

FNI 800

A nutrient solution for the optimal
production and stability of probiotics

INDUSTRIAL CONTEXT

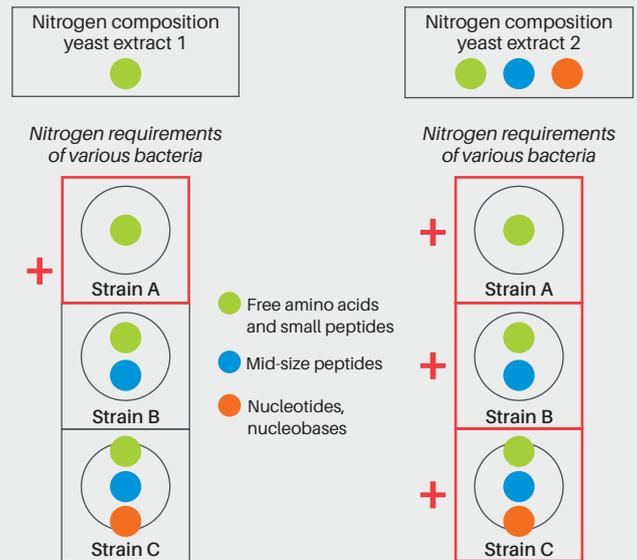
The probiotic market is a rapidly growing sector, and industry players are constantly increasing industrial fermentation capacities to meet that expanding demand. Today's probiotic market is driven by multiple strains of yeast and bacteria, including the lactic acid bacteria (LAB) family. There are two main challenges in producing high quality and cost effective biomass: ensuring optimal nutrition during fermentation to reach a high cell count at the end of the process and at the same time ensuring that bacteria will be robust enough to go through downstream process steps, such as freeze-drying, while still remaining active and viable.

A broad number of lactic acid bacteria used in the industry are selected for their probiotic activities but their nutritional requirements during fermentation are not often considered. The literature frequently reports the incapacity of many bacteria to perform *de novo* synthesis of some amino acids, small peptides or nucleobases. These auxotrophies can inhibit or slow down microorganism growth if these molecules are not present in their fermentation medium.

Yeast extracts (YE), a common source of nutrients used in the production of probiotics, are very different in their composition and may not always meet the nutritional requirements of the most demanding bacteria strains.



Schema illustrating the nitrogen requirements of various bacteria



Yeast extracts used in bacteria fermentation may have diverse compositions. **Yeast extract 1** mainly contains free amino acids and peptides and is suitable for the less demanding bacteria strains (**Strain A**). In addition to free amino acids and peptides, **Yeast extract 2** also contains mid-size peptides and nucleotides and will meet the requirements of most of bacteria strains, including the most demanding strains (**Strains A, B and C**).

NUTRIENT SOLUTIONS

To meet the need for high performance nutrients in the production of probiotics and other demanding bacteria, Lallemand has developed **FNI 800**, a fermentation nutrient solution designed for:

- **optimal growth in the fermentation** of a broad range of lactic acid bacteria, including the most demanding probiotic strains (Figure 1)
- **enhanced stability and viability** of freeze dried probiotics and cultures (Figure 2)

Performance of the yeast peptone **FNI 800** on the growth of *L. bulgaricus* (Lallemand strain, industrial conditions)

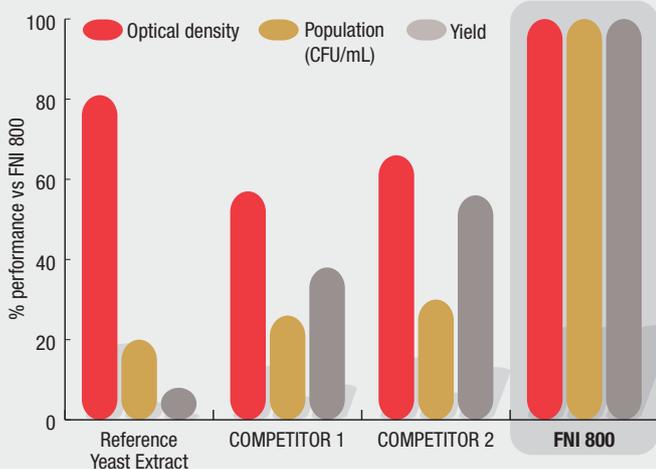


Figure 1: Four yeast extracts were tested for their performance in *L. bulgaricus* RXXX growth using an industrial medium (2L, batch conditions, pH regulated, anaerobic). At the end of propagation time, the optical density was measured at 600 nm and the population was counted on MRS medium. The results from the yeast extracts were compared to **FNI 800**.

Yield after freeze-dried *L. bulgaricus*

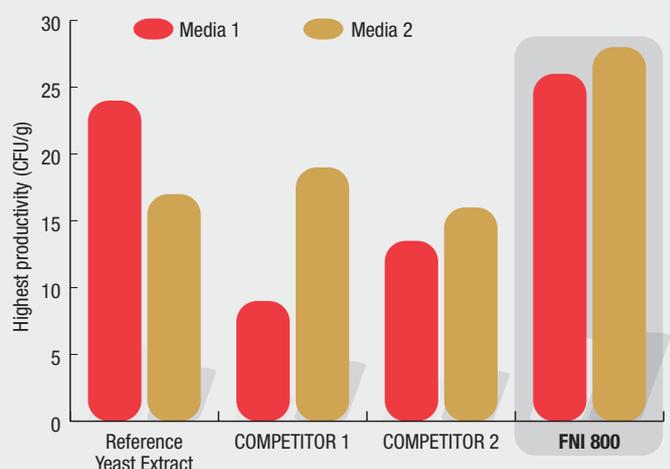


Figure 2: Four yeast extracts were evaluated for their effect on stability of *L. bulgaricus* RXXX in powder form. After fermentation, the biomass was concentrated by centrifugation and mixed with a standard cryoprotectant before freeze drying. The populations (CFU/g) were measured on MRS media and compared with **FNI 800**.

PRODUCT TECHNOLOGY

FNI 800: a sound combination of yeast components that make our product a unique solution

FNI 800 is a broad spectrum nutrient containing nitrogen in the form of free amino acids, peptides, nucleosides, nucleotides and other bioactive molecules (Table 1).

FNI 800 is a well-balanced combination of peptides (Figure 3), nucleosides and nucleotides (Figure 4).

This unique composition will meet the nutritional needs of most lactic acid bacteria, even the difficult and cumbersome ones. FNI 800 acts as a broad **auxotrophy corrector**.

Table 1:
Composition profile of FNI 800 yeast extract

	Standard YE	FNI 800
Free amino acids and small size peptides	⊗ ⊗ ⊗	⊗ ⊗
Mid-size bioactive peptides	⊗	⊗ ⊗ ⊗
Other bioactive molecules (nucleotides, nucleosides)	⊗	⊗ ⊗ ⊗

FNI 800: high content of bioactive mid-size peptides (50% of total peptides)
Molecular weight distribution

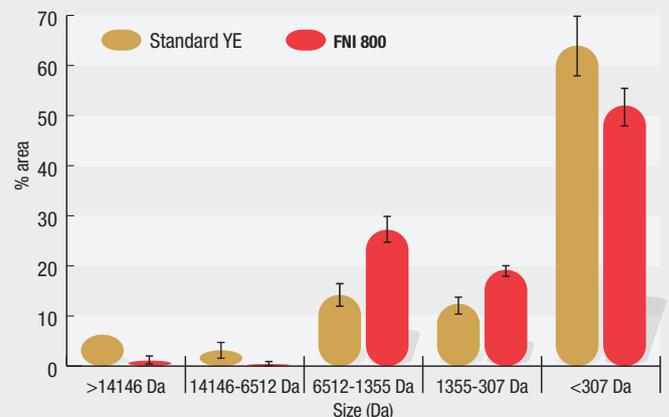


Figure 3: High performance size exclusion chromatography (SEC) has been used to separate proteins and peptides representing different molecular weights for yeast peptone FNI 800 versus a standard yeast extract. Analyses were done on 3 different lots. The proportion of mid-size peptides (300 to 6500Da) in FNI 800 represents 50% of total peptides.

FNI 800: balanced level of nucleosides

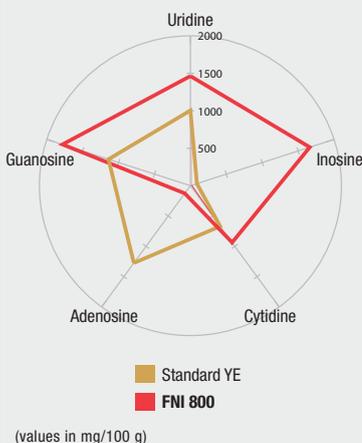
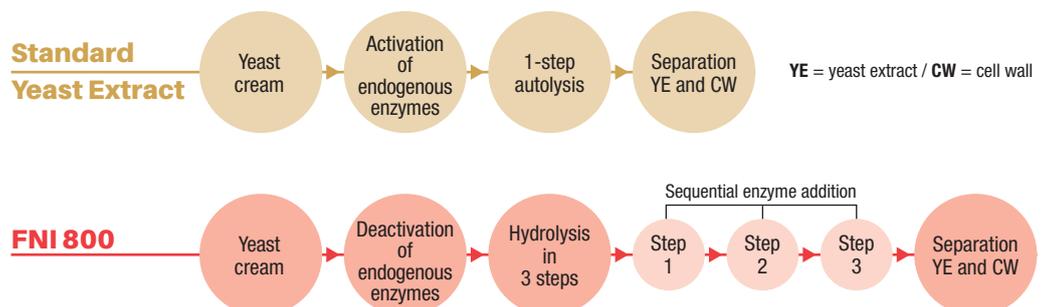


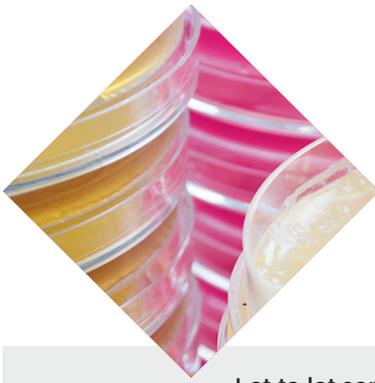
Figure 4: nucleoside profile or TPAN (Total Potentially Available Nucleotides) for FNI 800 compared to a standard yeast extract.

FNI 800: a sequential, multi-step enzymatic process to obtain a unique product performance

Lallemand has developed a proprietary technology to produce FNI 800 from a primary grown baker's yeast cream.

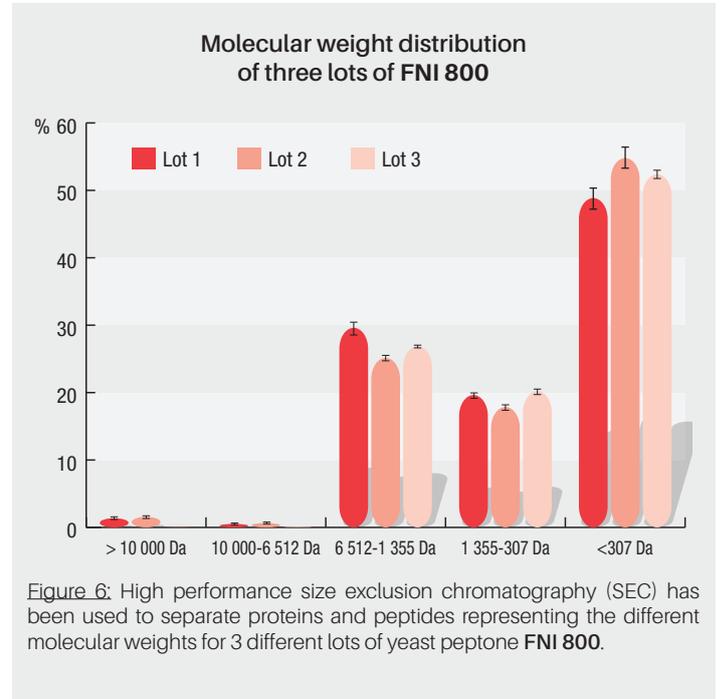
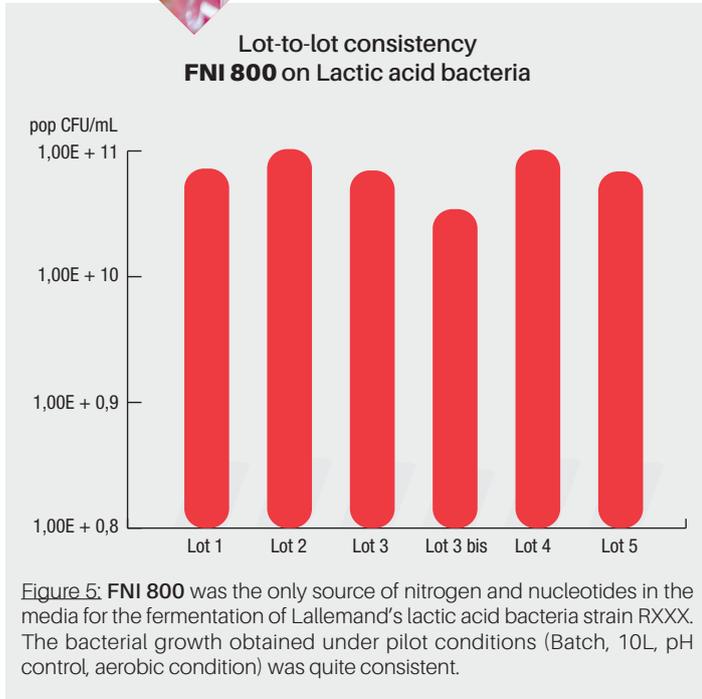
- **Endogenous enzymes deactivation:** to limit the autolysis of yeast and reach a high level in mid-size peptides
- **Sequential enzyme addition:** 3 steps to enrich the final yeast extract in nucleosides and nucleotides





FNI 800: The guarantee of a consistent and stable product

Our strict controls in the manufacturing process of **FNI 800** guarantee batch-to-batch consistency in product performance (Figure 5) and composition (Figure 6).



Lallemand Bio-Ingredients **FNI 800** is a water-soluble yeast peptone produced by the controlled enzymatic solubilisation of a primary grown yeast of the genus *Saccharomyces cerevisiae*. FNI 800 is a spray-dried and micro-agglomerated powder.

It is recommended for *Lactobacilli* and *Bifidobacteriae*, particularly the most tedious to grow.

FNI 800 is:

- Kosher certified
- Halal certified
- GMO Free



It is also available as a pumpable liquid (50% solids) which is stable for two years at ambient temperature.



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