LALLEMAND

BAKING UPDATE

SPECIAL EDITION

Bread Fortification with Vitamin D

Practical technology from Lallemand Inc., parent of American Yeast, producers and distributors of Eagle® yeast, fresh and instant.

VITAMIN D: NOT JUST FOR BONE HEALTH

Vitamin D is well known for its key role in forming and maintaining bone tissues through calcium and phosphate regulations. However, increasing numbers of evidence recognize the importance of adequate Vitamin D serum levels to support a healthy life.

Improving Glycemic Control – The presence of Vitamin D receptors on tissues requiring insulin for glucose uptake suggests a role of this vitamin in glucose utilization and insulin sensitivity. It has been shown to stimulate insulin secretion, a hormone secreted by pancreatic cells which allows glucose to be utilized by the body.

Preventing Type 2 Diabetes – Individuals with prediabetes tend to have lower serum 25-hydroxyvitamin D (25(OH)D) than people with normal glucose control. In addition, people with prediabetes symptoms and Vitamin D deficiency are at greater risks of progressing to Type 2 diabetes. This progression can however be halted by increasing Vitamin D intake through food or supplementation. Indeed several studies shown that a greater Vitamin D intake can reduce the level of glycated hemoglobin (HbA1C), an indicator of elevated blood glucose, and improve insulin sensitivity, glucose metabolism and glycemic control.

Improving Cognitive Performance – Vitamin D is increasingly considered necessary for normal brain development and function. Vitamin D receptors and enzymes involved in Vitamin D activation may be found in the central nervous system suggesting the importance of this vitamin on the brain functions. The reported Vitamin D physiologic effects include nerve impulse transmission, neuron and neuron junction synthesis, amyloid clearance to avoid its harmful accumulation in tissues and neuronal death prevention. Studies have shown that greater serum levels of 25(OH)D are associated with lower rates of Alzheimer's disease, and amyotrophic lateral and multiple sclerosis.

Lower Cancer Risk – Impacts of Vitamin D on cancer incidence, progression and mortality have been extensively studied in the past decades, and Vitamin D appears to play a positive role against breast and colorectal cancers. Inverse association have been reported between 25(OH)D and incidence and mortality rate of colorectal cancer. Higher serum 25(OH)D levels are associated with lower risks of breast cancer progression and mortality rates.

VITAMIN D DEFICIENCY EVIDENT THROUGHOUT EUROPE

Vitamin D status is determined by measuring serum 25(OH)D, an indicator of supply rather than function. Rickets and osteomalacia, bone diseases caused by Vitamin D deficiency, are associated with serum 25(OH)D values below 25 nmol/L. More recently, the term *Vitamin D insufficiency* has been used to describe suboptimal Vitamin D levels. Indeed, serum 25(OH)D levels below 50 nmol/L have been associated with increased risk of many diseases. As illustrated in the table below, this condition affects, although at varying degrees, a significant proportion of the EU population.

COUNTRIES	PERCENTAGE OF THE POPULATION WITH VITAMIN D LEVELS BELOW 50 NMOL/L
Austria	39.8-43.5
Belgium	-
Bosnia and Herzegovina	-
Bulgaria	-
Croatia	32.2
Czech Republic	-
Denmark	23.6 - 36.8
Estonia	-
Finland	63.7 - 76.1
France	34.6
Germany	45.6 - 56.0
Hungary	-
Iceland	33.6
Italy	30 - 64
Netherlands	33.6
Norway	27.9
Poland	65.8
Portugal	48 - 66
Russian Federation	60 - 83
Serbia	-
Slovakia	15
Spain	51
Sweden	17.1 - 23.1
Switzerland	53.4 - 61.6
Turkey	71.5
Ukraine	50.1
United Kingdom	55.4 - 57.9

According to a study published in 2016 in the American Journal of Clinical Nutrition, overall 40% of the European population was reported having insufficient Vitamin D levels. This trend has not only been observed in higher latitude countries, but also in areas where UVB radiation from sun light exposure allows for yearlong Vitamin D skin synthesis. This could be due to various factors:

- Low dietary intake (food not fortified with Vitamin D)
- Darker skin pigmentation
- Limited skin sun exposure due to clothing or sunscreen
- Reduced Vitamin D synthesis due to aging (+ 60 y.o.)
- Medications interfering with Vitamin D formation and degradation (antiretroviral, glucocorticoids and anticonvulsants therapy)

Several strategies aiming adequate Vitamin D intake levels for the majority of the European population were investigated. In July 2018 a Review and Guidance paper was published, in which 35 world-renown Vitamin D expert doctors, nutritionists, endocrinologists and university researchers called for a systemic food fortification to help close the gap between the current nutritional Vitamin D recommendation and actual intake, and prevent the significant public health burden linked with Vitamin D deficiency.

BAKER'S YEAST MAKES BREAD A DAILY SOURCE VITAMIN D

Baker's yeast can naturally produce Vitamin D, similar to humans. Our bodies can make Vitamin D when sunlight hits our skin. Yeast also naturally produces Vitamin D when exposed to UV light.

Lallemand Baking has developed a process that allows baker's yeast (*Saccharomyces cerevisiae*) to convert endogenous ergosterol to Vitamin D2 (ergocalciferol). According to the Commission Implementing Regulation (EU) 2018/1018, this natural and vegetarian source of Vitamin D can be incorporated into certain foods, including:

FOOD CATEGORY	MAXIMUM LEVELS OF VITAMIN D (µg /100G)
Yeast-leavened breads and rolls	5
Yeast-leavened fine bakery wares	5
Pre-packed fresh and dry yeast for home baking	45 (fresh yeast) 200 (IDY)

Lallemand Baking has investigated the thermo-stability of Vitamin D in its VitaD® yeast during the baking process. No significant Vitamin D losses were observed during the different baking steps (ingredient blending, dough proofing, baking) and a high Vitamin D recovery efficiency was achieved. These results also suggest that Vitamin D in VitaD® yeast is stable when exposed to high temperature (227°C).

During storage at room temperature, bread is exposed to oxygen and light that may affect the stability of Vitamin D. Therefore Lallemand Baking investigated possible Vitamin D losses during storage at room temperature. Vitamin D analyses were done on fresh, 4 and 14 days old white and whole wheat bread samples stored at room temperature. The Vitamin D content in bread remained stable throughout that storage period.

LALLEMAND BAKING VitaD® YEAST PRODUCTS

Lallemand Baking offers every baker the possibility to make bread a daily vegetarian source of Vitamin D. For artisanal and industrial bakers considering Vitamin D enrichment, Lallemand Baking offers various solutions to ensure absolute convenient and accurate scaling based on flour weight:

- ***Instaferm® VitaD® Plus Concentrate***
  (inactive Vitamin D yeast for flour enrichment)
- ***Instaferm® VitaD® Premixes***
  (blends of Vitamin D and flour)

Pre-packed fresh block yeast and instant dry yeast already enriched with Vitamin D yeast are also available, sold under different Lallemand Baking yeast brands (***Drozdze, Euroferm, Fermipan, Lal'Ferm, Prima***).

For home bakers, Lallemand sells at retail level pre-prepacked fresh yeast and instant dry yeast enriched with Vitamin D yeast (Cubes: ***Malteserkors VitaD*** & ***Wieninger VitaD;*** Sachet: ***Activa VitaD***).

LALLEMAND
BAKING UPDATE

Lallemand Baking Update is produced by Lallemand Inc. to provide bakers with a source of practical information and technology for solving problems. If you would like to be on our mailing list to receive future copies, or if you have questions or comments, please contact us at:

LALLEMAND Inc. | 1620 Préfontaine | Montréal | QC | H1W 2N8 | CANADA
tel: (800) 840-4047 (514) 522-2133 | fax: (514) 255-6861
email: baking@lallemand.com | www.lallemandbaking.com

FOOD FORTIFICATION WITH VITAMIN D

Food fortification is not a new idea, in fact it dates back to the early 1920s, where iodized salt was introduced to combat goiter. Once pure vitamins could be synthesized at an industrial level, food fortification became commonplace in the 1930s and 1940s. Vitamin D food fortification was introduced at that time in the United States and many other industrialized countries such Great Britain. In particular Vitamin D fortified milk was produced at that time, but Vitamin D was also added to a variety of foods and beverages including amongst others beer, bread and custard.

The Vitamin D food fortification policies were extremely effective in eradicating rickets. Their development was guided by the following fundamental principles:

- The intake of the nutrient, in the absence of fortification, is below the desir able level in the diets of a significant number of people.
- The food from which the nutrient is to be obtained is likely to be consumed in quantities that will make a significant contribution to the diet of the population in need.
- The addition of the nutrient is unlikely to create an imbalance of essential nutrients.
- The nutrient added is stable under proper conditions of storage and use.
- The nutrient is physiologically available from the food to which it will be added.
- There is a reasonable assurance against intake sufficiently in excess to be toxic.

Today again Vitamin D food fortification seems to be the most appropriate way of improving Vitamin D intake and status in the general population in order to meet dietary recommendations. This could be done by simply adding Vitamin D to food or by "bioaddition." Examples of bioaddition include feeding hens with Vitamin D to increase the content of the eggs, increasing Vitamin D content of feed for farmed fish or livestock animals to increase their flesh content. The UV exposure of mushrooms or yeast (that can be used to make bread), which facilitates the conversion of ergosterol to Vitamin D2, is another bioaddition solution.

The Commission Regulation (EU) 1925/2006 currently dictates the permitted addition of vitamins and minerals to food. The reference intake for Vitamin D is 5 µg per day.