



Biotransformation of Whey Waste Streams for Value Added Products

Food Innovation gateways, Teagasc 21st November 2019

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Glanbia Ireland - Our Combined Experience

Agribusiness

1 million tonne Agri powerhouse



Consumer

Ireland's #1 branded dairy company



Ingredients

Top 10 dairy company in Europe



Leading Brand Portfolio



Glanbia Ireland has established a business of relevant scale



A wide range of dairy ingredients sold into a number of market sectors ...



Infant Nutrition



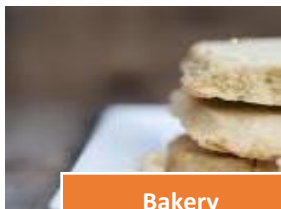
Sports & Lifestyle Nutrition



Clinical Nutrition



Affordable Nutrition



Bakery



Consumer Branded Fresh Dairy Products



Cheese

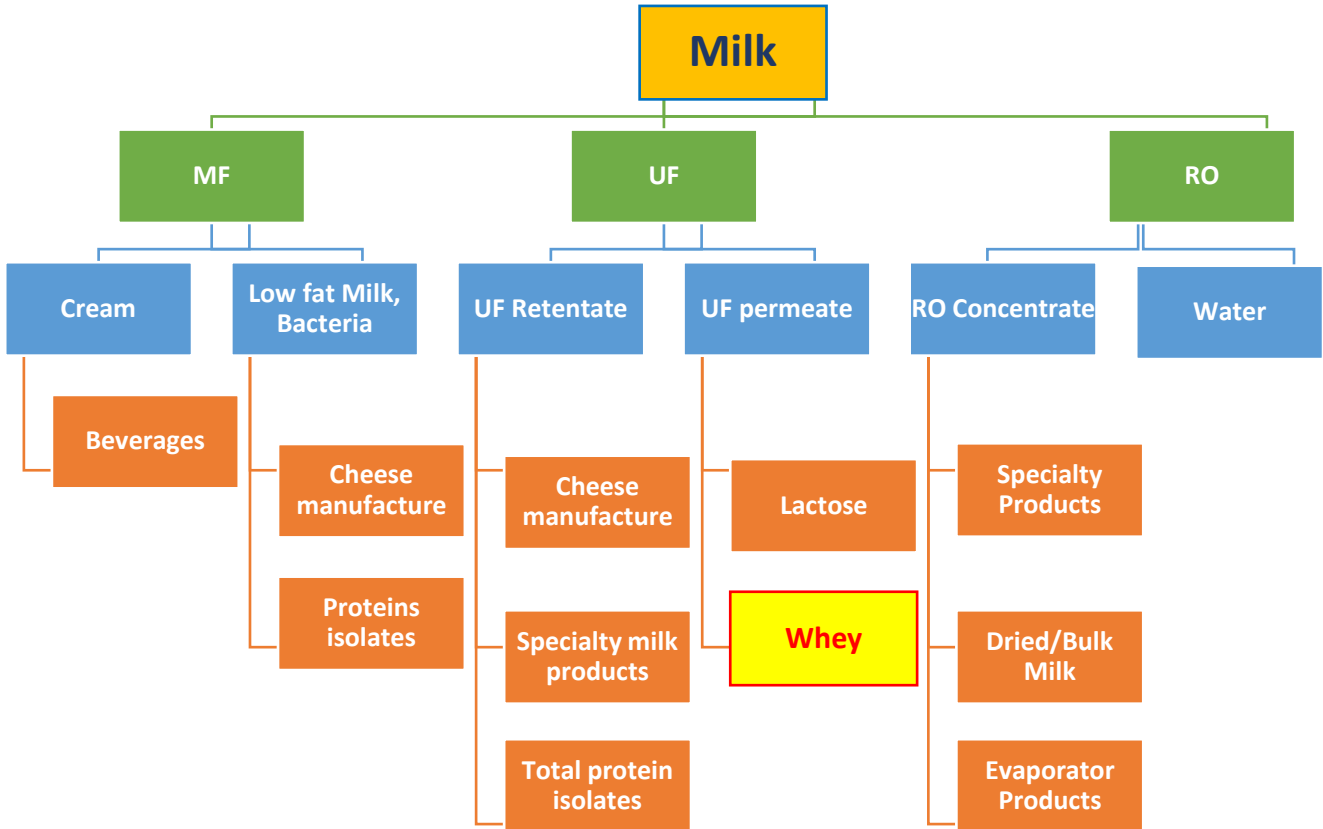
Fast Growing Dairy Company Of Scale



Milk Growth to 2017:
+35% since 2014



Forecast to grow:
~30% 2018 – 2022

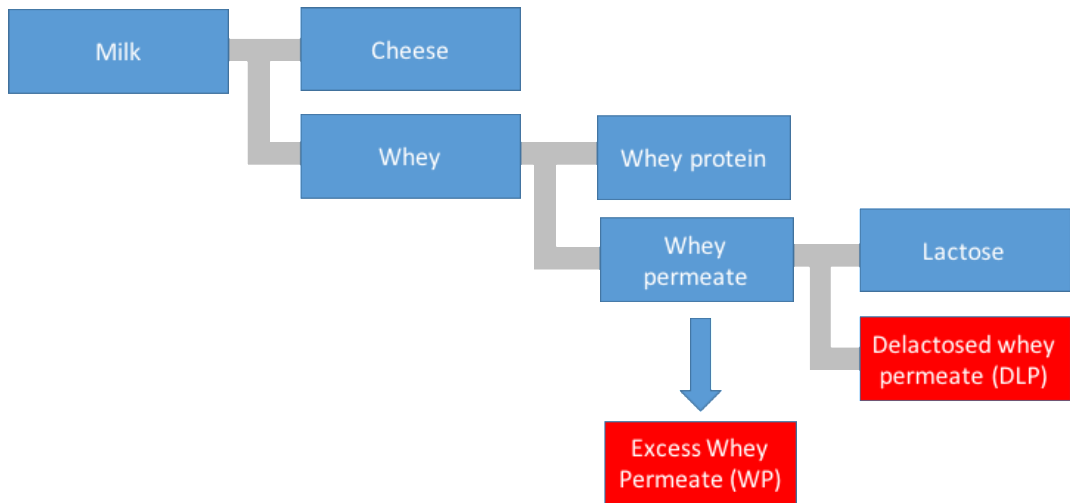


*Source -Market & Markets analysis, 2005 and UF & MF Handbook, 1998

AGRICHEMWHEY has received funding from the Bio-Based Industries Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement No. 744310.

Insight: Whey Permeate = Bottleneck for whey processing

Current Value Chain



Whey Permeates - a bottle neck for whey processing in post milk quota era

- EU Milk Quota abolished 1st April 2015, 1st Time in 30 years EU Dairy farmers can expand their enterprises
- **Delactosed Whey Permeate (DLP)** is a major side stream of whey processing and has limited routes to markets
- **Excess Whey permeate** has limited routes to market with significant volumes disposed of as animal feed
- **Volumes** of these feedstocks will grow as more whey protein is extracted from whey pools and also due to post quota milk expansion

➤ **Problem:**

- **The disposal of Whey permeates is a current bottle neck for future whey processing**
- **The Challenge** for the Dairy Industry has been to find a reliable significant route to market, that will also bring increased sustainable value

Characterisation of WP, DLP and DLC

	Whey Permeate	DLP	DLC
Calcium (ppm)	8226	9010	10676
Magnesium (ppm)	546	837	1610
Phosphate (ppm)	3890	9770	10196
Sodium (ppm)	7189	10333	22553
Potassium (ppm)	8226	18238	36896
Chloride (ppm)	13300	41600	42800
Ash %	3.69	8.66	14.3
Lactose %	21	29	45
TS%	25	38	59

Why Dairy waste streams utilization is challenging for process development??

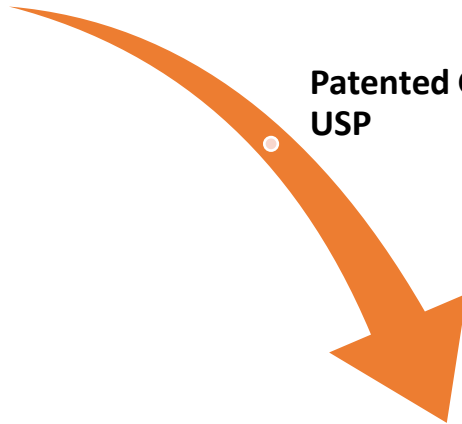
- ✓ High salinity
- ✓ Removal of inorganic load from dairy samples
- ✓ Better microbial biotransformation
- ✓ Feasible down streaming for product recovery

Our challenges and new technologies

- ✓ Recovery of lactose from whey waste streams
- ✓ Microbial fermentation of lactose to Lactic acid
- ✓ Recovery of Lactic acid from complex fermentation broth

Pre-treatment process development for ash removal

Whey Permeate/DLP



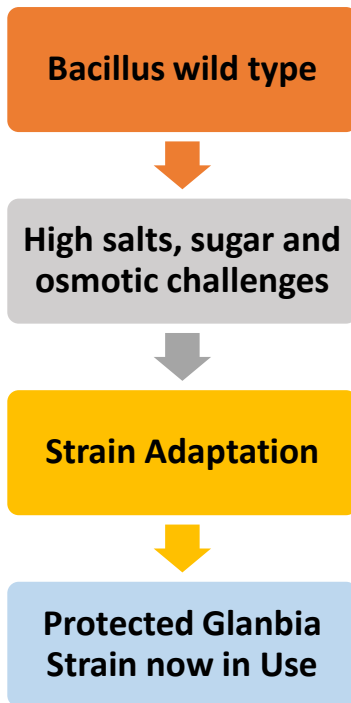
**Patented Glanbia
USP**

**Clarified Feed for
Fermentation**

- **Process gives fermentable lactose substrate**

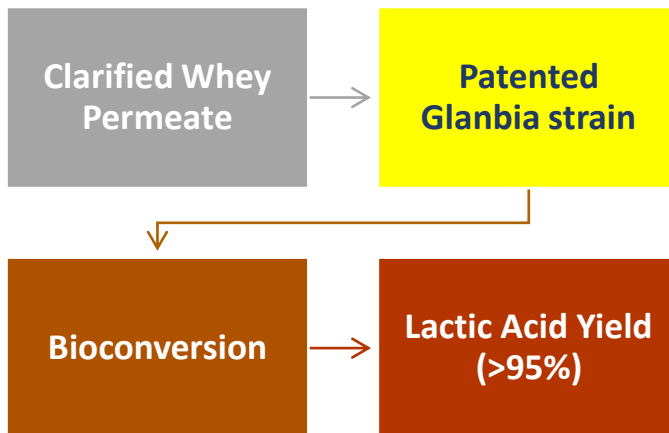
***WO/2018/029219**

Strain development for lactose fermentation



*US/2018/0312885A1

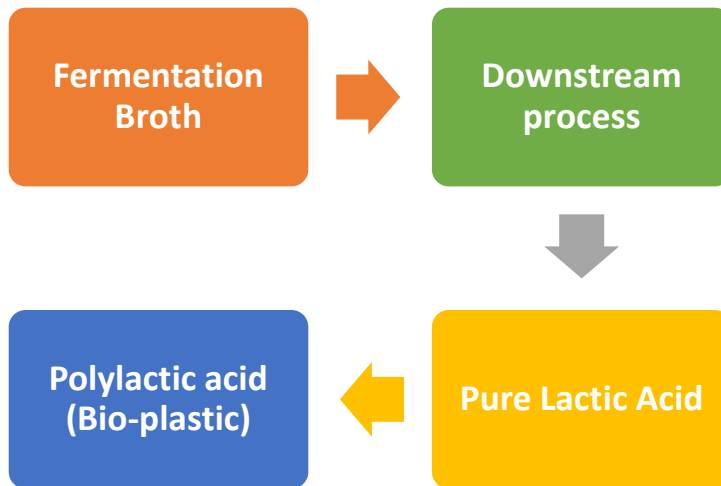
Fermentative production of Lactic Acid



- ✓ Lactic acid production with high Yield and Productivity (7g/l.hr)

*WO/2018/029219, US/2018/0312885A1

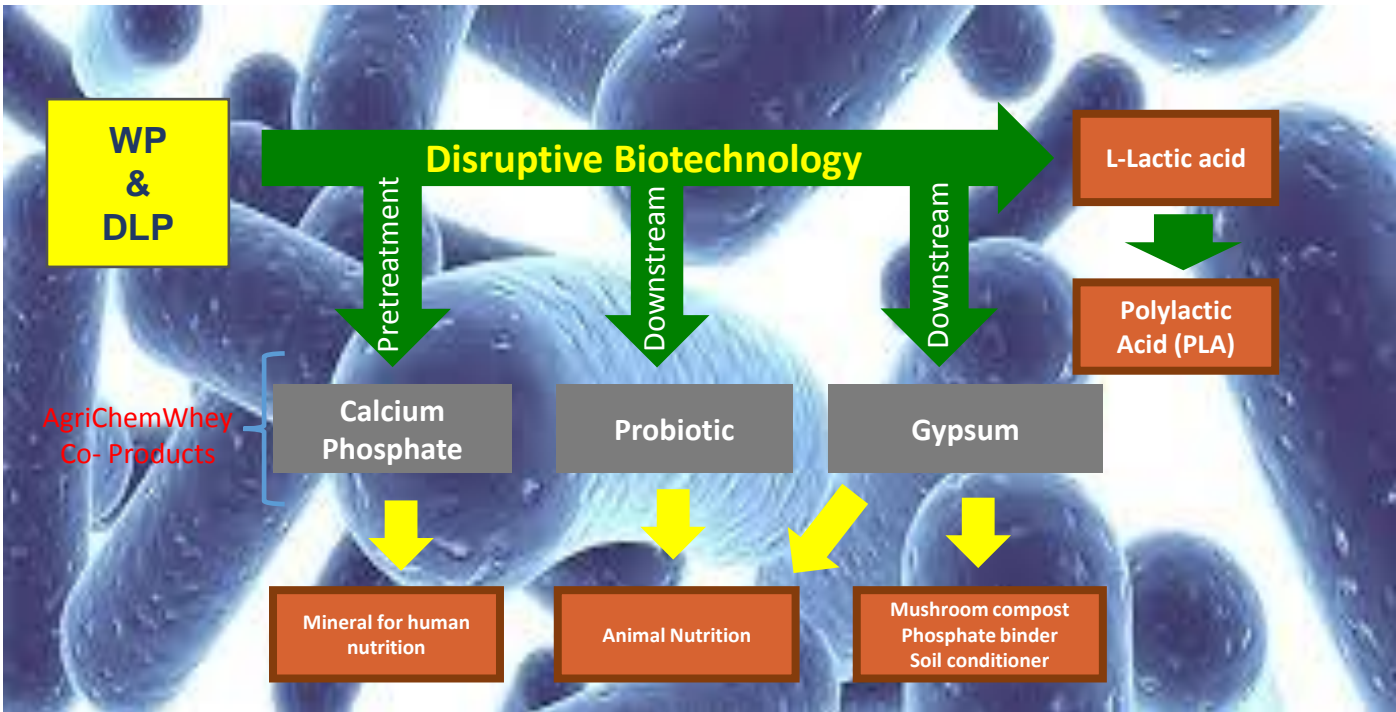
Recovery and Purification of Lactic Acid



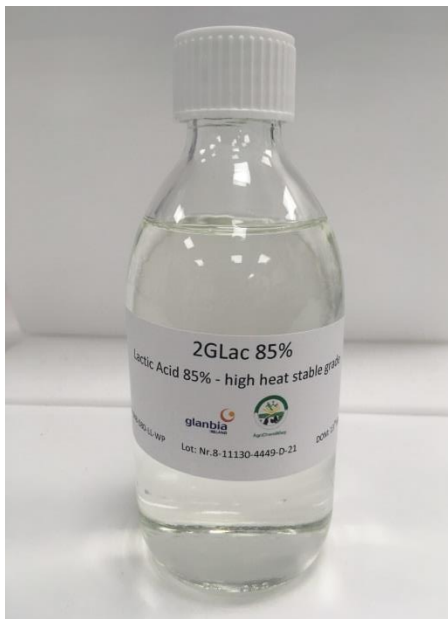
- Pure Heat Stable Lactic acid for Bioplastic production

***WO/2018/029219**

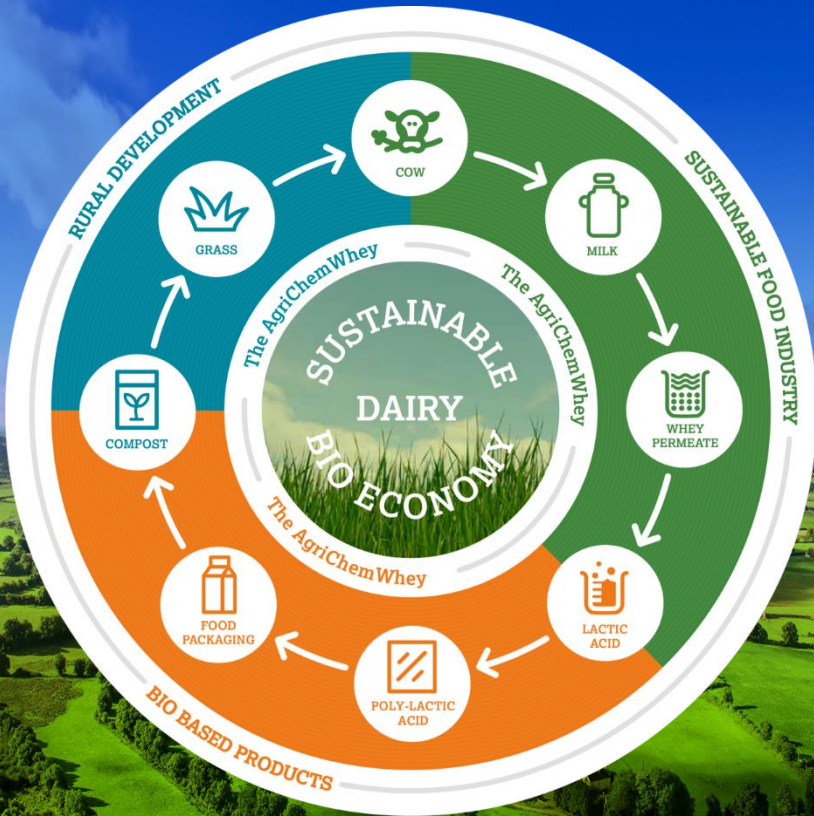
Glanbia technology map for value added products from low value dairy whey streams



Heat Stable polymer grade Lactic Acid



***Lactic Acid product trade mark registered as ECOLAC in EU**



**DELIVERING BETTER NUTRITION
FOR EVERY STEP OF LIFE'S JOURNEY**

The Role of BIC and BBI JU Underpins AgriChemWhey

2014 - Glanbia commences research with UCD & TCD

2014 - The EU commission launches a €3 billion BBI JU fund

2015 - Glanbia became a full member of Bio Industries Consortium (BIC)

2016 - Glanbia scales up its patented technology to produce high purity lactic acid.

2017 - Glanbia is successful in leading a grant of €22.3 million Flagship grant from BBI JU

2018 - Glanbia commences the AgriChemWhey project in the Lisheen National Bioeconomy Campus.

AgriChemWhey Partners



CONSORTIUM





Multi Product Biorefinery



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AgriChemWhey



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An integrated biorefinery for the conversion of dairy by-products to high value bio-based chemicals

www.agrichemwhey.com

Thank you !!