



# MICROINCAPSULIAMOLI TUTTI ... I PROBIOTICI

**e non solo**

Gianluigi Mauriello

# LA MICROINCAPSULAZIONE



**Microcapsule al microscopio  
ottico ingrandite 400 volte**

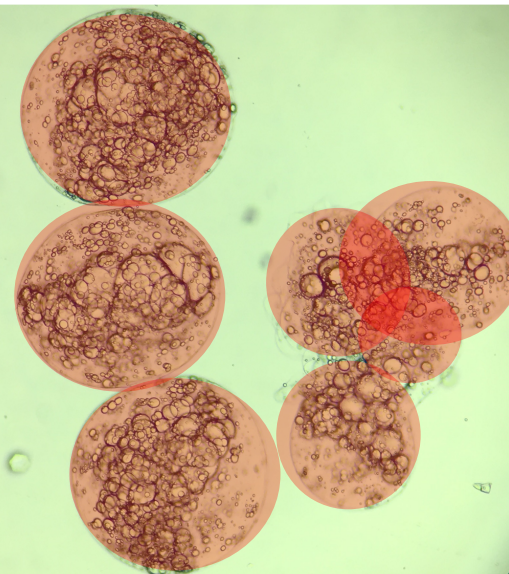
1/100 cm

o

1/10 mm

o

100  $\mu$

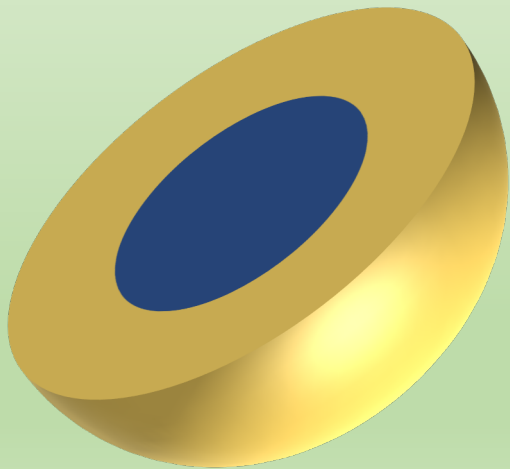


# I PROBIOTICI

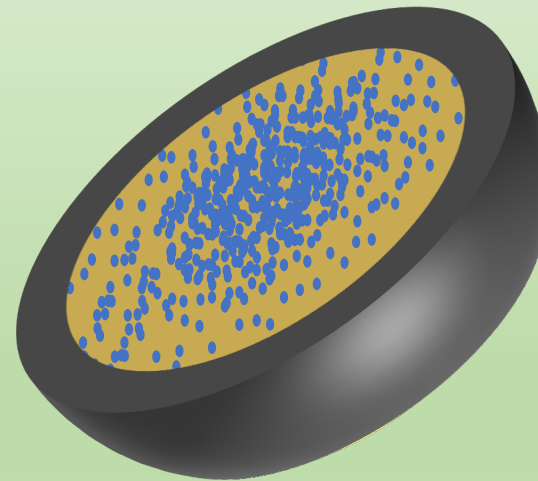
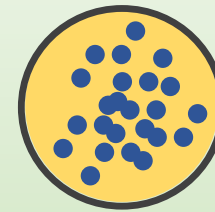
**Microorganismi in grado di esercitare un effetto benefico su un organismo umano o animale**



# TIPOLOGIE DI MICROCAPSULE

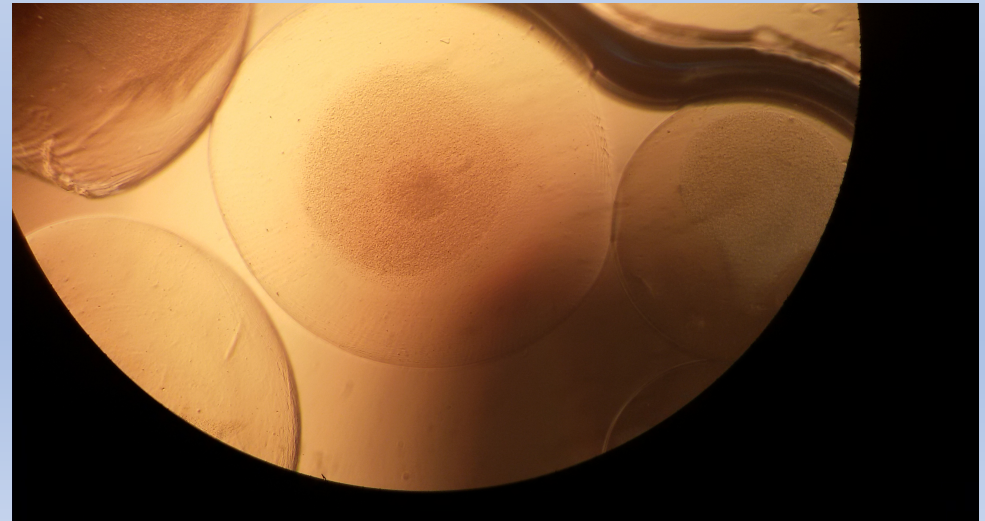
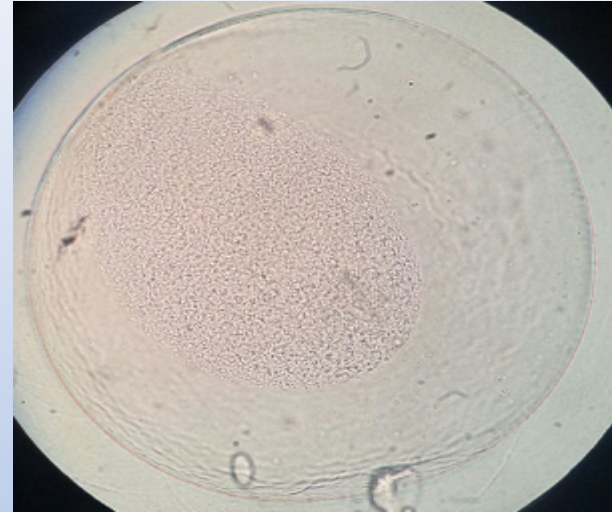
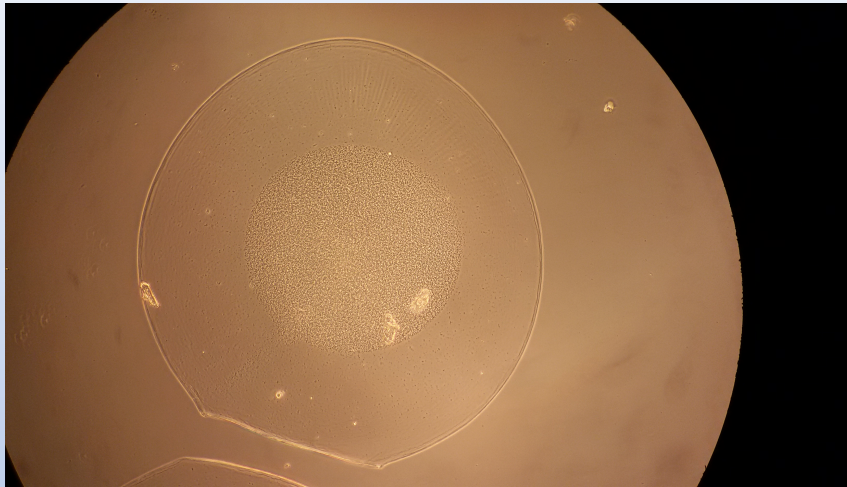


**CORE-SHELL**

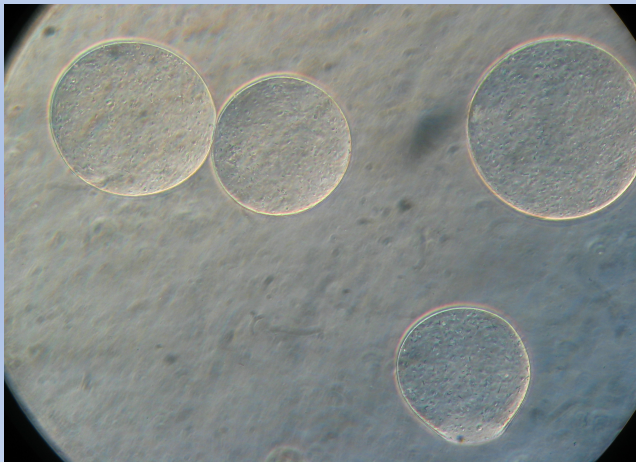
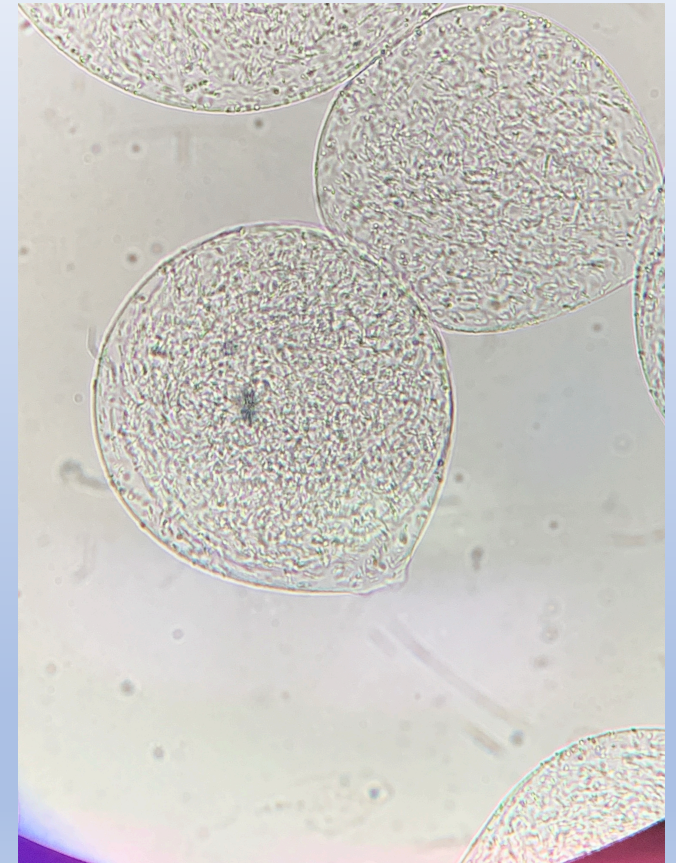
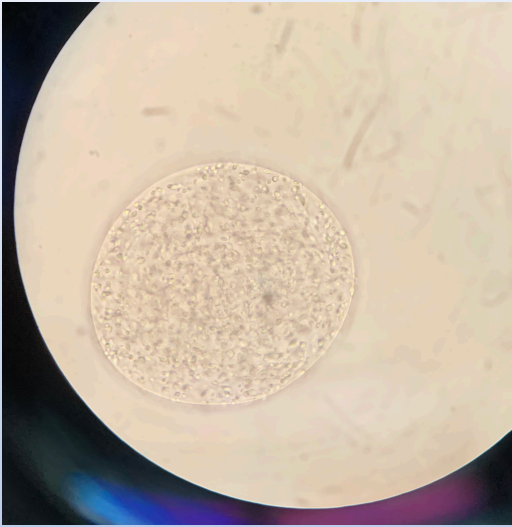


**MATRICE RIVESTITA**

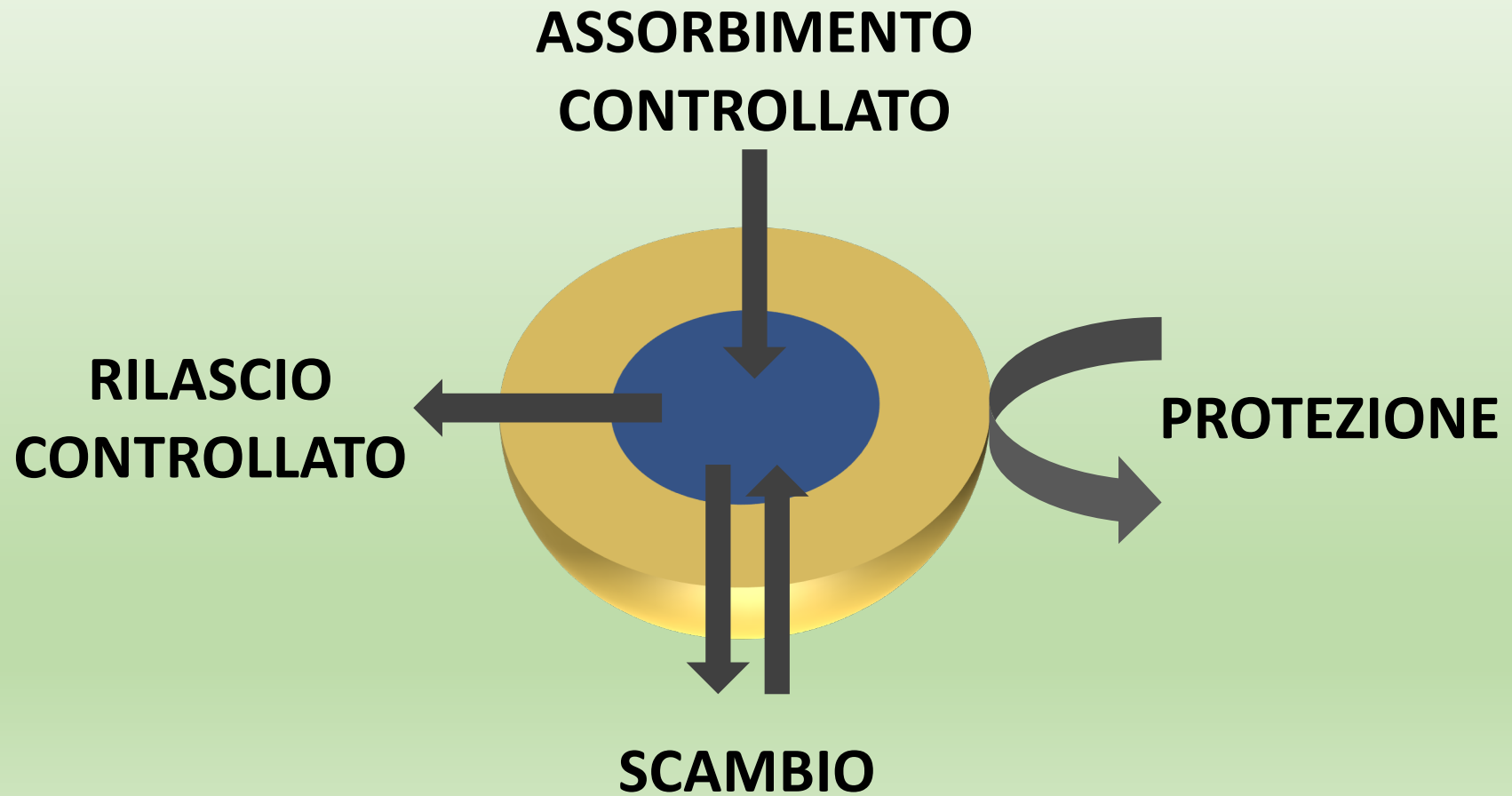
# MICROFOTOGRAFIE DI MICROCAPSULE CORE-SHELL

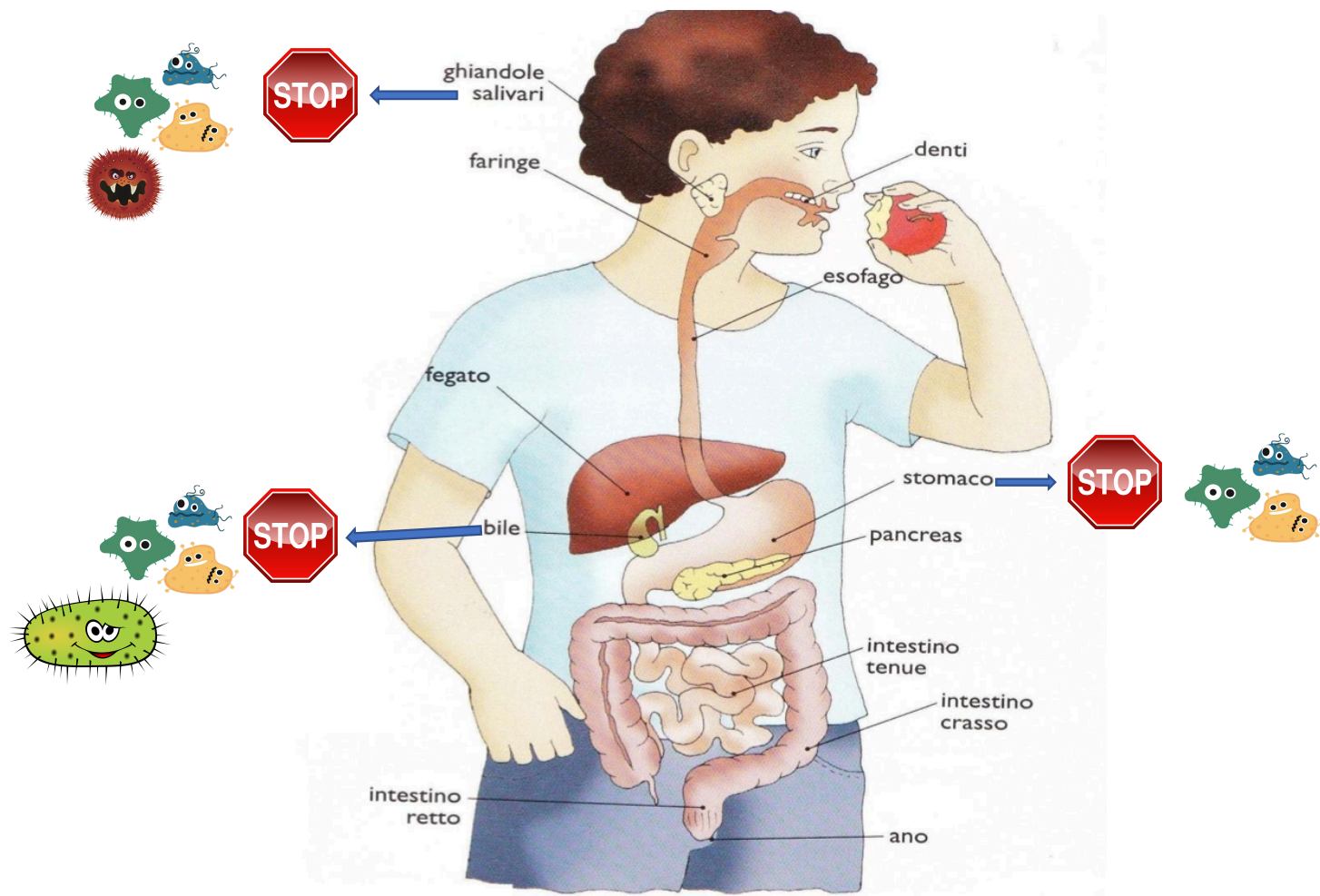


# MICROFOTOGRAFIE DI MICROCAPSULE A MATRICE



# PERCHÉ MICROINCAPSULARE?









Ministero della Salute

DIREZIONE GENERALE DELLA PROGRAMMAZIONE SANITARIA  
UFFICIO 3

#### RACCOMANDAZIONE

#### PER LA MANIPOLAZIONE DELLE FORME FARMACEUTICHE ORALI SOLIDE

**La manipolazione delle forme farmaceutiche orali solide, qualora si renda necessaria, causa errori in terapia se non correttamente gestita**

#### Raccomandazione n. 19

La corretta somministrazione della terapia farmacologica costituisce requisito indispensabile per l'efficacia e la sicurezza delle cure anche quando si verificano situazioni nelle quali risulta impossibile utilizzare la formulazione integra delle forme farmaceutiche orali solide ed è necessario ricorrere alla loro *manipolazione*.

Occorre, pertanto, fornire indicazioni sull'argomento al fine di garantire qualità e sicurezza delle cure.

The screenshot shows the NHS website interface. At the top is the NHS logo and a search bar. Below the logo are navigation links: Health A-Z, Live Well, Care and support, Pregnancy, and NHS services. A yellow banner highlights 'Coronavirus (COVID-19)' with a link to 'Get the latest advice about coronavirus'. The breadcrumb trail reads 'Home > Health A to Z'. The main heading is 'Problems swallowing pills'. Below it, a sub-heading reads 'Lots of people find it hard to swallow pills. There are things you can try to make it easier and a pharmacist can offer advice.' The section 'How to make it easier to swallow pills' is divided into 'Do' and 'Don't' categories. The 'Do' section lists three green checkmarks: 'take pills with water', 'lean forward slightly when you swallow', and 'practice swallowing with small sweets or bits of bread'. The 'Don't' section lists three red X marks: 'do not throw pills towards the back of your throat', 'do not tip your head back too much when you swallow', and 'do not crush pills, open capsules or alter your medicine without getting medical advice'.



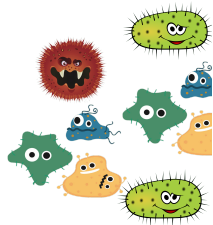
## Best Practices for Tablet Splitting



At some point your healthcare or managed care company may have recommended tablet splitting for reasons such as to adjust the dosing of your medication or to reduce costs. In such cases, it is your healthcare professional's responsibility to monitor the impact of risks associated with the practice of tablet splitting. You should always talk to your healthcare professional before splitting a tablet and not be afraid to ask him or her questions if you are considering splitting tablets.



LA  
TRA



We're not  
ALL  
BAD!



SO DI  
ANISMI



## Microencapsulation of *Lactobacillus reuteri* DSM 17938 Cells Coated in Alginate Beads with Chitosan by Spray Drying to Use as a Probiotic Cell in a Chocolate Soufflé

Clorinda Malmo · Antonietta La Storia · Gianluigi Mauriello

LWT - Food Science and Technology 61 (2015) 452–462



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LWT - Food Science and Technology

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Microencapsulation by vibrating technology of the probiotic strain *Lactobacillus reuteri* DSM 17938 to enhance its survival in foods and in gastrointestinal environment



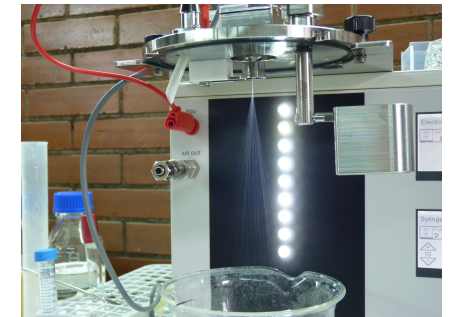
Annachiara De Prisco <sup>a</sup>, Diamante Maresca <sup>a</sup>, Duncan Ongeng <sup>b</sup>, Gianluigi Mauriello <sup>a,\*</sup>

<sup>a</sup> Department of Agriculture, University of Naples Federico II, via Università 100, 80055 Portici, NA, Italy  
<sup>b</sup> Faculty of Agriculture and Environment, Gulu University, Uganda

## SPRAY DRYING



## VIBRATING TECHNOLOGY



Foods 2021, 10, 217. <https://doi.org/10.3390/foods10020217>

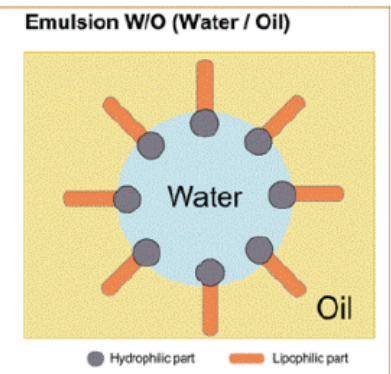


Article

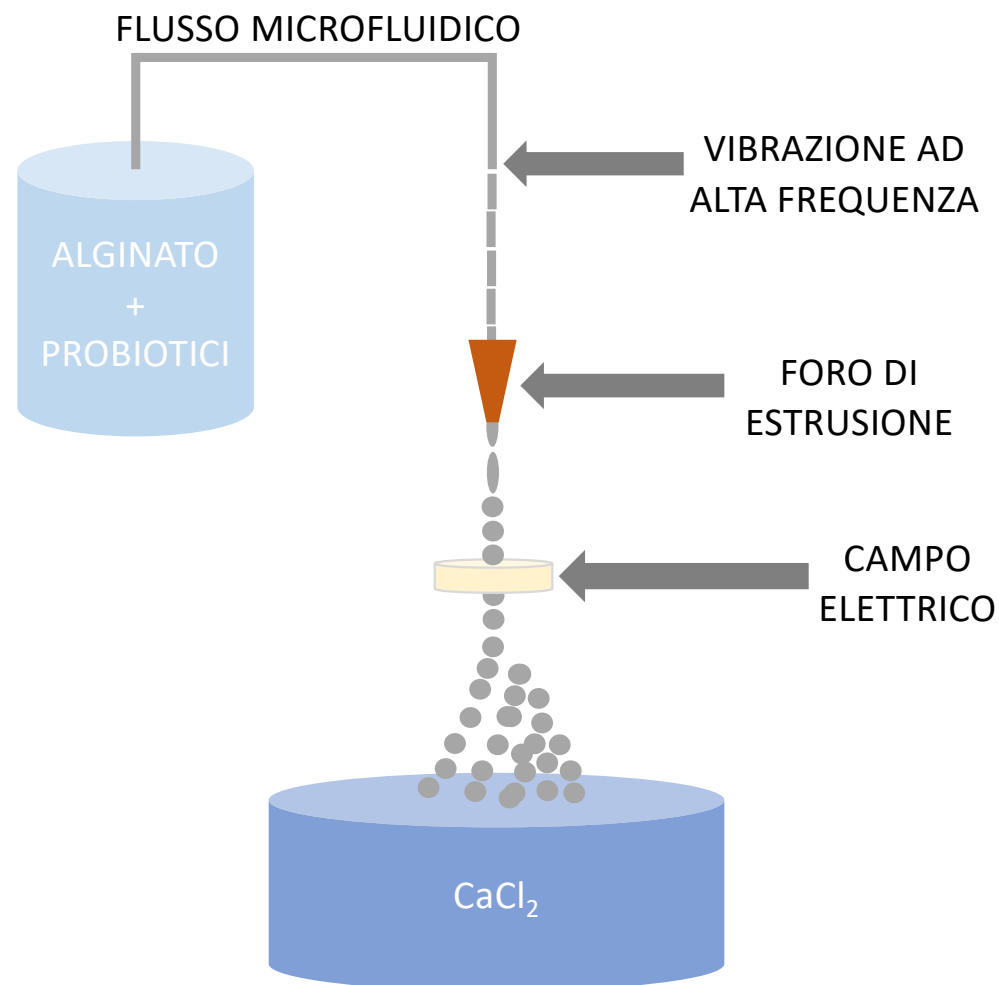
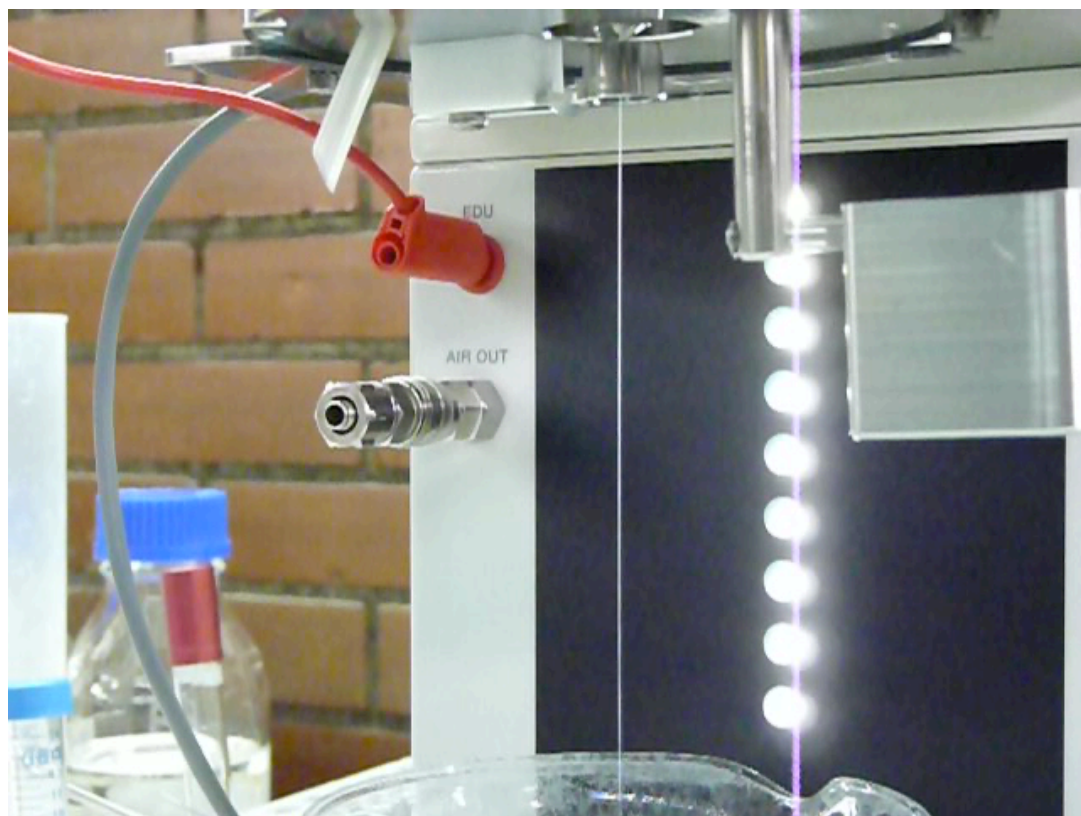
### Effect of Microencapsulation on Survival at Simulated Gastrointestinal Conditions and Heat Treatment of a Non Probiotic Strain, *Lactiplantibacillus plantarum* 48M, and the Probiotic Strain *Limosilactobacillus reuteri* DSM 17938

Clorinda Malmo, Irene Giordano and Gianluigi Mauriello <sup>\*✉</sup>

## EMULSION TECHNOLOGY



# MICROINCAPSULAZIONE MEDIANTE VIBRATING TECHNOLOGY





ORIGINAL PAPER

## Microencapsulated Starter Culture During Yoghurt Manufacturing, Effect on Technological Features

Annachiara De Prisco<sup>1</sup> · Hein J. F. van Valenberg<sup>2</sup> · Vincenzo Fogliano<sup>2</sup> · Gianluigi Mauriello<sup>1</sup>

Food Bioprocess Technol (2017) 10:1767–1777

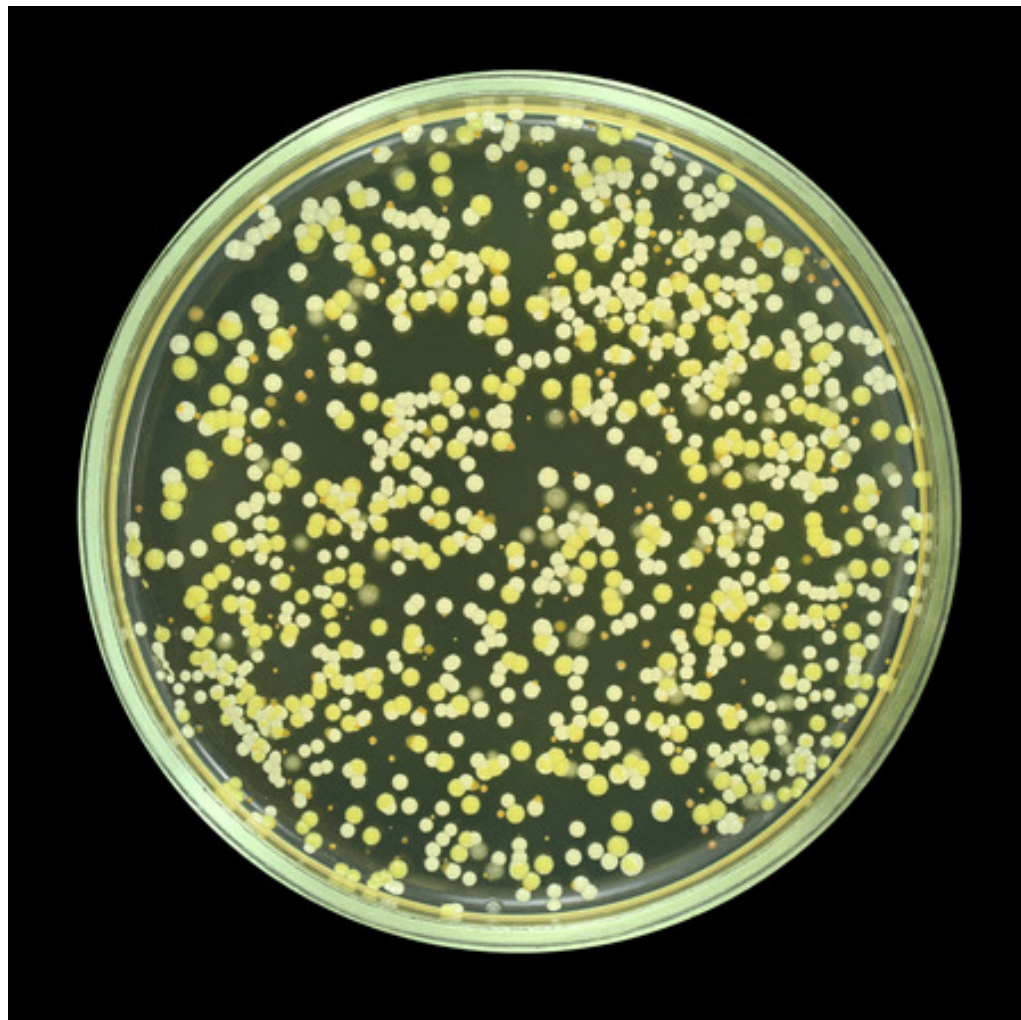
1771

**Table 1** Bacterial load (log CFU/mL or g) of intact and disrupted matrix (MM) and core-shell (CSM) microcapsules

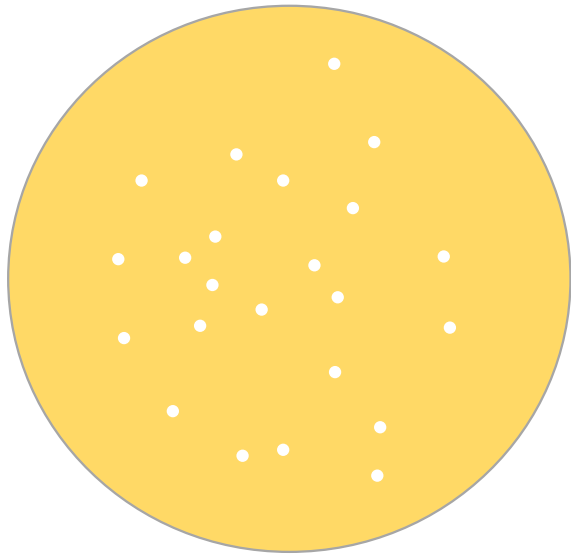
	MM		CSM	
	<i>L. delbrueckii</i>	<i>S. thermophilus</i>	<i>L. delbrueckii</i>	<i>S. thermophilus</i>
Intact	7.20 ± 0.10	7.15 ± 0.15	5.50 ± 0.10	5.40 ± 0.10
Disrupted	9.05 ± 0.05	9.00 ± 0.05	8.10 ± 0.20	8.20 ± 0.15

Mean results of three independent trials ± standard deviation

## **CLONIE BATTERICHE SU PIASTRA DI AGAR**

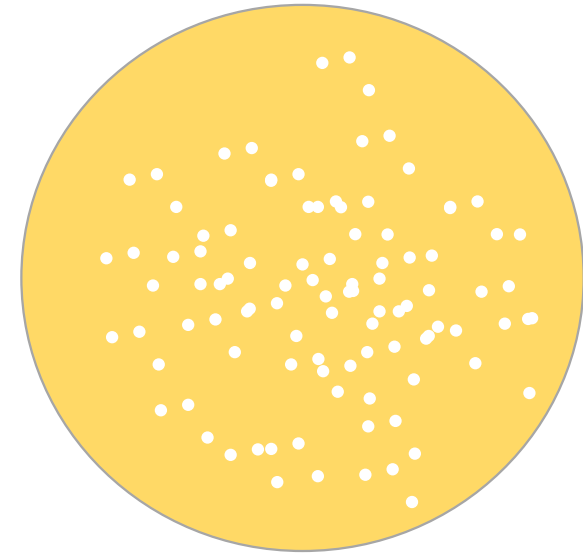


# QUANTE CELLULE CI SONO IN OGNI MICROCAPSULA?



100 colonie/g = 100 microcapsule/g

Dopo disgregazione  
della microcapsula



100 colonie/ml = 1 cellule per capsula

1000 colonie/ml = 10 cellule per capsula

10000 colonie/ml = 100 cellule per capsula



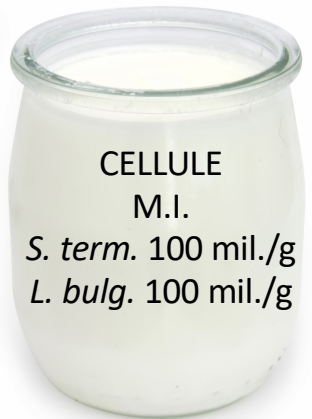


28 giorni a 4°C



Sopravvivenza %

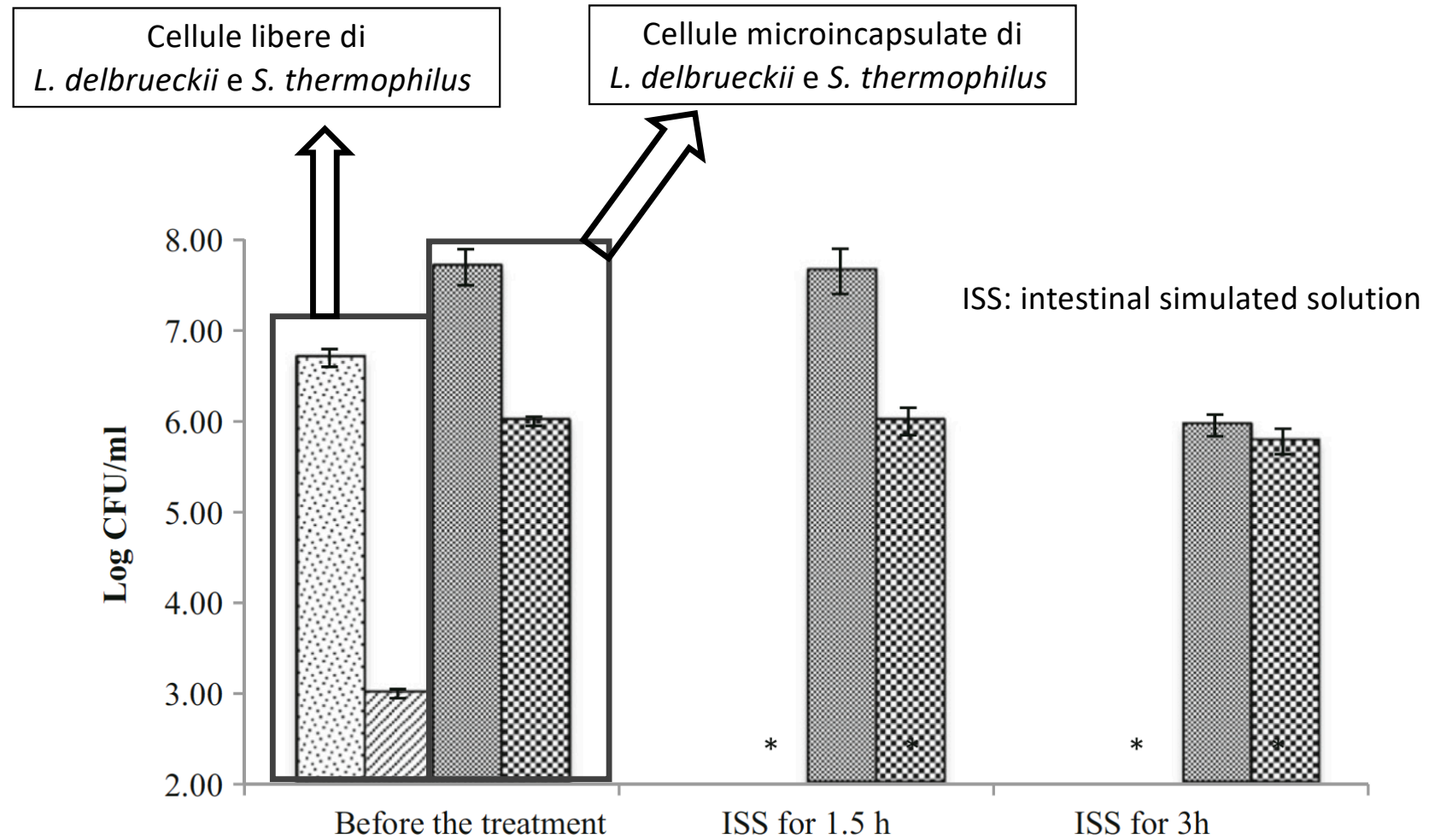
0,00001  
6



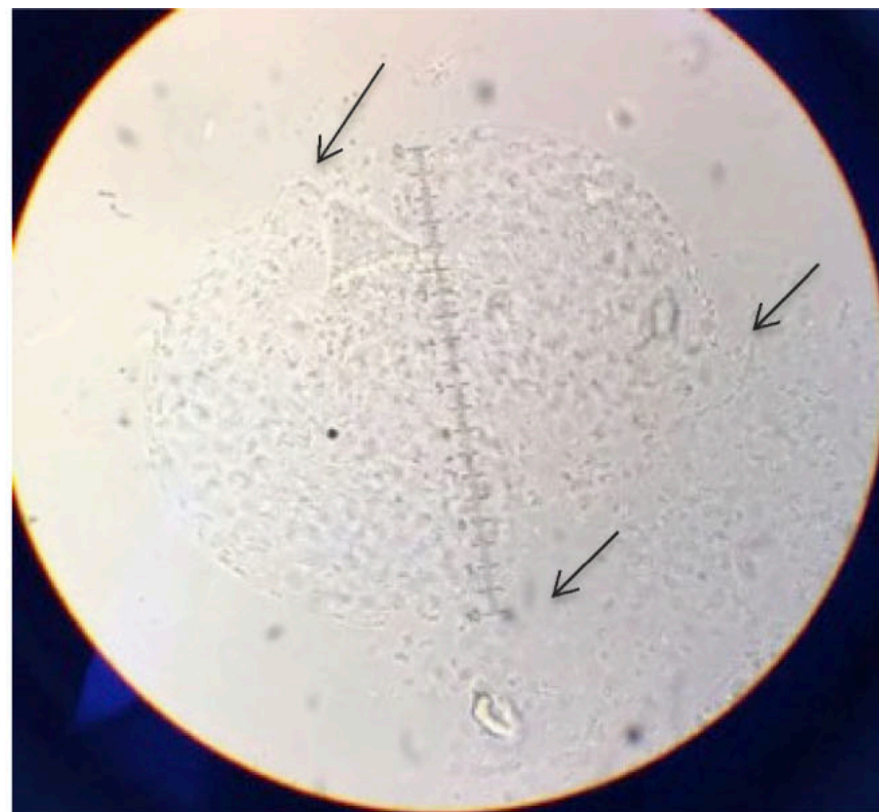
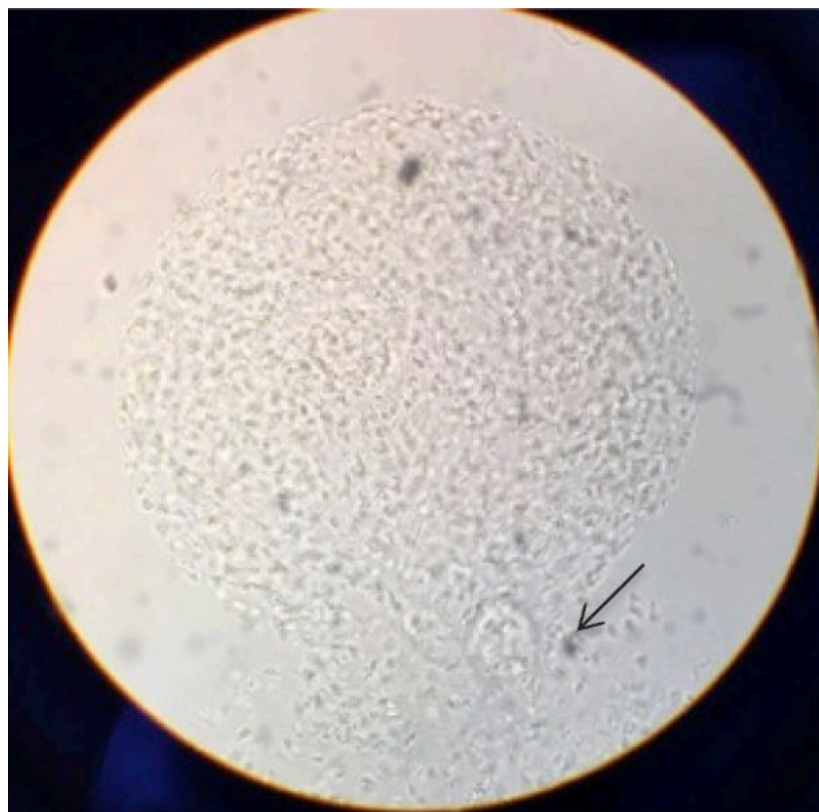
1  
60

# SOPREVVIVENZA CELLULARE AL PASSAGGIO SALIVARE E GASTRO-INTESTINALE DELLO YOGURT

SALIVA 10 MINUTI; SUCCO GASTRICO 2 ORE; SUCCO BILIARE 1,5 E 3 ORE



# LA MICROCAPSULA A CONTATTO CON ISALI BILIARI



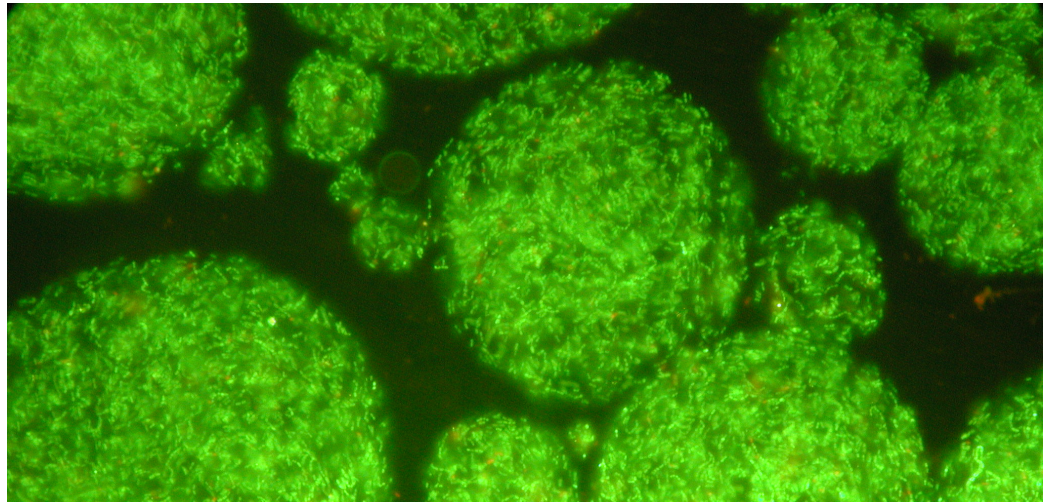
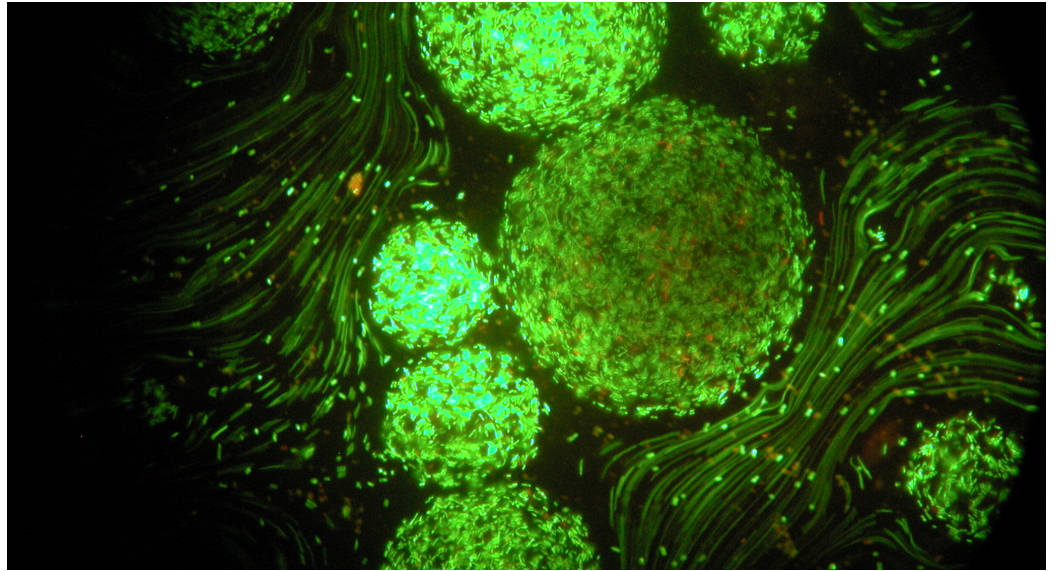
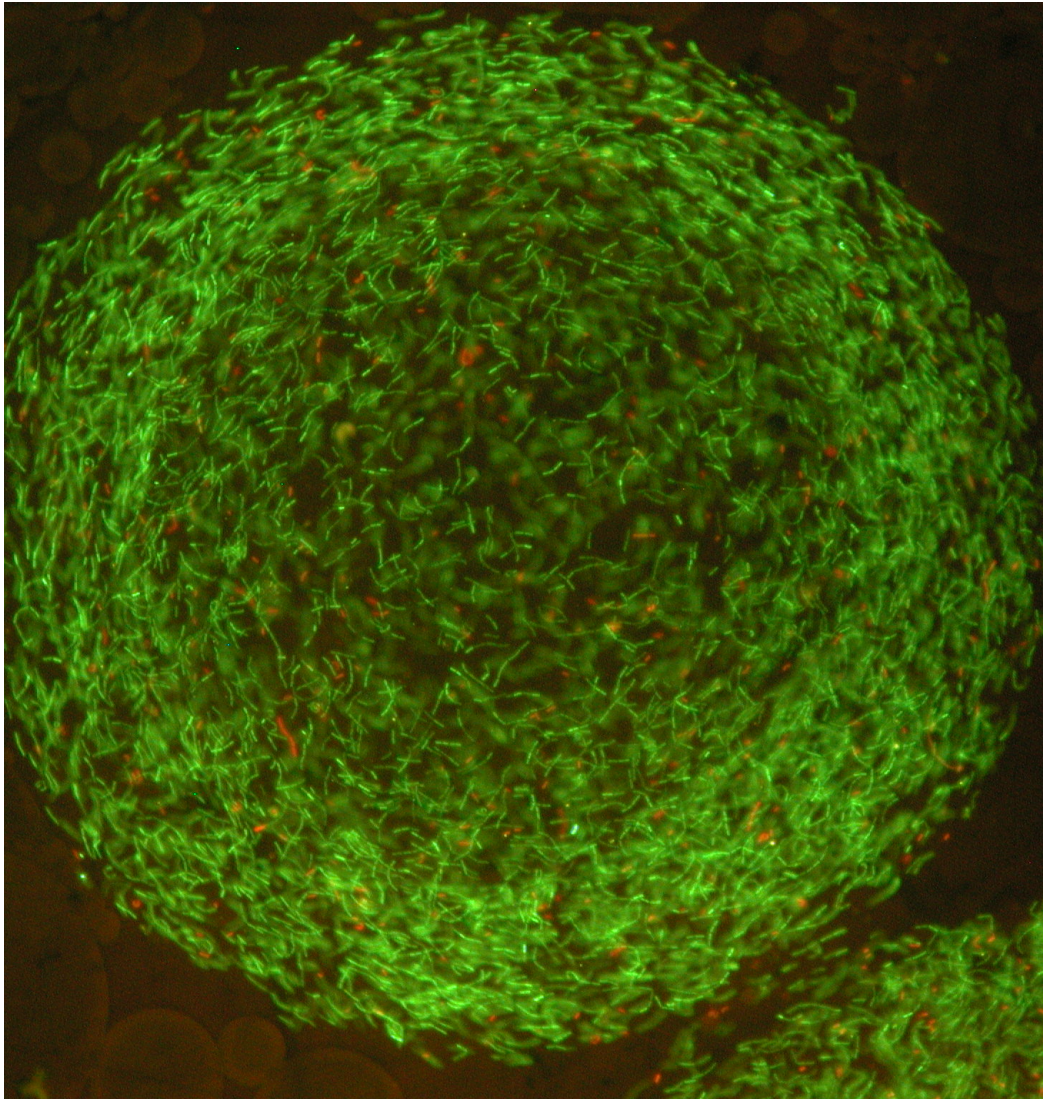
ORIGINAL PAPER

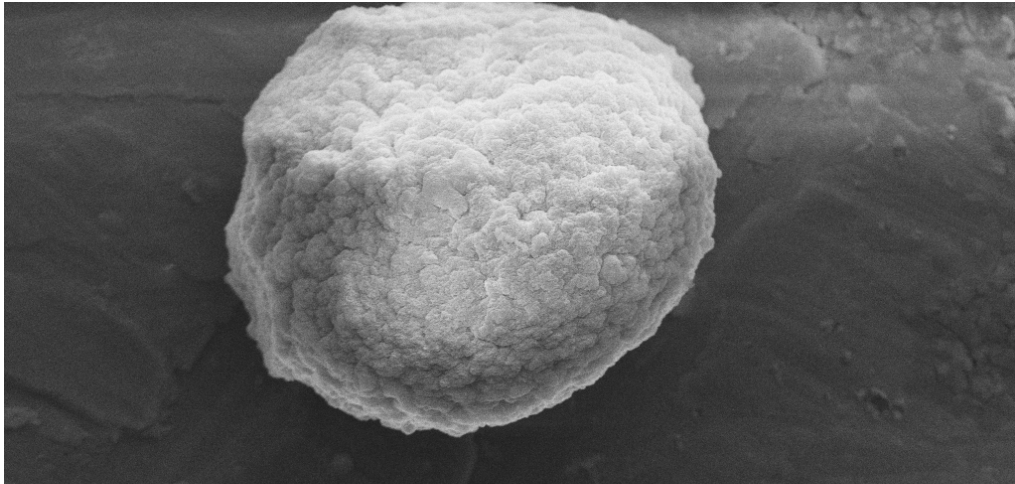
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Clorinda Malmo · Antonietta La Storia · Gianluigi Mauriello

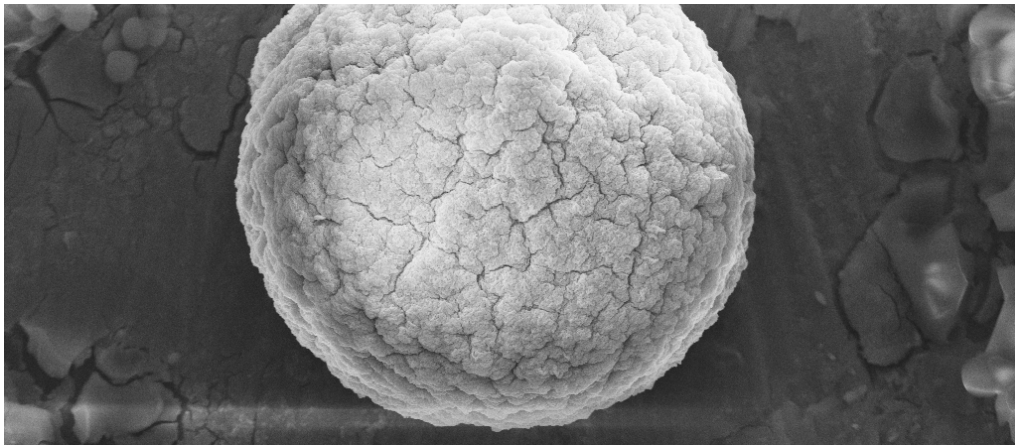
CAMPIONE	% DI SOPRAVVIVENZA
Cellule libere	1,0 ± 0,05
Cellule microincapsulate	10,0 ± 0,05



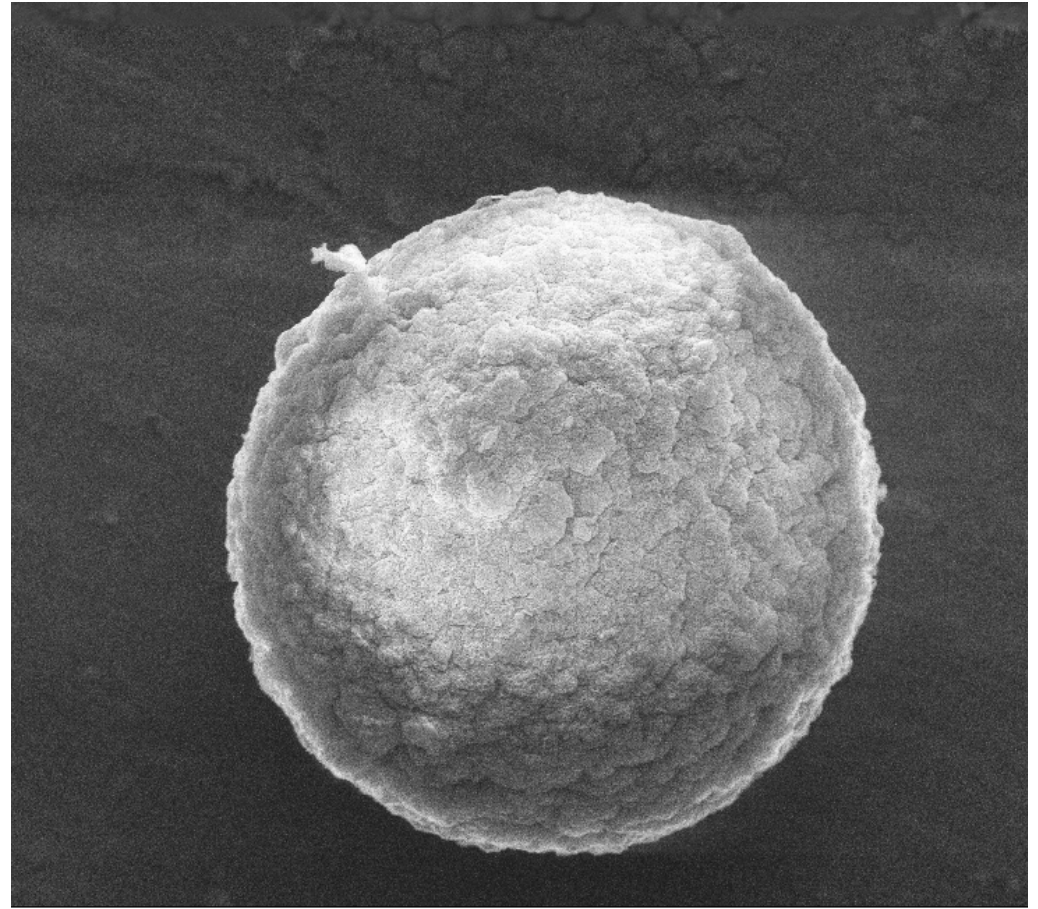




10µm EHT = 20.00 kV Signal A = SE1 Date :25 Jun 2013  
WD = 14.0 mm Photo No. = 1721 Time :11:43:11 ZEISS



20µm EHT = 20.00 kV Signal A = SE1 Date :30 May 2013  
WD = 13.0 mm Photo No. = 1654 Time :11:28:59 ZEISS



EHT = 20.00 kV Signal A = SE1 Date :25 Jun 2013  
WD = 14.0 mm Photo No. = 1725 Time :12:16:29



# BIBLIOGRAFIA

Food Bioprocess Technol (2013) 6:795–805  
DOI 10.1007/s11947-011-0755-8

ORIGINAL PAPER


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## Microencapsulation by vibrating technology of the probiotic strain *Lactobacillus reuteri* DSM 17938 to enhance its survival in foods and in gastrointestinal environment

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Food Chemistry 300 (2019) 125174

Contents lists available at ScienceDirect



Food Chemistry

journal homepage: [www.elsevier.com/locate/foodchem](http://www.elsevier.com/locate/foodchem)

## Yeast cells in double layer calcium alginate–chitosan microcapsules for sparkling wine production

Ilaria Benucci<sup>a</sup>, Martina Cerretti<sup>a, \*</sup>, Diamante Maresca<sup>b</sup>, Gianluigi Mauriello<sup>b</sup>, Marco Esti<sup>b</sup>

Trends in Food Science & Technology 48 (2016) 27–39

Contents lists available at ScienceDirect



Trends in Food Science & Technology

journal homepage: <http://www.journals.elsevier.com/trends-in-food-science-and-technology>

## Probiotication of foods: A focus on microencapsulation tool

Annachiara De Prisco, Gianluigi Mauriello<sup>\*</sup>

Department of Agricultural Science, Division of Microbiology, University of Naples Federico II, via Università 100, 80055 Portici, Italy

LWT - Food Science and Technology 66 (2016) 436–443

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LWT - Food Science and Technology

journal homepage: [www.elsevier.com/locate/lwt](http://www.elsevier.com/locate/lwt)

## Microencapsulation of nisin in alginate beads by vibrating technology: Preliminary investigation

Diamante Maresca, Annachiara De Prisco, Antonietta La Stora, Teresa Cirillo, Francesco Esposito, Gianluigi Mauriello

Food Research International 116 (2019) 1274–1281

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



## Preparation and characterization of microencapsulated phytosterols for the formulation of functional foods: Scale up from laboratory to semi-technical production

Roberta Tolve<sup>a</sup>, Nicola Condelli<sup>a</sup>, Marisa Carmela Caruso<sup>a, \*</sup>, Francesco Genovese<sup>b</sup>, Giovanni Carlo Di Renzo<sup>a</sup>, Gianluigi Mauriello<sup>b</sup>, Fernanda Galgano<sup>a</sup>

 **foods** Foods 2021, 10, 121. <https://doi.org/10.3390/foods10010121> 

Article

## Basil Essential Oil: Composition, Antimicrobial Properties, and Microencapsulation to Produce Active Chitosan Films for Food Packaging

Ghita Amor<sup>1,2</sup> , Mohammed Sabbah<sup>3</sup> , Lucia Caputo<sup>4</sup> , Mohamed Idbella<sup>1,2</sup>, Vincenzo De Feo<sup>4</sup> , Raffaele Porta<sup>5</sup> , Taoufiq Fechtali<sup>2</sup> and Gianluigi Mauriello<sup>1, \* </sup>

Food Chemistry 340 (2021) 127900

Contents lists available at ScienceDirect



Food Chemistry

journal homepage: [www.elsevier.com/locate/foodchem](http://www.elsevier.com/locate/foodchem)

## Novel microencapsulated yeast for the primary fermentation of green beer: kinetic behavior, volatiles and sensory profile

Ilaria Benucci<sup>a</sup>, Teresa Cecchi<sup>b</sup>, Claudio Lombardelli<sup>a, \*</sup>, Diamante Maresca<sup>c</sup>, Gianluigi Mauriello<sup>c</sup>, Marco Esti<sup>a</sup>

## EFFECT OF DIFFERENT FOOD STRESS CONDITIONS ON THE VIABILITY OF ENCAPSULATED *Lactobacillus plantarum* AND *Lactobacillus casei* ISOLATED FROM KLILA (AN ALGERIAN TRADITIONAL FERMENTED CHEESE)


Samiya Amira<sup>1</sup>, Mohamed Sifour<sup>\*1</sup>, Houria Ouled-Haddar<sup>1</sup>, Sawsen Hade<sup>2</sup>, Tarek Khemouf<sup>2</sup>, Gianluigi Mauriello<sup>4</sup>, Diamante Maresca<sup>4</sup>

*J Microbiol Biotech Food Sci / Amira et al. 2019 : 9 (1) 38-43*

 **foods** Foods 2021, 10, 217. <https://doi.org/10.3390/foods10020217> 

Article

## Effect of Microencapsulation on Survival at Simulated Gastrointestinal Conditions and Heat Treatment of a Non Probiotic Strain, *Lactiplantibacillus plantarum* 48M, and the Probiotic Strain *Limosilactobacillus reuteri* DSM 17938

Clorinda Malmo, Irene Giordano and Gianluigi Mauriello 



Il prossimo seminario si terrà il giorno 14 aprile 2021

**TERESA DEL GIUDICE**

L'innovazione, l'agricoltura e le politiche di intervento:  
l'audace progetto di un ecosistema della conoscenza.