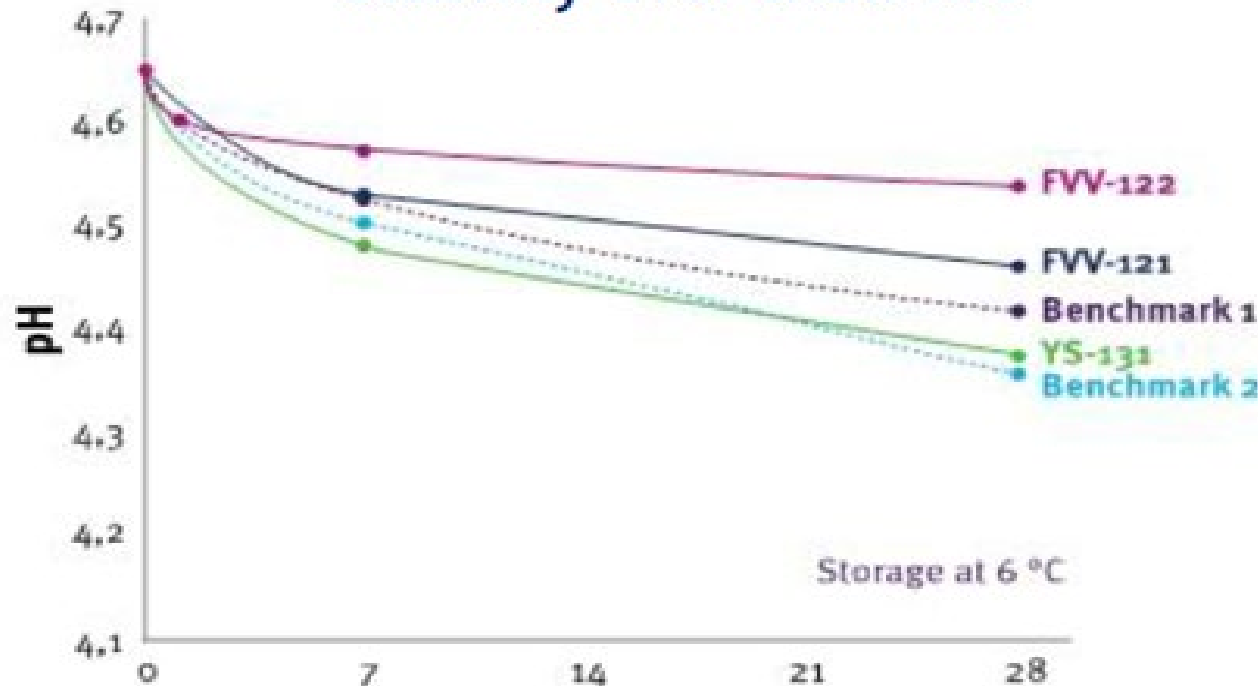


- Concentrated lactases like DSM's **Maxilact® Super** are highly efficient in sugar reduction at low enzyme dosage levels

pH-stable yoghurt starters like Delvo[®]Fresh YS-040 and FVV-122 are synergetic cultures for high mildness and sugar reduction with MAXILACT



FVV 122 shows excellent PH stability over shelf life



- Even lower post-acidification and smaller pH-drop when lactose is co-hydrolyzed during fermentation
- Potential to added considerably less sugar due to milder and less acidic taste

Significant sweetness effects of high -quality stevia sweeteners

In 2019, the joint venture AVANSYA between Cargill and DSM started the first commercial-scale fermentation facility for fermentation-derived stevia sweeteners in the U.S.



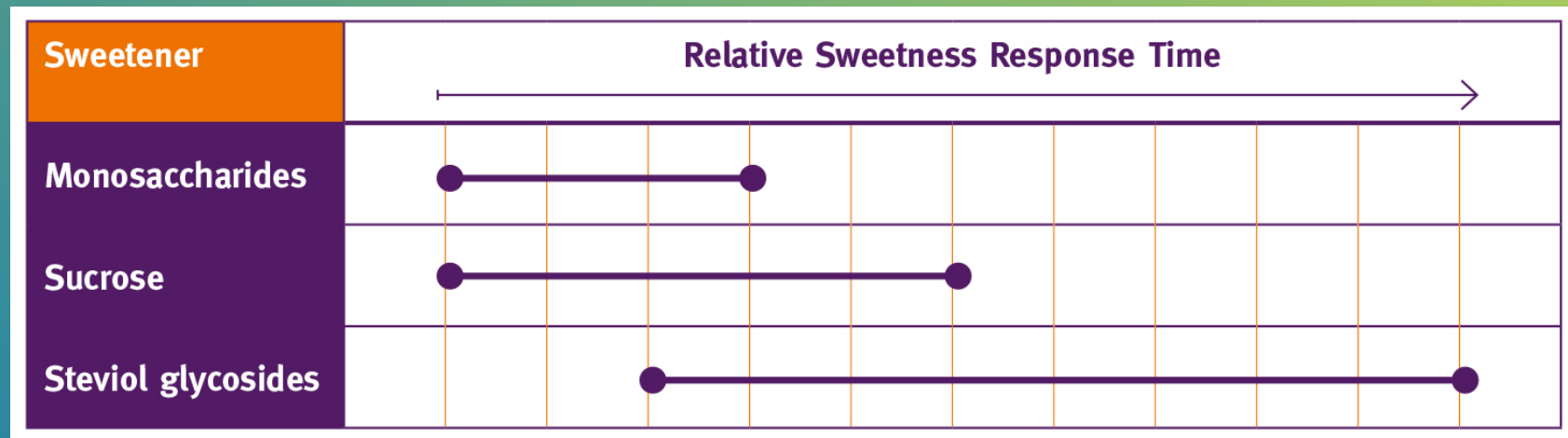
Yeasts convert simple sugar into Reb M and Reb D (identical to those produced by the stevia plants) far more efficiently and in much greater quantity than a stevia plant

Reb M and Reb D have significantly more sweetness and less bitterness at high usage levels (than the traditional Reb A extracted from the stevia plant) of the resulting high-quality stevia sweetener EverSweet

→ EverSweet preferred Sucrose Equivalent Value (SEV) of up to 9

Monosaccharides released by lactase harmonize sweetness response profile of stevia sweeteners

- Synergistic effect of monosaccharides released by Maxilact[®] takes place when using a slow impact sweetener
 - Examples of slow impact sweeteners are steviol glycosides and (natural) sugar flavors
- Very high sugar reduction potential in combined application



Source: Hull Peter, 2010, Glucose syrups, Wiley Blackwell, Oxford, p.231
 Sáinz Javier, 2012, Getting the best from stevia via water purified extracts, Galam Group, p. 6

SUMMARY Natural sugar reduction in fermented dairy products by combined application of lactase, stevia sweeteners and mild starter cultures



Although obesity and reduction of sugar intake from foods have been an issue for years, innovation in the area of sugar reduction in dairy products is still needed. This presentation describes the combined effect of 3 non-artificial sugar-reduction concepts:

- Highly purified and concentrated lactase doubles the natural sweetness of lactose in an efficient way
- Extra mild starter cultures reduce the sweetening need
- Steviol glycosides allow substitution of added sugar

The combined application of these three solutions reduces calories, sugar or artificial sweeteners in a natural way and generates a sucrose-like sweetness profile with superior sweetness quality compared to traditional combinations of artificial sweeteners.

Highly purified and concentrated lactases are efficient in sugar reduction as well as both invertase- and arylsulfatase-free. As resulting benefits, no collateral sweetness losses occur, and no off-flavor notes develop in sugar-reduced dairy products when they are applied.



Thanks for listening!

**Need to know more contact Martin Knossalla,
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