

IA ET FERMENTATION - UNE PERSPECTIVE INDUSTRIELLE

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DANONE
ONE PLANET. ONE HEALTH

Insert Section title here

INTRODUCTION A DANONE



DANONE
ONE PLANET. ONE HEALTH



DANONE EST UN LEADER AGROALIMENTAIRE MONDIAL, AVEC UNE PORTEFEUILLE PRODUITS FOCUS SANTE

NOTRE MISSION

“APPORTER LA SANTÉ PAR
L'ALIMENTATION AU PLUS GRAND
NOMBRE”

NOTRE VISION

One Planet. One Health

CHIFFRES CLES

TOP 10 MARCHES EN 2022

(% CA)



UNE PRESENCE GLOBALE

120+

Pays où les produits Danone sont disponibles

96,000+

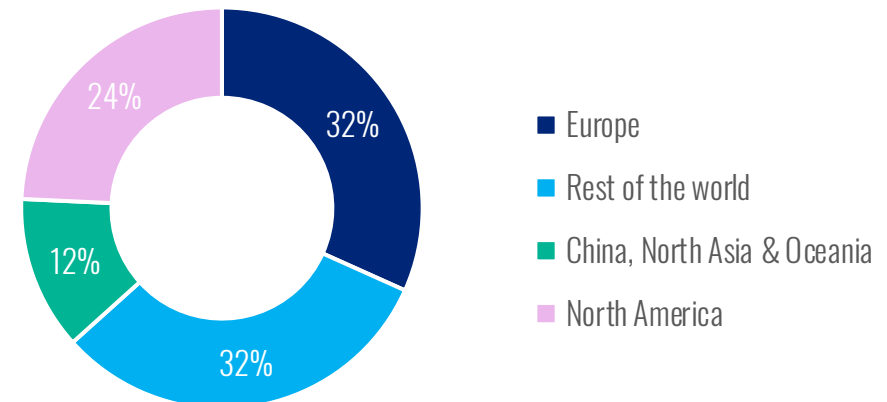
Salariés dans plus de 55 pays

CA EN 2022



(1) LIKE-FOR-LIKE.

CA PAR REGION



TROIS CATEGORIES DE PRODUITS SANTE

54% LAITIERS & ORIGINE VEGETALES













Fresh dairy Plant-based spoonable Plant-based beverage Coffee creamer High Protein

#1
MONDIAL

En produits laitiers frais & boissons & aliments d'origine végétales

30% NUTRITION SPECIALISEE











Formula milks Specialized pediatrics Baby food Adult medical nutrition

#2
MONDIAL

en nutrition infantile

#1
IN EUROPE

En nutrition médicale pour adultes

16% EAUX













Plain Still Flavored Still Sparkling Plain Sparkling Flavored Functional

#2
MONDIAL

en eaux embouteillés

RESEARCH & INNOVATION AT DANONE

1700 EXPERTS en
1 CENTRE GLOBALE
2 SITES ET
6 HUB SPECIALISE



DANONE RESEARCH & INNOVATION, SITEX CENTER

Madrid, Spain

A unique semi-industrial scale pilot plant for Dairy and Plant-Based products processing, supported by experts on product-process interaction.



DANONE NUTRICIA RESEARCH & INNOVATION CENTER

Utrecht, Netherlands

Supporting the Specialized Nutrition categories: baby formula, specialized pediatrics & adult medical nutrition



DANONE RESEARCH & INNOVATION, THE PLANT-BASED CENTER

Wevelgem, Belgium

Dedicated to the Plant-Based category in a center equipped with a semi-industrial scale pilot to reduce industrial trials.



DANONE RESEARCH & INNOVATION, OPEN SCIENCE RESEARCH CENTER (OSRC)

Shanghai, China

Supporting on life-transforming nutrition, consumer co-creation, early-life nutrition and healthy aging, core milks, and FSMP products, human milk, digital health tech, personalized nutrition, and nutrition efficiency via gut.

1997

2012

2013

2017

2018

2020

2023



DANONE RESEARCH & INNOVATION, PACKAGING CENTER

Evian, France

Supporting packaging development from design, simulation, material prototyping, small-scale production, quality check to full transport qualification, for all Danone's categories.



DANONE RESEARCH & INNOVATION, THE GREENHOUSE

Louisville, USA

Specialized in Dairy and Plant-Based categories, with capabilities covering a wide range of formats, process and packaging technologies.



DANONE RESEARCH & INNOVATION, PRECISION NUTRITION D-LAB

Singapore

A global innovation hub, harnessing science, technology & data to design customer-centric services, developing digital solutions to help parents, adults, and patients to unlock the best nutrition.



INTERNATIONAL RESEARCH & INNOVATION CENTER DANIEL CARASSO

Paris-Saclay, France

Dedicated to our Dairy, Plant-Based, and Waters categories, to advance research and innovation on human microbiota, and on the benefits of lactic ferments and mineral water.

DANONE & FERMENTATIO N





1919



LA FERMENTATION CHEZ DANONE

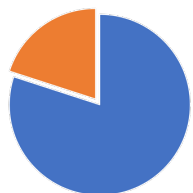


>40% du CA de DANONE sont des produits fermentés avec des cultures ou probiotiques*



Les produits fermentés ont une forte valeur ajoutée

"Never forget that cultures are the cheapest we buy - you buy 1 and get 1 for free after 20 min"

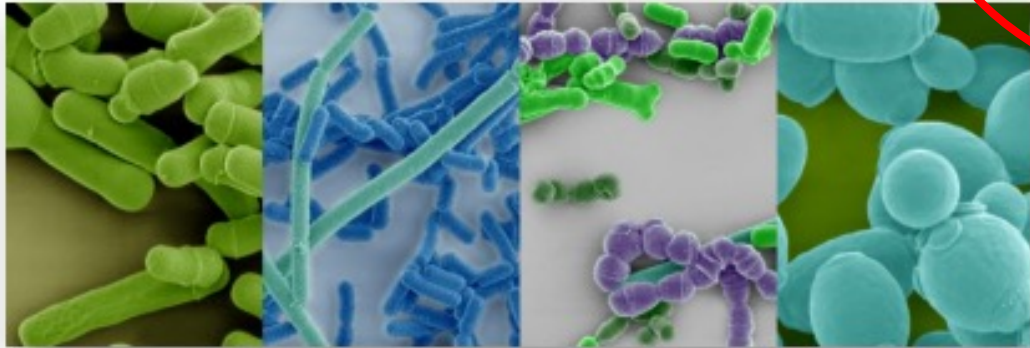


80% de CULTURES dans nos produits sont exclusive à



APPORT DE IA DANS LA FERMENTATION

UNIQUE & DIFFERENTIATING PROPRIETARY STRAIN COLLECTION



IA, DATA & MODELISATION CHEZ DANONE

Santé Digital



> J Pediatr Gastroenterol Nutr. 2021 Feb 1;72(2):255-261. doi: 10.1097/MPG.0000000000003007.

Machine Learning Supports Automated Digital Image Scoring of Stool Consistency in Diapers

Thomas Ludwig ¹, Ines Oukid ², Jill Wong ¹, Steven Ting ¹, Koen Huysentruyt ³, Puspita Roy ¹, Agathe C Foussat ¹, Yvan Vandenplas ³



PATENT-FILED DNA-powered maternal nutrition coaching with **machine learning**, to optimise prenatal nutrition and baby's future health
Proven significant nutritional improvements in maternal (Ca, Folate, Iron & key Vitamins)

Modélisation mécanistique



A transient mechanistic two-fluid model for Direct Contact Condensation

S.S. Safavi Nic ^{a,b}, T.E. Kuipers ^a, K.A. Buist ^{a,*}, R.E.M. Verdurmen ^b, J.A.M. Kuipers ^a

^a Multiphase Reactors Group, Department of Chemical Engineering and Chemistry, Eindhoven University of Technology, P.O. Box 513, 5600 MB, Eindhoven, the Netherlands
^b Danone Nutricia Research, the Netherlands

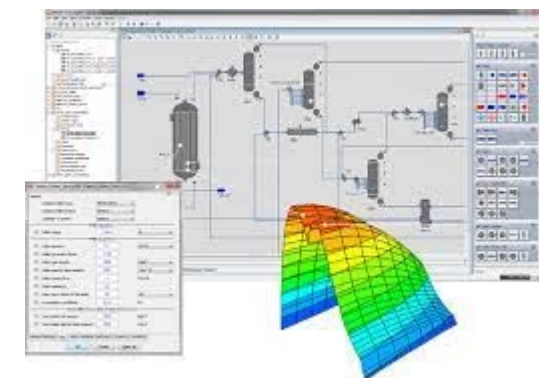
RESEARCH ARTICLE

Transport Phenomena and Fluid Mechanics

AICHE JOURNAL

An objective classification of condensation regimes in direct contact condensation

Sherwin S. Safavi Nic ^{1,2} | Tijmen H. P. van Veen ¹ | Kay A. Buist ¹ |
Rud E. M. Verdurmen ² | J. A. M. Kuipers ¹



LIMITATIONS DE LA MODÉLISATION MÉCANISTIQUE VS FERMENTATION

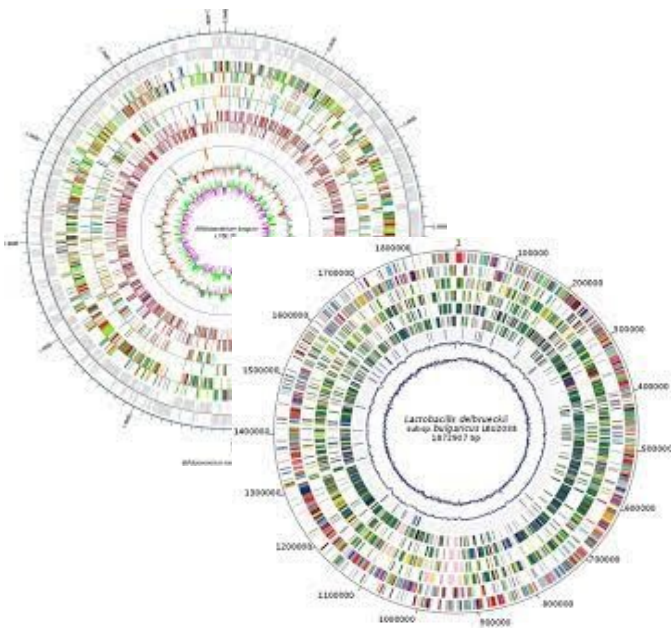
5 souches en co-fermentation :

Lactobacillus bulgaricus * 2,

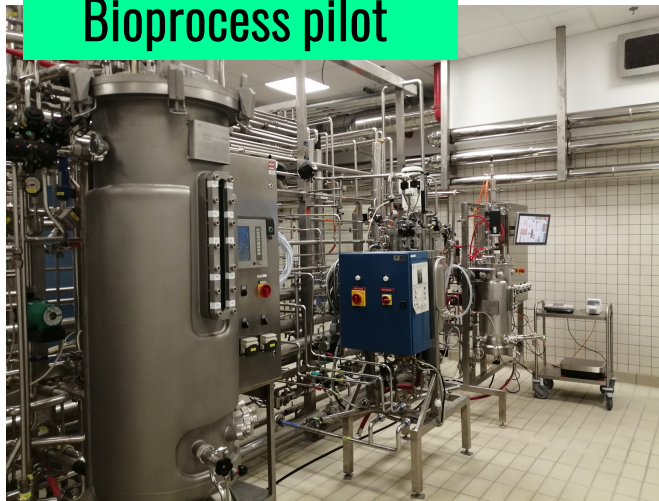
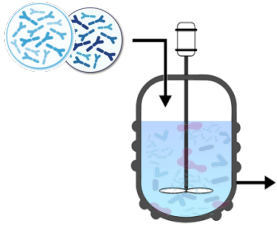
Streptococcus thermophilus,

Lactococcus lactis

Bifidobacterium lactis DN 173 010/CNCM I-2494.



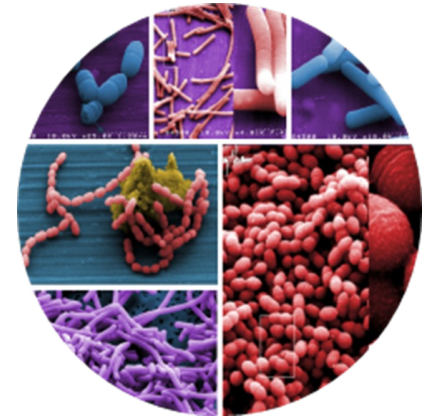
PROCESS DE FERMENTATION D'AUJOURD'HUI



Bioprocess pilot

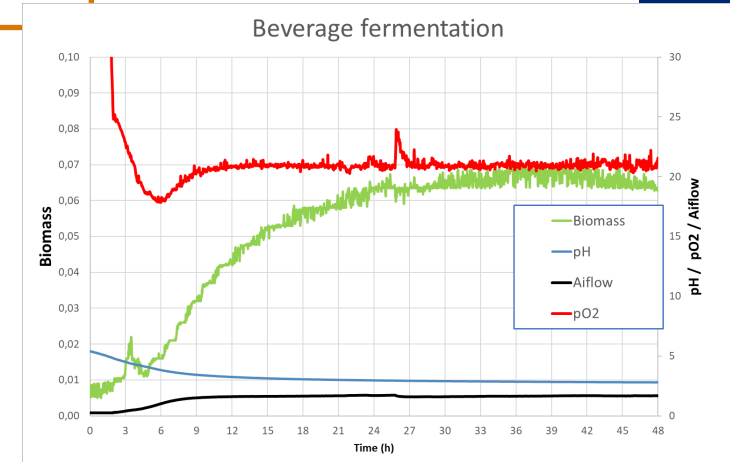
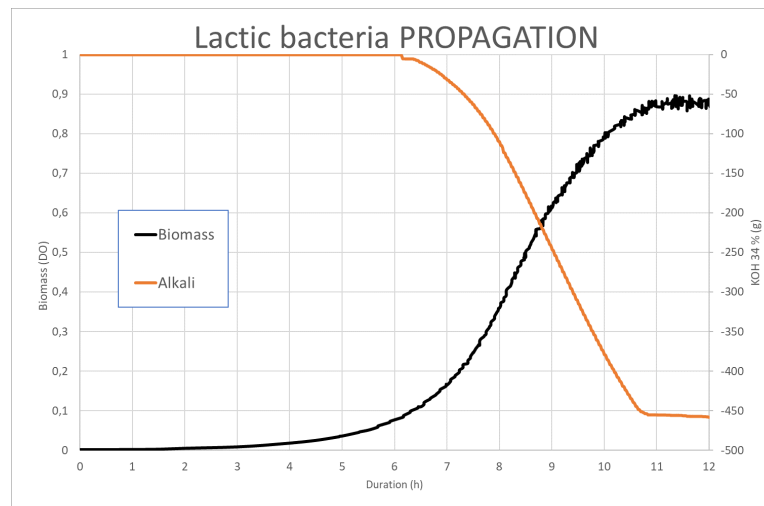
Control

- pH
- Température
- Agitation
- Substrat
- Air / O₂ Inlet
- Pression
- pO₂

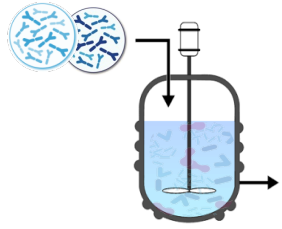


Mesures

- pH
- Température
- Agitation
- Biomasse
- O₂ / CO₂ Outlet
- Pression
- Dissolved O₂



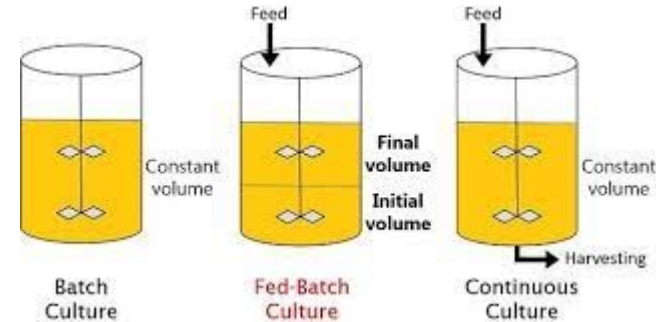
PROCESS DE FERMENTATION DE DEMAIN ?



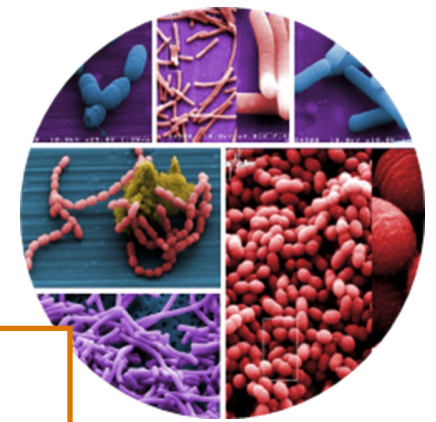
Paramètres

- Sucres
- Volatiles
- Proteins / peptides
- Acides organiques
- Ethanol

Méthode



- Batch
- Fed-batch
- Continuous



Limites : Difficulté de mesurer en milieu opaque & pH acide

CHALLENGES et BESOINS DATA & IA en FERMENTATION

- Modélisation Hybride – intégrer des approches IA avec la mécanistique
- Conception de consortia pour optimiser des propriétés produits
- Pilotage expression des gènes pendant la fermentation - capteurs en ligne
- Bioéquivalence
- Rassembler des connaissances pour transformer l'art de la fermentation vers une science