

LACTOSE AND DERIVATIVE INGREDIENTS MARKET

Science- Market – Regulation 1 Report

This comprehensive report is based on in-depth interviews with food companies completed by a desk review. It provides for **DECISION MAKERS** a global understanding of the sector as well as an outlook on its future.

2009

MARKET ANALYSIS

- Trends and outlook
- Use of ingredients: volume-value
- Manufacturers profiles
- Users opinions
- Regulation

FOOD SEGMENTS

- Food industry
- Functional food
- Food supplements

INGREDIENTS

- Lactose
- GOS
- Lactulose
- Lactitol
- Lactosucrose
- Lactobionic acid

COUNTRIES COVERED

- USA
- Europe
- Asia
- Australia- New Zealand

UBIC USA
5020 Campus Drives
NEWPORT BEACH
CA-92660
Phone: 1 702 355 8804
Fax: 1 949 752 2287

UBIC EUROPE
Techno-Pôle 3
CH 3960 SIERRE
Phone: +41 (0) 27 456 1440
+41 (0) 27 456 1444
Fax: +41 (0) 27 456 1447

UBIC IRELAND
45 Glencarraig
DUBLIN 13
Phone: 353 1 832 47 12
Fax: 353 1 832 12 77

UBIC FRANCE
10, Rue du Colisée
75008 Paris
Phone: +33 1 400 600 86
Fax: +33 1 400 600 87

UBIC
CONSULTING

ubic@ubic-consulting.com

REPORT FOCUS

MARKET

Market trends
Applications in food segments
Use of ingredients: volume-values
Outlook

MANUFACTURERS

Food industry usages and needs

RESEARCH

New prebiotics
Research and technical aspects

ENVIRONMENT

Regulatory aspects

INTRODUCTION

Several kinds of oligosaccharides, such as galacto-oligosaccharides, lactosucrose, lactulose, and lacti-tol, have been developed from lactose as the raw material. Almost all of these saccharides have the same characteristics as those produced from sucrose.

LACTOSE

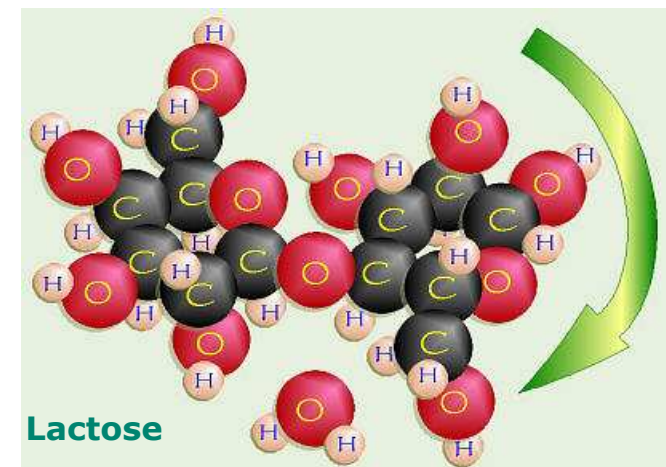
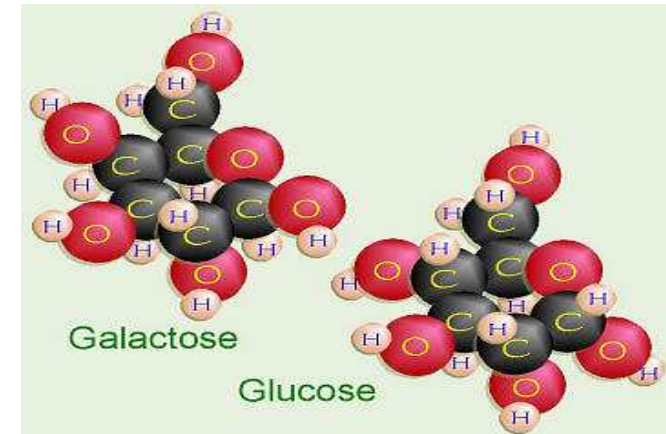
•Generalities

Lactose is the main milk sugar, however, there are very small amounts of other carbohydrates or saccharides (especially oligosaccharides) present. Lactose is important as a starting material for production of lactulose and lacto-oligosaccharides.

Two monosaccharides can join by **dehydration synthesis** to form a **disaccharide**. For example, Glucose + galactose = **lactose**, or milk sugar.

•Lactose - a potential prebiotic

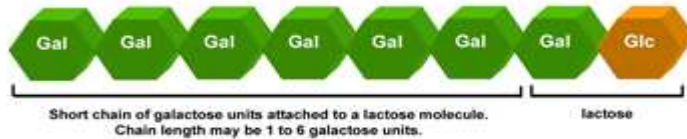
According to recent studies, there is emerging evidence that certain lactic acid-producing bacteria, which selectively consume prebiotics, may be beneficial against some lower intestinal diseases.



LACTULOSE AND DERIVATIVE INGREDIENTS MARKET

GOS (Galacto Oligo saccharides)

Galacto-oligosaccharides (GOS), which also occur naturally, consist of short chains of galactose molecules. These compounds can be only partially digested by humans.

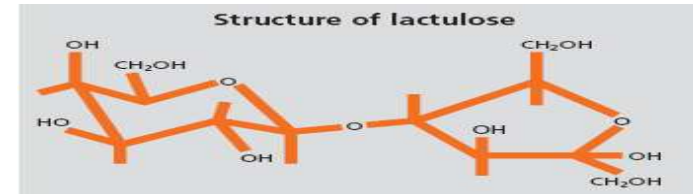


Galacto-oligosaccharides (GOS) are prebiotic functional foods that have many health benefits on human health by stimulating the growth and/or activity of *Bifidobacteria* in the colon. GOS can be added to foods such as soft drinks, ice cream, cookies, infant formulas, and animal feeds. Naturally, GOS are found in garlic, onion, soybean, and chicory roots, etc. However, natural GOS are not sufficient and convenient to use as food additives to enhance human health. As a result, the development of chemical or enzymatical production of GOS is necessary. Currently, GOS are commercially produced from a transgalactosylation reaction of β -galactosidase from lactose, which is in the equilibrium with a hydrolysis reaction producing glucose and galactose. Because of the competition of these two reactions, the resulting GOS yield is lower than 50%. At higher lactose conversion, lactose is completely hydrolyzed to glucose and galactose.

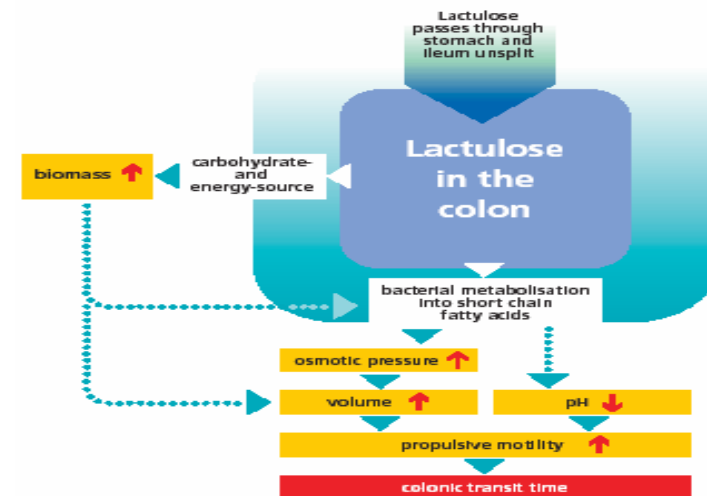
LACTULOSE

Lactulose is a non-caloric, complex carbohydrate synthesized from lactose. It is a synthetic disaccharide that consists of fructose and galactose. As there is no corresponding disaccharidase in the human intestinal mucosal cells lactulose is not split in the small intestine and therefore it is not absorbed. In the colon it is metabolized to organic acids in short chains (acetic and lactic acids) by the gut flora.

This fermentation acidifies the content of the intestine and it has an osmotic affect. High does intensifies the osmotic effect.



Lactulose has been successfully applied in the treatment of constipation since 1959. Lactulose has proven its efficacy as a gentle as well as highly effective medication.



Mechanism of action in constipation

LACTITOL

Lactitol is obtained from lactose by hydrogenation. At a rate of use less than 5%, it is known for its hypercholesterolemic capacity and sugar activity for diabetics.

Less sweet than lactulose, it can be considered as a low calorie bulk sweetener and also retards crystallisation.

Sweeteners obtained by hydrogenation of simple oses, diholosides or oligosides (sugar alcohols or polyols)

	Origin	Sweetening Power	Negative dissolution heat kJ/kg	Caloric value	
				official	theoric
Sorbitol	Glucose hydrogenation (Starch hydrolysis)	0,5-0,6	-120	2,4	4
Mannitol	Fructose hydrogenation (Starch hydrolysis or inverted sugar)	0,5-0,6	-120	2,4	4
Xylitol	Xylose hydrogenation (hydrolysis of <i>xylanes</i> , <i>bouleau</i>)	1	-145	2,4	4
Isomalt	Isomal-tulose hydrolysis (<i>saccharose</i>)	0,5	-39	2,4	2
Maltitol	Maltose hydrogenation (Starch hydrolysis)	0,9-1	-	2,4	2
Lactitol	Lactose hydrogenation	0,3-0,4	-	2,4	2

Lactitol is used in a few new products in the candy and dessert areas. High-intensity sweeteners can be formulated successfully into chocolate, and sugar alcohols (usually maltitol or lactitol) also have been used as sugar replacements in chocolate confections for many years. Thus, lactitol may have a laxative effect that limits its use but is the less laxative of the polyols group. It has the advantage of a low "cooling effect" compared to sorbitol.

Although lactitol monohydrate is not widely used by ice cream manufacturers, it also offers many advantages. A lactitol/maltodextrin blend gives a lower viscosity that leads to a cleaner profile and better flavor release. In addition, the freezing point is depressed more with the lactitol blend.

Source: UBIC

LACTOSUCROSE

Lactosucrose is produced by enzymatic inversion of lactose and sucrose. It is a selective bifidus growth promotor.

Hayashibara Biochemical Laboratories Inc. has demonstrated possibilities that **lactosucrose** would modulate intestinal environment to activate an intestinal immunity against pathogenic bacteria and viruses including a pathogenic Escherichia coli O 157 and Norovirus, and to relieve clinical symptoms concomitant with an allergic reaction of pollinosis and atopic dermatitis. We will try to clarify the mechanism of action of **lactosucrose** in a modulation of intestinal immunity and further to find out other novel function in lactosucrose.

LACTOBIONIC ACID

•Nutraceutical properties

Lactobionic acid is formed by oxidation of the disaccharide lactose. It is a molecule in which the PHA gluconolactone is attached to a sugar, galactose. Lactobionic acid takes the properties of bulk and polarity still further than the PHAs, with the added benefit of being a strong antioxidant and iron chelator. Moreover, preliminary studies suggest that lactobionic acid can reduce fine lines and wrinkles by stimulating the deposition of glycosaminoglycans (GAGs) in the epidermis. The result is taut skin.

Lactobionic acid has been reported as a bifidobacteria enhancer.

•Market applications

Lactobionic acid is already widely used as a preservative for organ transplantation, due to its ability to suppress tissue damage caused by oxygen radicals during organ storage.

Lactobionic acid is a new ingredient used in skin care products with promising benefits. Its chemical structure confers a strong binding property while its iron chelating properties inhibit the production of hydroxyl radicals.


C O N T E N T

1.1. INTRODUCTION	5		
1.2. OBJECTIVES	6		
1.3. METHODOLOGY	7		
2. SUMMARY-CONCLUSIONS	8		
2.1- Definition - Classification	9		
2.2- Future of Dairy Ingredients	10		
2.3. Market data	10		
Description	15		
3- LACTOSE AND ITS DERIVATIVES	19		
3-1- LACTOSE	20		
Summary	20		
3-2- GOS (Galacto Oligo saccharide)	21		
Nutritional Properties	22		
Market applications	23		
Lactose derivatives market size	26		
Market size	26		
GOS market	27		
GOS by market segment	28		
Suppliers	28		
3-3- LACTULOSE	33		
Description	33		
Nutraceutical properties	34		
Lactulose market applications	36		
Market	38		
Suppliers	39		
3-4- LACTITOL	41		
Description	41		
Nutraceutical properties	41		
Market size	42		
Suppliers	44		
		3-5- LACTOSUCROSE	49
		Market	49
		Suppliers	50
		3-6- LACTOBIONIC ACID	52
		Nutraceutical properties	52
		Market applications	52
		Market size	53

LACTOSE AND DERIVATIVE INGREDIENTS MARKET

SUBSCRIPTION 2009

	Sections	Cost
Complete study	<input type="checkbox"/> All sections	• €1,390
COST BY SECTION	<input type="checkbox"/> Lactose	• € 90
	<input type="checkbox"/> GOS	• € 690
	<input type="checkbox"/> Lactulose	• € 390
	<input type="checkbox"/> Lactitol	• € 290
	<input type="checkbox"/> Lactosucrose	• € 190
	<input type="checkbox"/> Lactobionic acid	• € 190

<p>Study purchase includes one year update available on-line on UBIC's Extranet</p> <p>Assistance is also available for specific questions</p>	<p>COMPANY _____</p> <p>Name _____ Position _____</p> <p><input type="checkbox"/> _____</p> <p>_____</p> <p> _____ Date _____</p> <p>Signature _____</p>
--	---