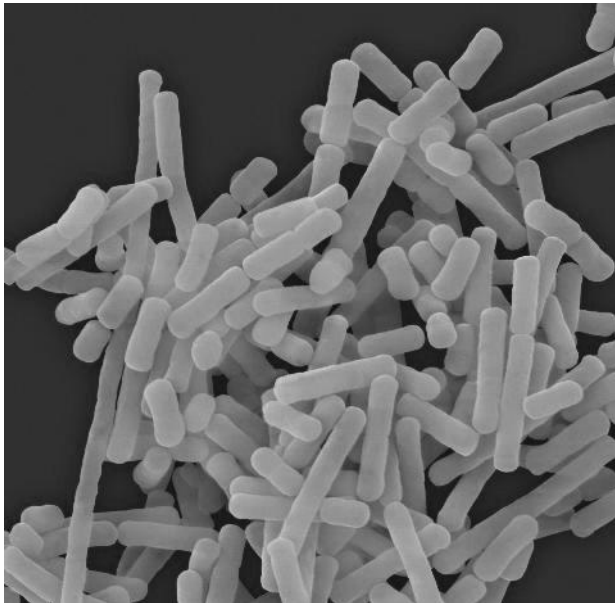
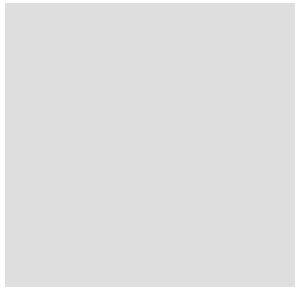


MICROBIAL INNOVATION FOR OPTIMIZED PLANT-BASED DAIRY



Silvia Soragni – Category Manager Savory Ingredients –
LALLEMAND BIO-INGREDIENTS

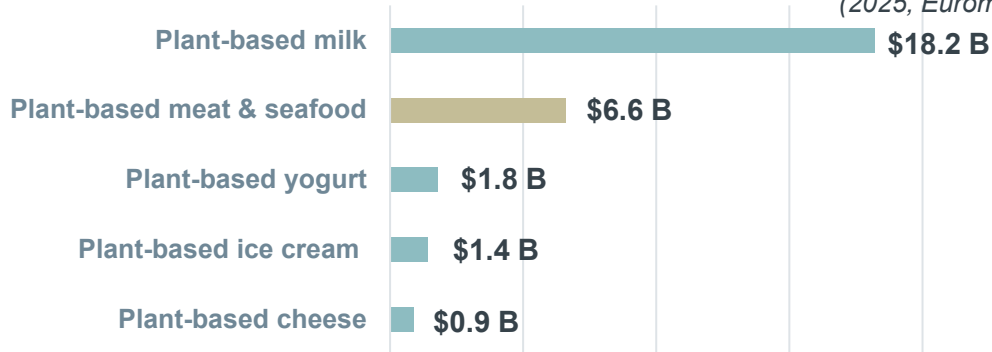
Dr. Camille Duc – Technical Support Manager Plant-Based –
LALLEMAND SPECIALTY CULTURES

PLANT-BASED DAIRY: A BRIEF EU OVERVIEW

Euromonitor valued **Europe's** plant-based retail market at €10,1 billion USD in 2025

Global plant-based foods retail sales estimates by main category (\$USD)

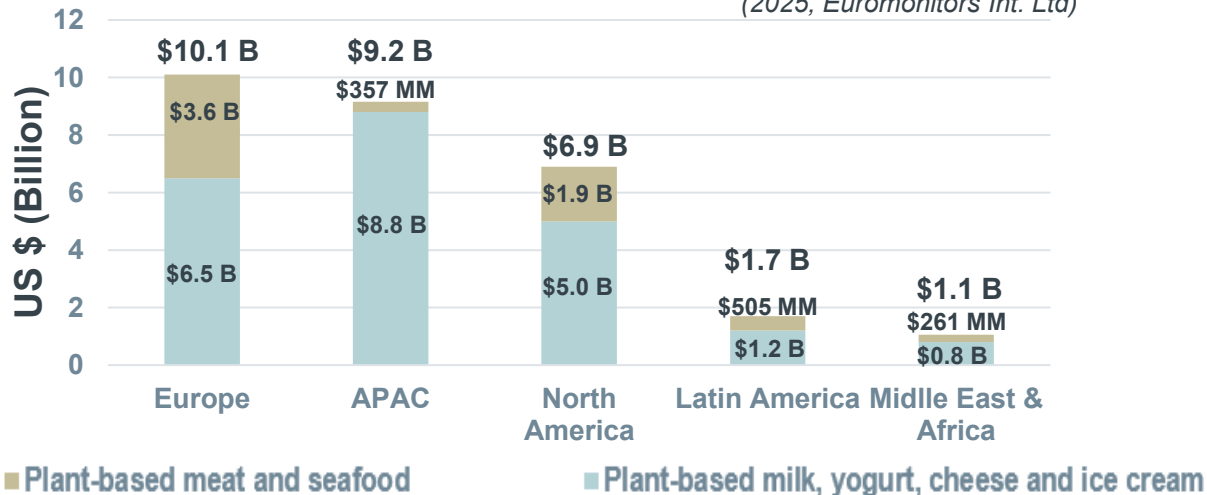
(2025, Euromonitor Int. Ltd)



The two largest plant-based categories are “milk and drinks”, and meat

Global plant-based foods retail sales estimates by region (\$USD)

(2025, Euromonitor Int. Ltd)



Europe is the largest current market (≈40% share), driven by vegan/flexitarian penetration and retail availability



Plant-based yogurt & cheese are the largest categories requiring fermentation >150 K tons

DAIRY ALTERNATIVES INNOVATIONS FIT WITH CONSUMER EXPECTATIONS BUT...

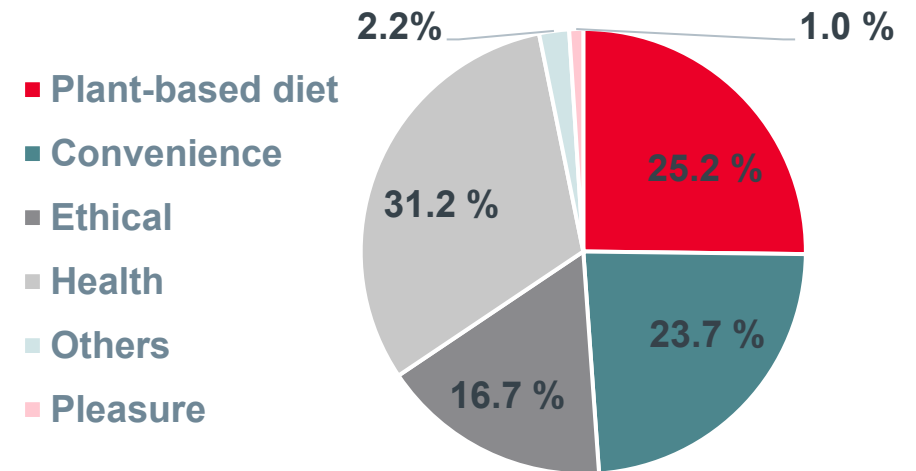
Innovations fits with main consumer expectations :

- Diet evolution (25%)
- Convenience (24%)
- Ethical requirements (17%)
- Health expectations (31%)

But fail to innovate on pleasure! **(only 1% of the innovations!)**

While taste is a critical parameter to ensure a good market share (NECTAR study)

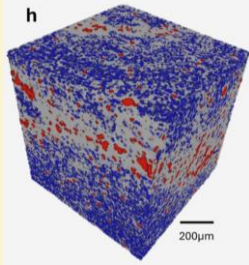
2024 Plant-based dairy alternatives innovations positioning across Europe *(Innova Database)*



WHY PLANT-BASED DAIRY PRODUCT IS STILL A TOUGH CATEGORY

What makes dairy products work

- Naturally structured casein networks



- Historical knowledge in cheesemaking

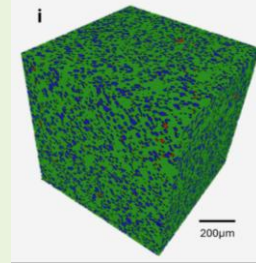
- Aromas development
- Proteolysis management



A self-organizing protein-fat system built by fermentation

What happens with plant-proteins

- No natural protein network



- Use of complex formulation
- **Off-flavors** content
- Complex flavor development

Plant proteins follow different physical, Microbial and sensory rules

What consumers may experience

- Low protein levels
- Inconsistent melt, stretch & aging notes
- Gap between expectation and experience



Taste, texture and nutrition often fall short together



Tomography analysis of commercial hard cheese structure vs commercial plant-based cheese
S. Dobson & A.G. Marangoni, 2025

OUR COMPANY – A PASSION FOR FERMENTATION

Founded in Montréal by Fred A. Lallemmand at the end of the **19th century**



Montreal yeast production started in **1923**



Over **6,500 employees** globally



58 plants including **28 yeast** and **11 bacteria** plants



A worldwide presence



Owned by the Chagnon family since **1952**



SOLUTIONS AND KNOW-HOW FOR A WORLD OF MICROORGANISMS

 ANIMAL NUTRITION	 BREWING	 PERSONAL CARE	 HUMAN HEALTH	 PLANT CARE
 BAKING	 COCOA	 DISTILLED SPIRITS	 OENOLOGY	 SAVOURY INGREDIENTS
 BIOFUELS	 COFFEE	 FERMENTATION MEDIA	 PHARMA	 FOOD CULTURES



LALLEMAND BIO-INGREDIENTS



Yeast-based ingredients & enzymes



LALLEMAND SPECIALTY CULTURES



For cultures

2 business units dedicated to plant-based food industries



LALLEMAND BIO-INGREDIENTS' OFFERINGS



Nutrition built in:

Engevita[®] HiPRO Beyond yeast protein to increase protein content in dairy alternatives and hybrid dairy products, with minimal impact on flavor and aroma

Natural fortification solutions, including **Lalmin[®] Vita D[®]**, a natural, vegan source of vitamin D.

Taste & mouthfeel

Powered by **Lyfe[®]** yeast extracts and natural flavors, supported by **Toravita[®]** masking agents





TRUE PROTEIN QUALITY

HiPRO Beyond delivers a **complete amino acid profile** at 80%+ protein concentration — making it one of the most nutritious non-animal protein sources available.

Its **non-functional nature is a formulation advantage**: with no impact on rheology, it integrates seamlessly into both **sweet and savory applications**, without altering texture or sensory properties.

		Protein content (% of raw material)	Essential amino acids (% of raw material)								ΣEAA (%)	
			Histidine	Isoleucine	Leucine	Lysine	Cys + Met (SAA)	Phe + Tyr (AAA)	Threonine	Valine		
		<i>FAO reference pattern (%)</i>	1,9	2,8	6,6	5,8	2,5	6,3	4,8	3,5		
Commercial plant-based protein isolates*	Animals*	<i>Human muscle</i>	84	2,8	3,4	6,3	6,6	1,7	5,8	2,9	4,3	33,8
		Milk	78	1,9	2,9	7,0	5,9	2,3	7,3	3,5	3,6	34,4
		Egg	51	0,9	1,6	3,6	2,7	1,8	4,1	2,0	2,0	18,7
	Yeast	Engevita® HiPRO Beyond	81	2,2	4,6	7,1	7,5	2,2	7,8	4,2	5,3	41,0
	Cereals	Wheat	81	1,4	2,0	5,0	1,1	1,4	4,9	1,8	2,3	19,9
		Corn	65	1,1	1,7	8,8	1,0	1,4	6,1	1,8	2,1	24,0
		Brown rice	79	1,5	2,0	5,8	1,9	2,6	7,2	2,3	2,8	26,1
	Pulses	Soybean	80	1,5	1,9	5,0	3,4	0,5	5,4	2,3	2,2	22,2
		Pea	80	1,6	2,3	5,7	4,7	0,5	6,3	2,5	2,7	26,3
	Tubers	Potato	80	1,4	3,1	6,7	4,8	1,6	8,0	4,1	3,7	33,4

* Gorissen et al (2018). Protein content and amino acid composition of commercially available plant-based protein isolates. *Amino acids*, 50, 1685-1695.

NUTRITIONAL & SENSORY IMPROVEMENT OF A CLASSIC VEGAN CHEESE BLOCK

- **Engevita® HiPRO Beyond** and **Engevita® Bland Powder** notably enhance the protein levels in vegan cheese blocks.
- **Engevita® HiPRO Beyond** offers a neutral nutritional improvement.
- **Engevita® Bland Powder** enhances and balances the fundamental savory cheese flavors within the starch and oil base.
- **High-Lyfe® 605 A** adds a deep **kokumi** sensation with a lasting finish.

+5g protein!

INGREDIENTS	QUANTITY
	% by weight
Water	34.5
Starch mix (Modified potato starch, Salt, Flavoring, Color)	31.1
Refined coconut oil	26.8
Engevita® HiPRO Beyond	5.05
Engevita® Bland Powder	1.95
High-Lyfe® 605 A	0.24
Lactic acid	0.24
Black pepper	0.12
TOTAL	100.0

PLANT-BASED PROTEIN SHAKE – 100% YEAST PROTEIN

Vegan allergen-free protein based on yeast protein.

Engevita® HiPRO Beyond provides high quality protein and ensures a neutral taste.



INGREDIENTS	QUANTITY
	% by weight
Water	82.6
Engevita® HiPRO Beyond	13.5
Sucrose	5.00
Ube Flavoring	0.50
Xanthan gum	0.08
Total	100

11% high quality protein

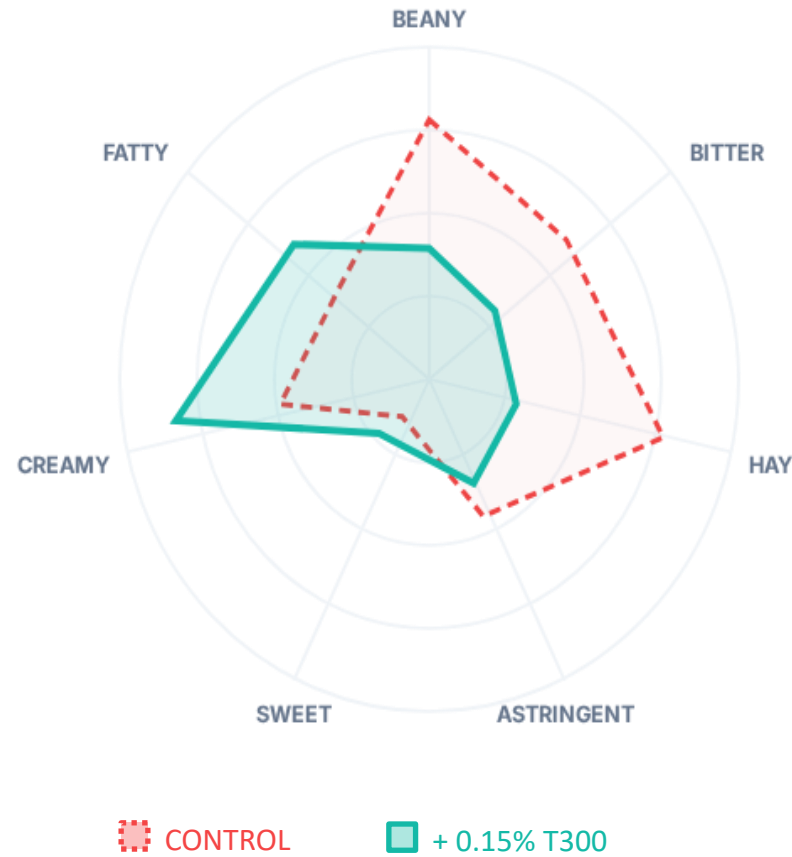
X 1.5 times market standards!

**Stop by Booth F12
and taste it today**

OPTIMIZATION OF SENSORY PROFILE: UNSWEETENED SOY MILK

Internal Panel screening:
Optimized flavor modulation with 0.15% Toravita® 300 addition

ATTRIBUTE	CONTROL	T300	DELTA (Δ)
Beany	7.82	3.84	-3.98
Bitter	5.61	2.64	-2.97
Hay	5.12	3.15	-1.97
Astringent	4.12	3.14	-0.98
Sweet	1.84	3.32	+1.48
Creamy	3.42	5.39	+1.97
Fatty	2.82	3.84	+1.02



Expert internal panel (n=5); potential institutional bias acknowledged.
Results demonstrate high fidelity and strong correlation with external quantitative descriptive analysis from a trained laboratory panel (n=8).



LALLEMAND SPECIALTY CULTURES



> Dedicated on specialty cultures tailored for **dairy, meat, and plant-based** food applications.

SURFACE

STARTER / ACIDIFICATION

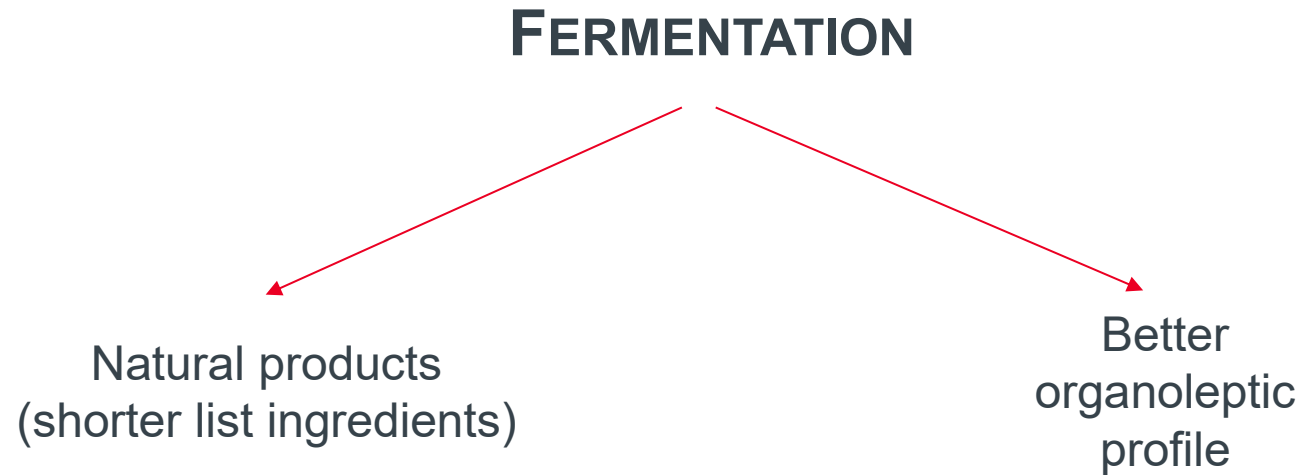
RIPENING

BIOPROTECTION



100 % plant-based compatible cultures





Taste
#1 Plant-Based default*



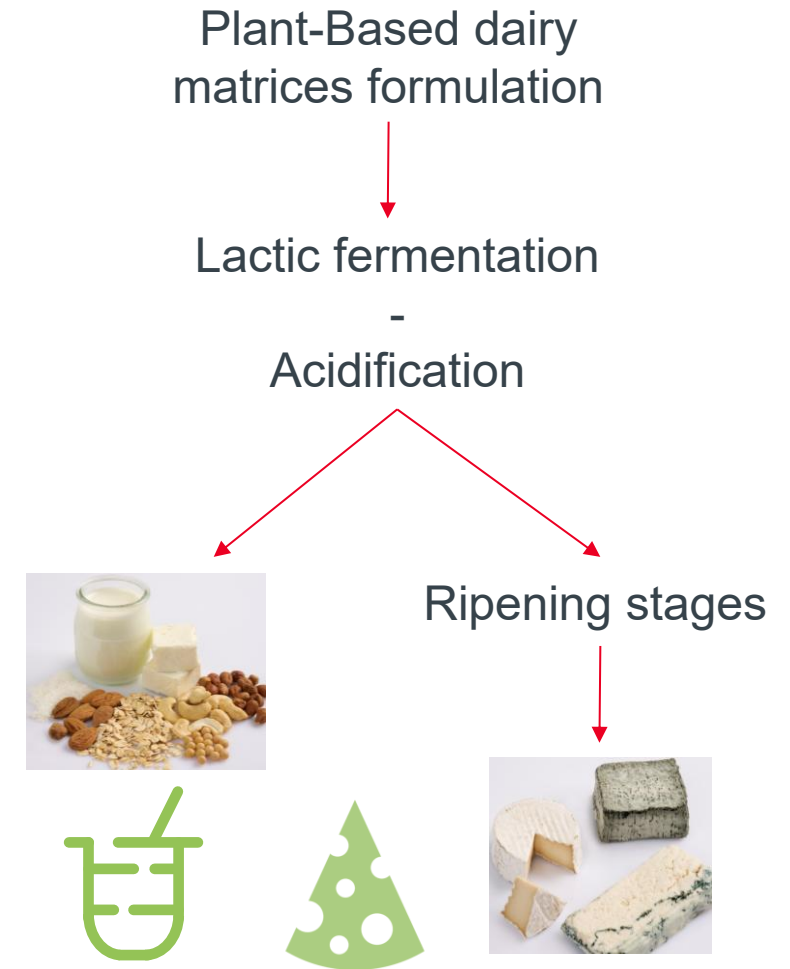
Clean label

An **opportunity** to answer consumer expectation :

- **Better taste & experience**
- **Clean-label**

*NECTAR. Taste of the Industry 2026: A Sensory Analysis of Dairy-Free Products. Food System Innovations, 2026.

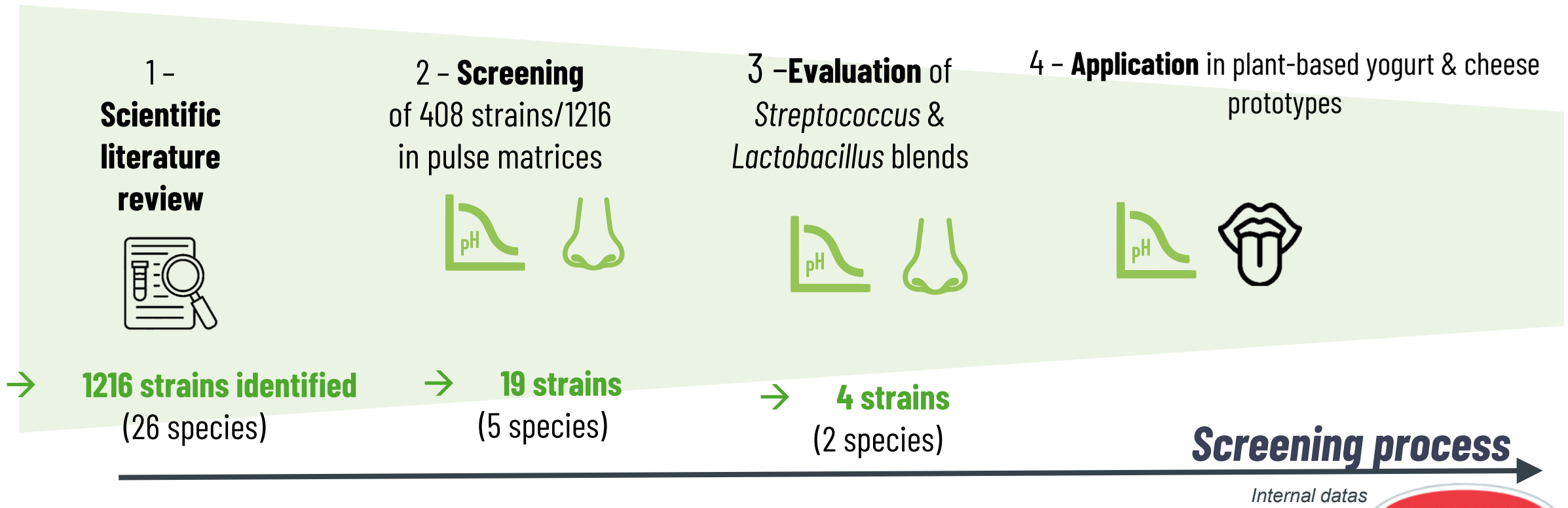
- **Plant-Based yogurt & plant-based ripened cheese :**
 - Both rely on a controlled acidification step as the starting point
- **Plant-based cheese :**
 - Requires an additional ripening step to develop flavor
 - Our historical expertise
- **Key Challenge :**
 - Plant-Based matrices complexities do not allow the direct use of standard dairy developed cultures



PLANT-BASED FERMENTED DAIRY ALTERNATIVES



- **Acidification** is a key lever to **reduce** plant-based **off-flavors** and build product richness
- Combining **fast acidification** with a **positive organoleptic** profile remains **challenging**
- Development of a tailored & versatile starter cultures for plant-based matrices :

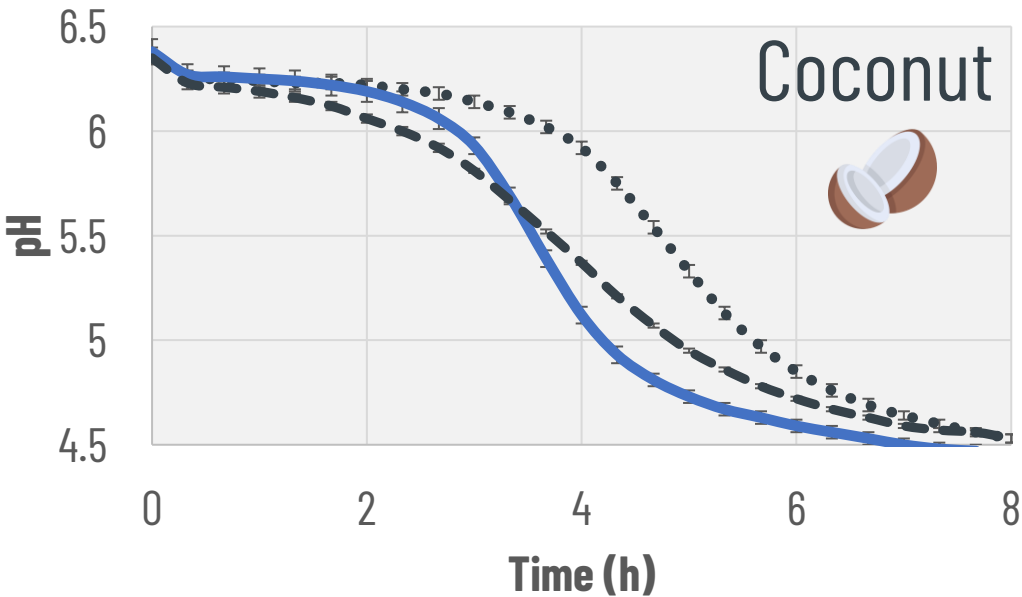


PLANT-BASED FERMENTED DAIRY ALTERNATIVES



- Validated on industrial plant-based cheese & yogurt prototypes

Standardized at 3,7 g proteins /100 g product



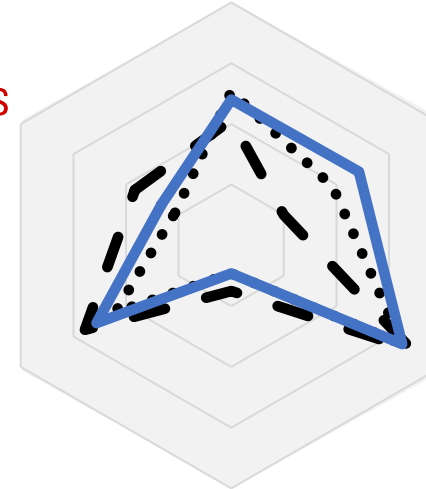
Dairy notes

Green notes

Acidity

Astringency

Coconut notes



— Developed starter
 - - - Market references

Bitterness



soy – oat – almond



Confirmed performance across the most representative plant-based yogurt matrices on the market

- Obtention of a **versatile** plant-based **starter** delivering **fast acidification** and **positive organoleptic** properties

Internal datas



PLANT-BASED FERMENTED DAIRY ALTERNATIVES



- **Ripening :**
 - A multiparameter process, involving a **complex microbial ecosystem**
 - Allow to **naturally develop surface & flavor** complexity
 - Applied to :
 - white bloomy, smear-ripened & blue-style plant-base cheeses
- **Our surface & ripening cultures portfolio** already offer a range off **plant-based compatible solutions**



- **Actively working** on plant-based complexities with relevant **industrial partners (Cocagne project)**



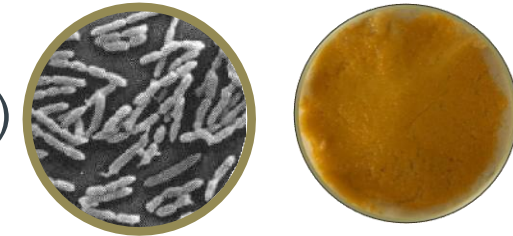
Internal datas



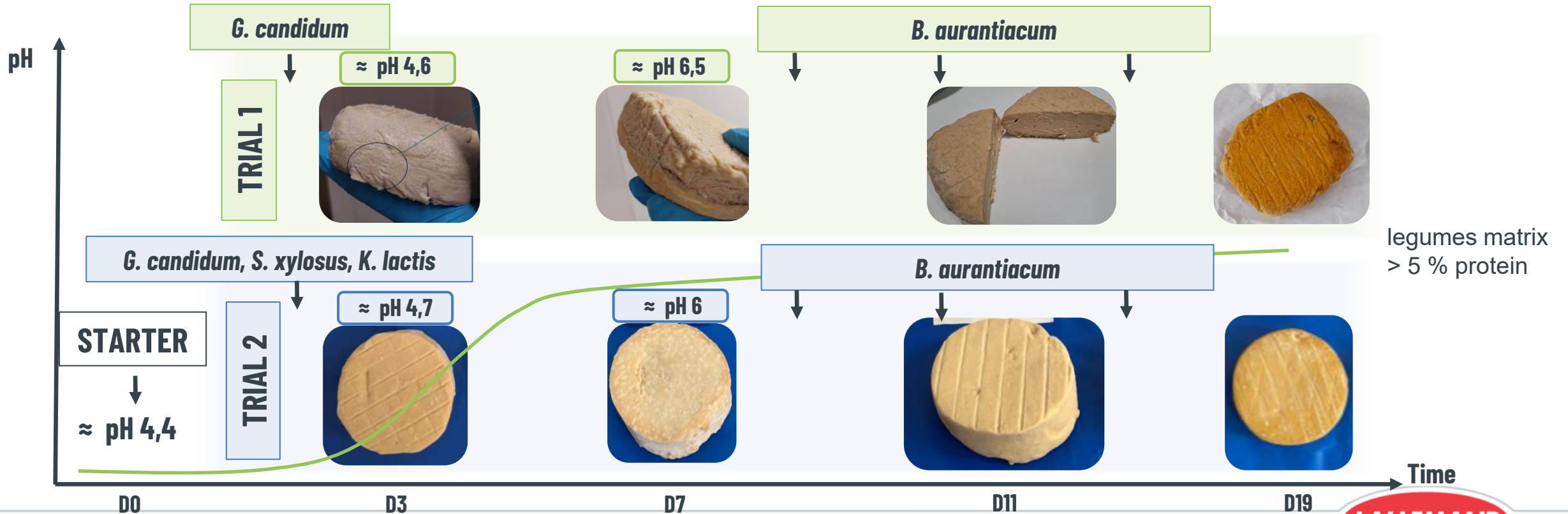
PLANT-BASED FERMENTED DAIRY ALTERNATIVES



- A challenging application : Plant-Based smear-ripened cheese
- Requires a **deacidification** step to enable **surface development** (*B. aurantiacum*)
 - Achieves a **natural rind color** : no used of artificial pigment (annatto)
 - Enables **development complex aromas**



B. aurantiacum



CONCLUSION

➤ 2 complementary approaches to enhance plant-based dairy alternatives



Ingredient-based approach

- With Yeast-derived solutions
 - Optimization of nutritional profile
 - Improvement of taste and overall sensory perception



Fermentation driven approach

- Carefully selected and developed cultures are a key lever to enhance:
 - Taste
 - Aromatic profile
 - Appearance



Clean Label

- Both approaches :
 - **addressing** the #1 consumer expectation: **taste**
 - Offering **clean label** solutions
- With **microbial innovations**



Thank you for your time and attention

Visit our booth F12



LALLEMAND BIO-INGREDIENTS

Yeast-based specialties for the
food industry



LALLEMAND SPECIALTY CULTURES

We make cultures
our specialty



Enzymatic solutions to optimize
processes and product quality

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