GENERALITAT VALENCIANA
Conselleria d'Innovació, Universitats, Ciència i Societat Digital

Probiotic *Lactobacillus reuteri* growth improved under fucoidan exposure

1st International Electronic Conference on Food Science and Functional Foods

10 - 25 November 2020

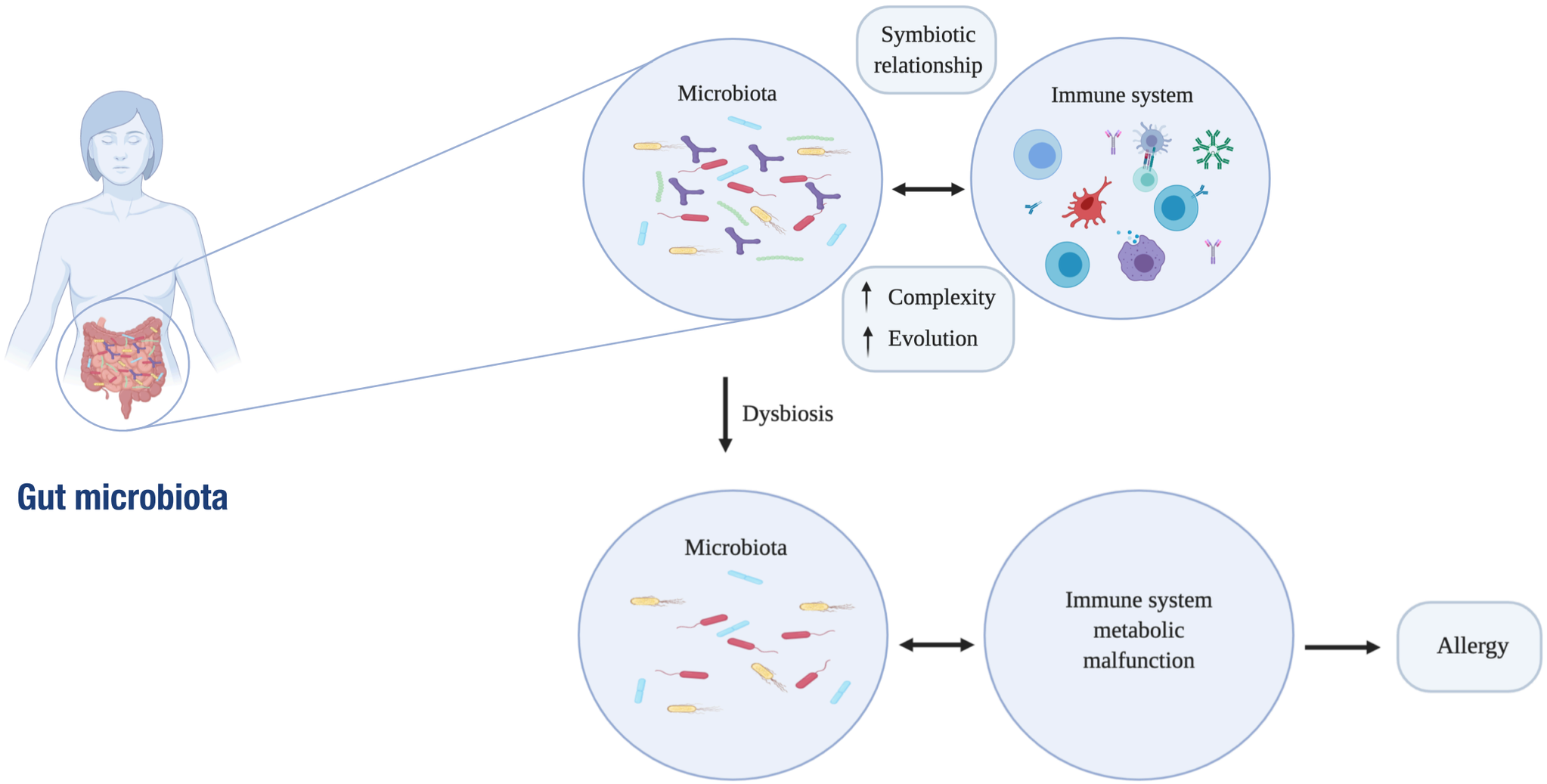
VNIVERSITAT DE VALÈNCIA Facultat de Ciències Biològiques

Neus Ricós-Muñoz
Sergi Maicas
Mª Consuelo Pina-Pérez

Facultat de Ciències Biològiques

Gut microbiota, immune system & allergy

- **Allergy:** most common disease in Europe (40% of the population)
- **Symbiotic relationship between gut microbiota and immune system:** major complexity, major evolution
- **Dysbiosis causes allergy:** microbiota imbalance causes alteration of immune system metabolic function and induces allergies.



Based on Belkaid *et al.* (2017)

Pictures created with Biorender

Gut microbiota

- **Four main phyla:**

Firmicutes
Lactobacillus spp.

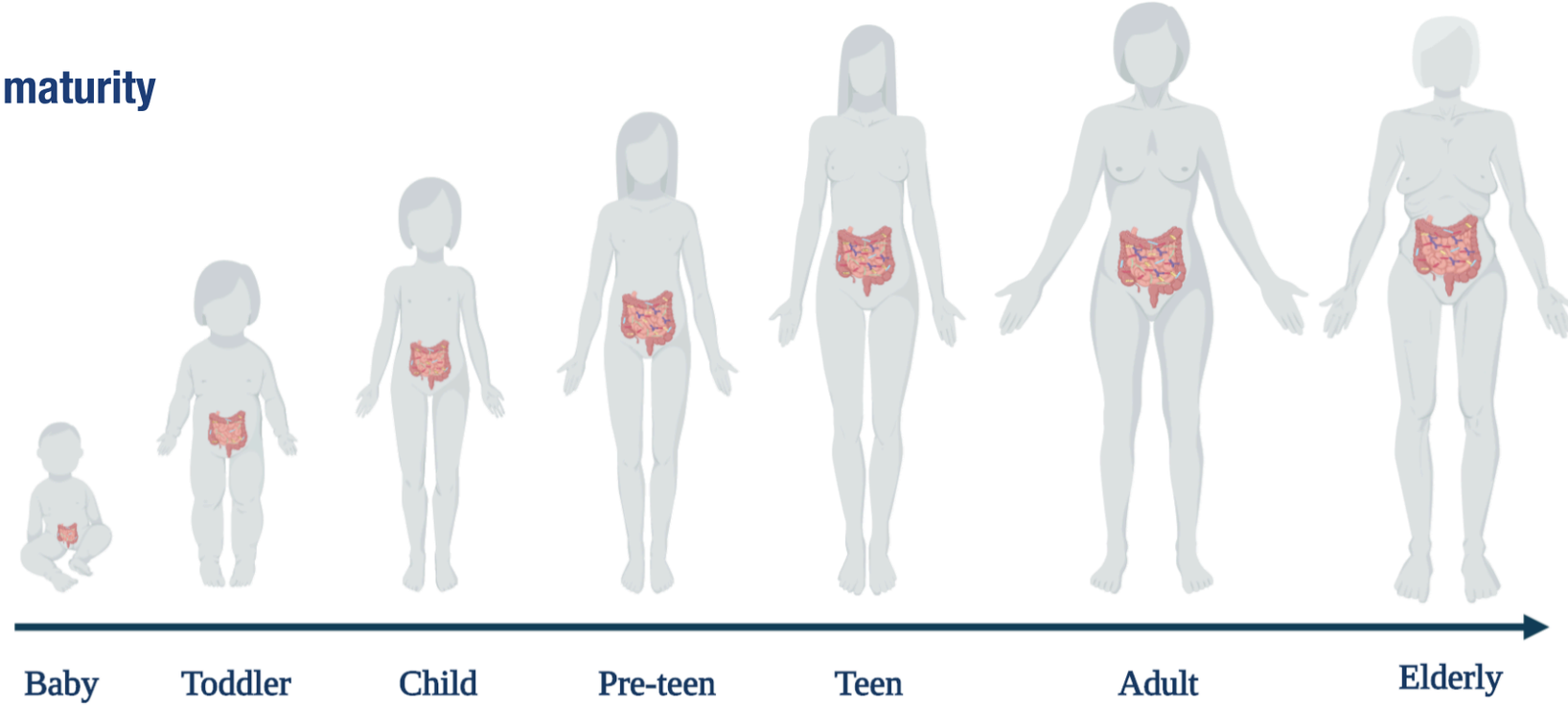
Bacteroids
Bacteroides spp.

Actinobacteria
Bifidobacterium spp.

Proteobacteria
Escherichia coli

- **Gut microbiota change from birth to maturity**

- **Influencing factors on variability**
  - Genetics
  - Epigenetics
  - Environment



Pictures obtained from:
https://www.shutterstock.com

Facultat de Ciències Biològiques

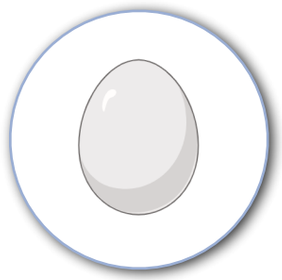
Gut microbiota & allergy

Nuts allergies

↑ *Bacteroides* spp.

Cow's Milk allergy

↓ Firmicutes



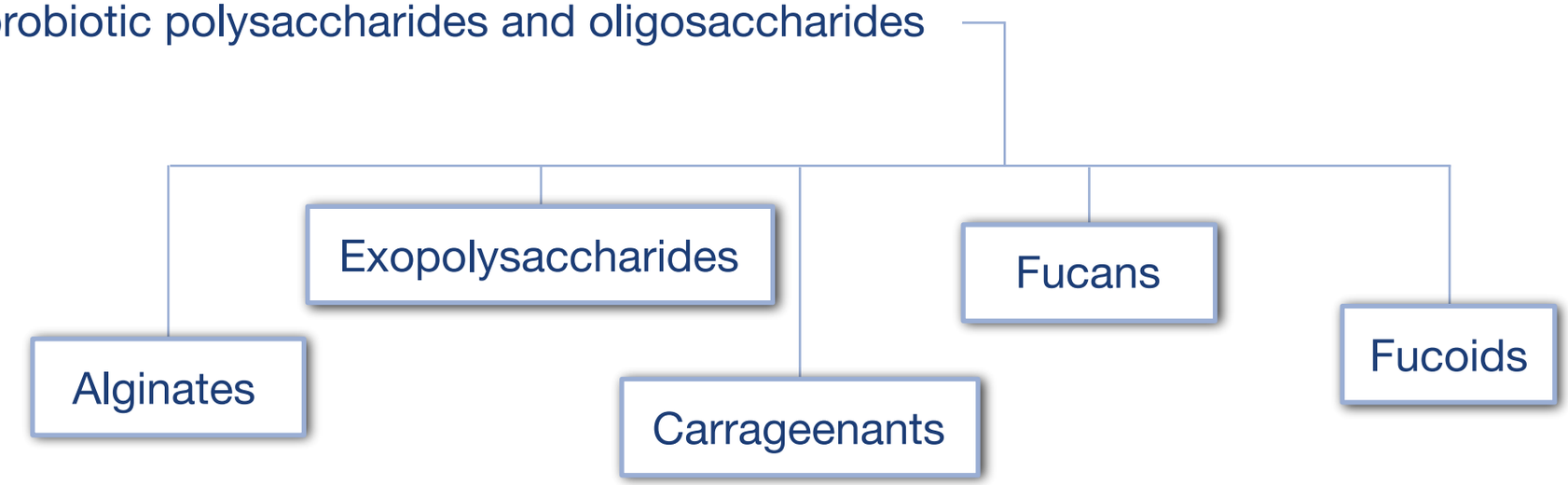
Ovalbumin allergy

Alteration of:

Porphyromonadaceae
Lactobacillaceae
Rikenellaceae
Lachnospiraceae

Prebiotics & algae

- **Prebiotics:** are tipically polymers of carbohydrates that cannot be digested or absorbed by the human gut
- **Algae:** important source of probiotic polysaccharides and oligosaccharides



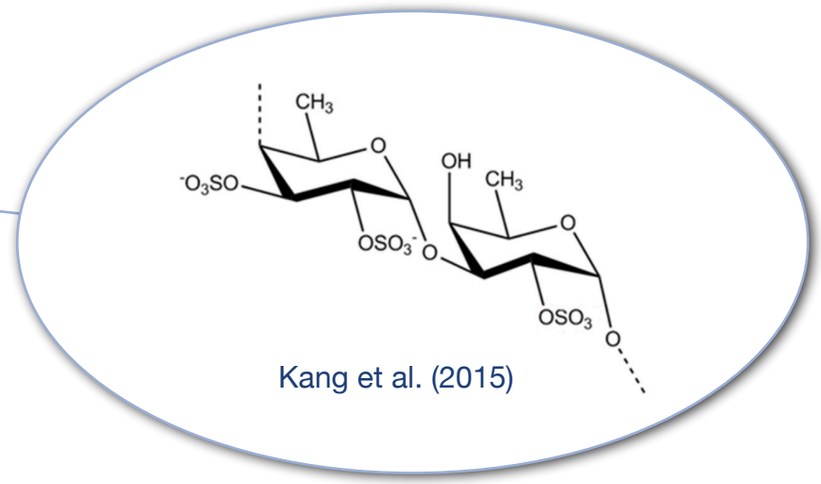
Pictures created with Biorender

Facultat de Ciències Biològiques

Fucoidan: structure, function & effects

What is this? Polysaccharid from brown algae cell wall

Basic structure: L-fucose and sulfat



Kang et al. (2015)

Functions & effects

- ⇧ *Lactobacillus* spp.
- ⇧ *Bifidobacterium* spp.
- ⇧ Ruminococcaceae
- ⇧ SCFAs
- ⇩ *Peptococcus* spp.
- ⇩ *Akkermansia* spp.
- Protection against allergy
- Anticoagulant & Anti-thrombotic
- Antimicrobial
- Antitumor & Immunomodulatory
- Antioxidant
- Blood lipid reducer
- Anti-inflammatory
- Gastric protector
- Hepatoprotector
- **Prebiotic**

Aim

To evaluate the **potential prebiotic effect** of the **fucoidan** compound, extracted from the seaweed *Fucus vesiculosus,* on the growth of the ***Lactobacillus reuteri*** to act against allergic symptoms.

Algae

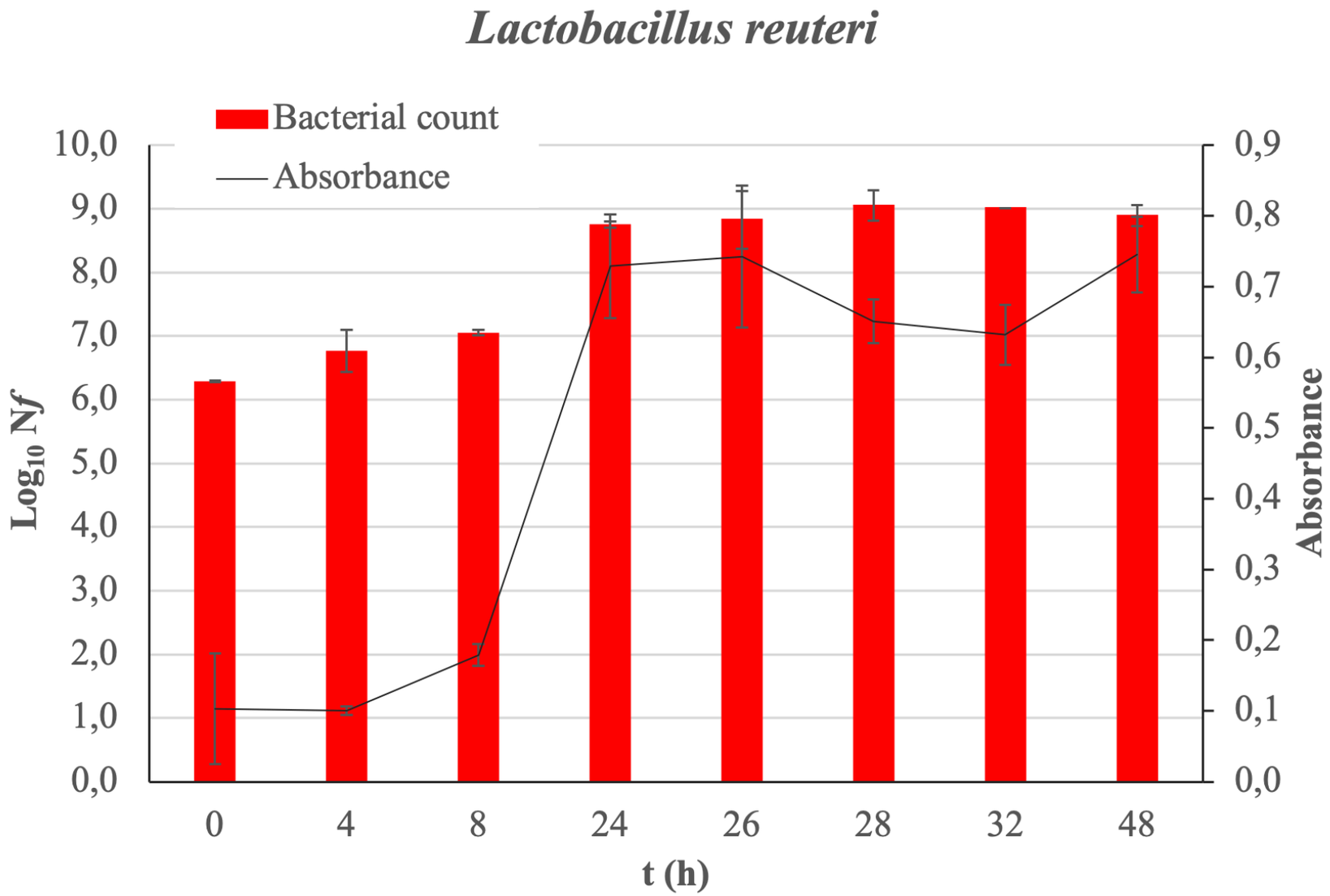
Fucus vesiculosus

Bacterial

Lactobacillus reuteri

Pictures obtained from:
https://www.shutterstock.com

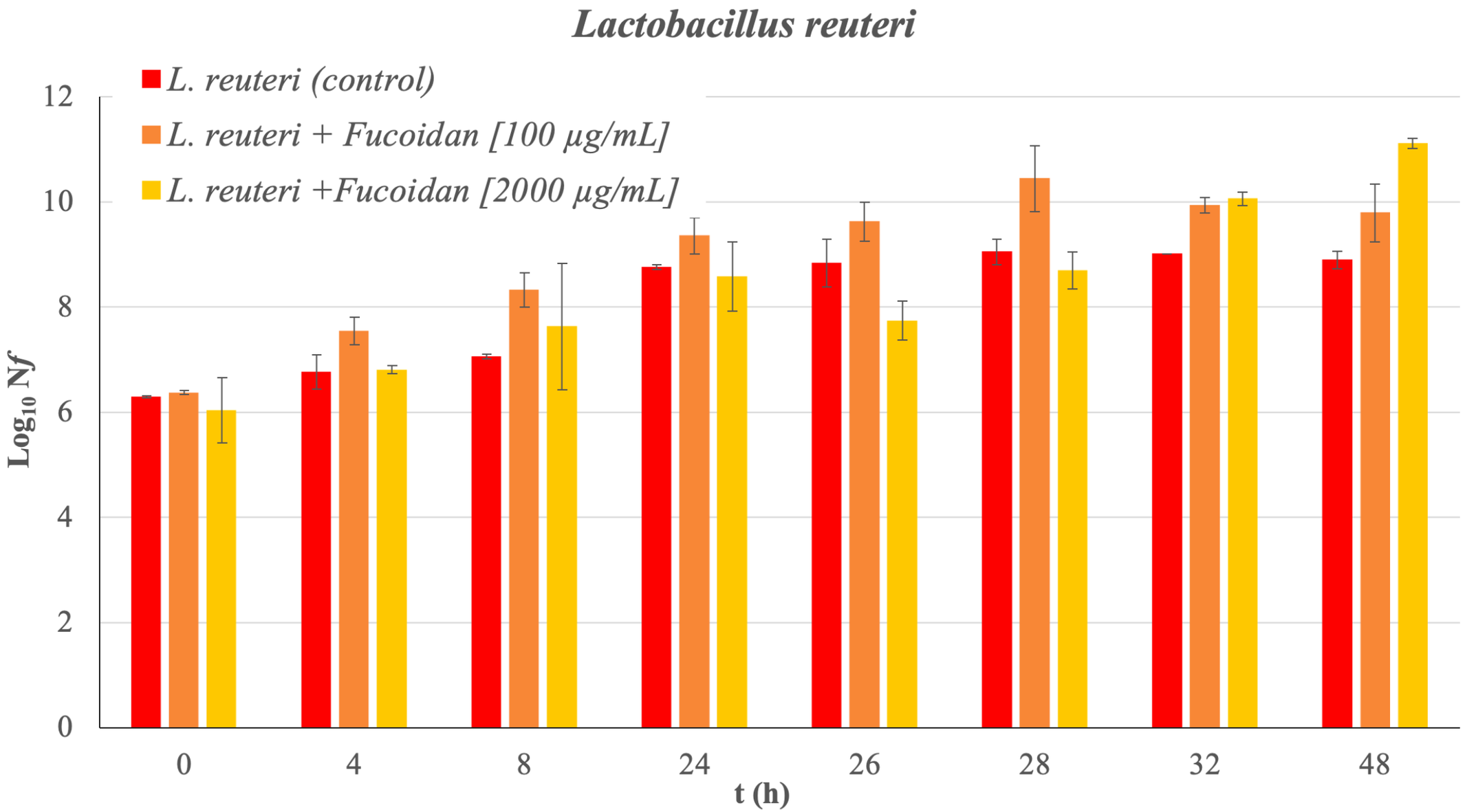
L. reuteri growth curve without fucoidan



Latency phase: between 0 h and 8 h of incubation

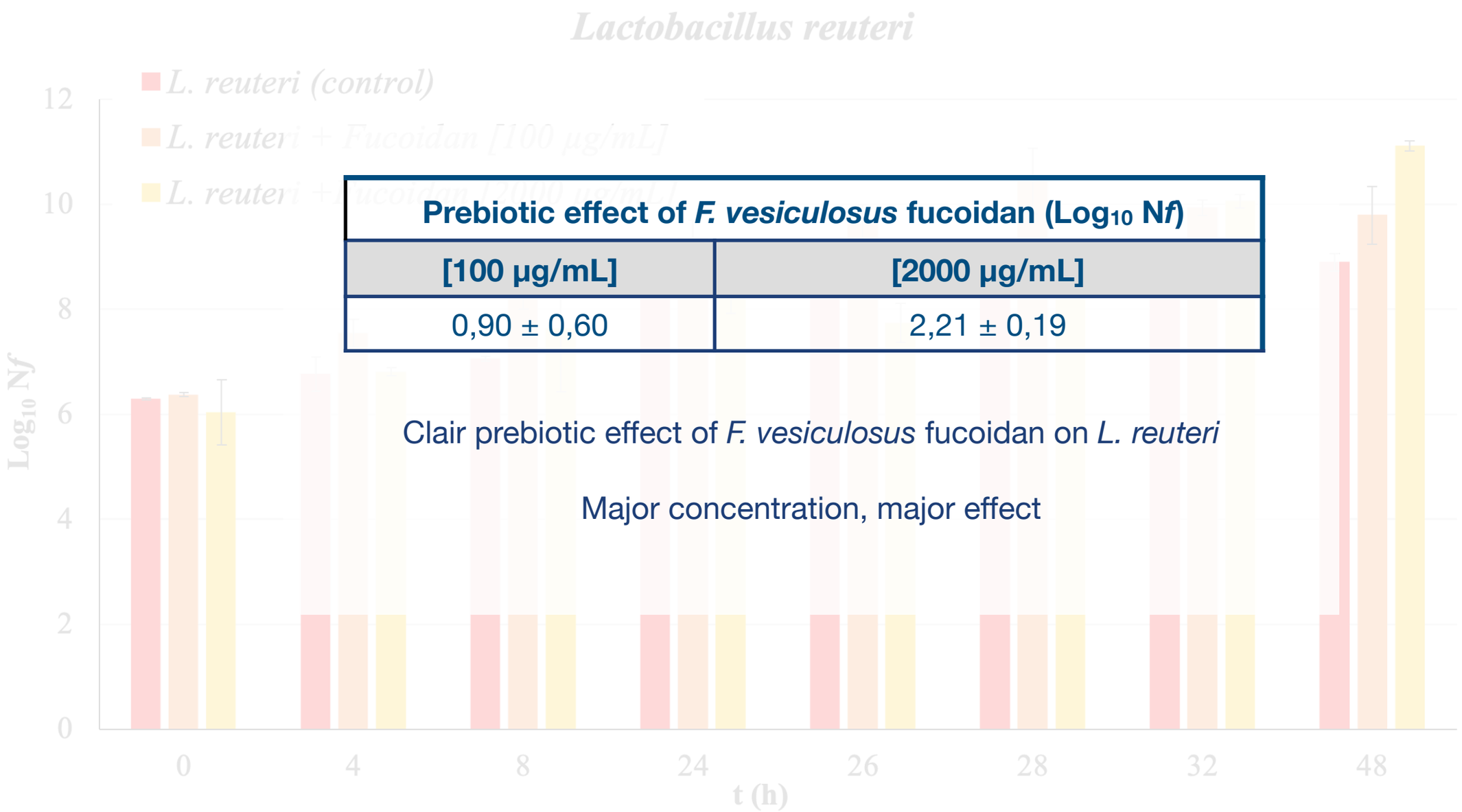
Exponential growth phase: between 8 h and 24 h of incubation

L. reuteri growth curve for different concentrations of fucoidan



Facultat de Ciències Biològiques

Prebiotic effect of *Fucus vesiculosus* fucoidan



Prebiotic effect of *F. vesiculosus* fucoidan (Log_{10} N*f*)	
[100 µg/mL]	[2000 µg/mL]
0,90 ± 0,60	2,21 ± 0,19

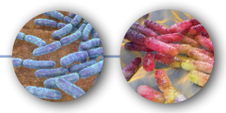
Clair prebiotic effect of *F. vesiculosus* fucoidan on *L. reuteri*

Major concentration, major effect

Discussion

Action of prebiotic bacterial

L. rhamnosus* i *L. reuteri



- Improvement of atopic dermatitis

Other prebiotic bacterial

- Production of direct inhibitory components on pathogenic bacteria
- Production of SCFAs ⇩ luminal pH
- Competition for nutrients with pathogenic bacteria
- Modulation of immune response

Fucoidan

F. vesiculosus, U. pinnatifida* & *M. pyrifera

- Bacteriostatic and bactericidal on *Helicobacter pylori*

Fucoidan from brown algae

- ⇧ Blood galectin-9
- Antiallergic action

Fucus vesiculosus

- GRAS ingredient

Other saccharides

Alginate oligosaccharides

- ⇧ *Lactobacillus* spp.
- ⇧ *Bifidobacterium* spp.

Pictures obtained from:
https://www.shutterstock.com

Material

Culture media & other reagents

MRSB
MRSA
Peptone water
Glycerol

Fucoidans

F. vesiculosus (purity 95%)

Bacterial strains

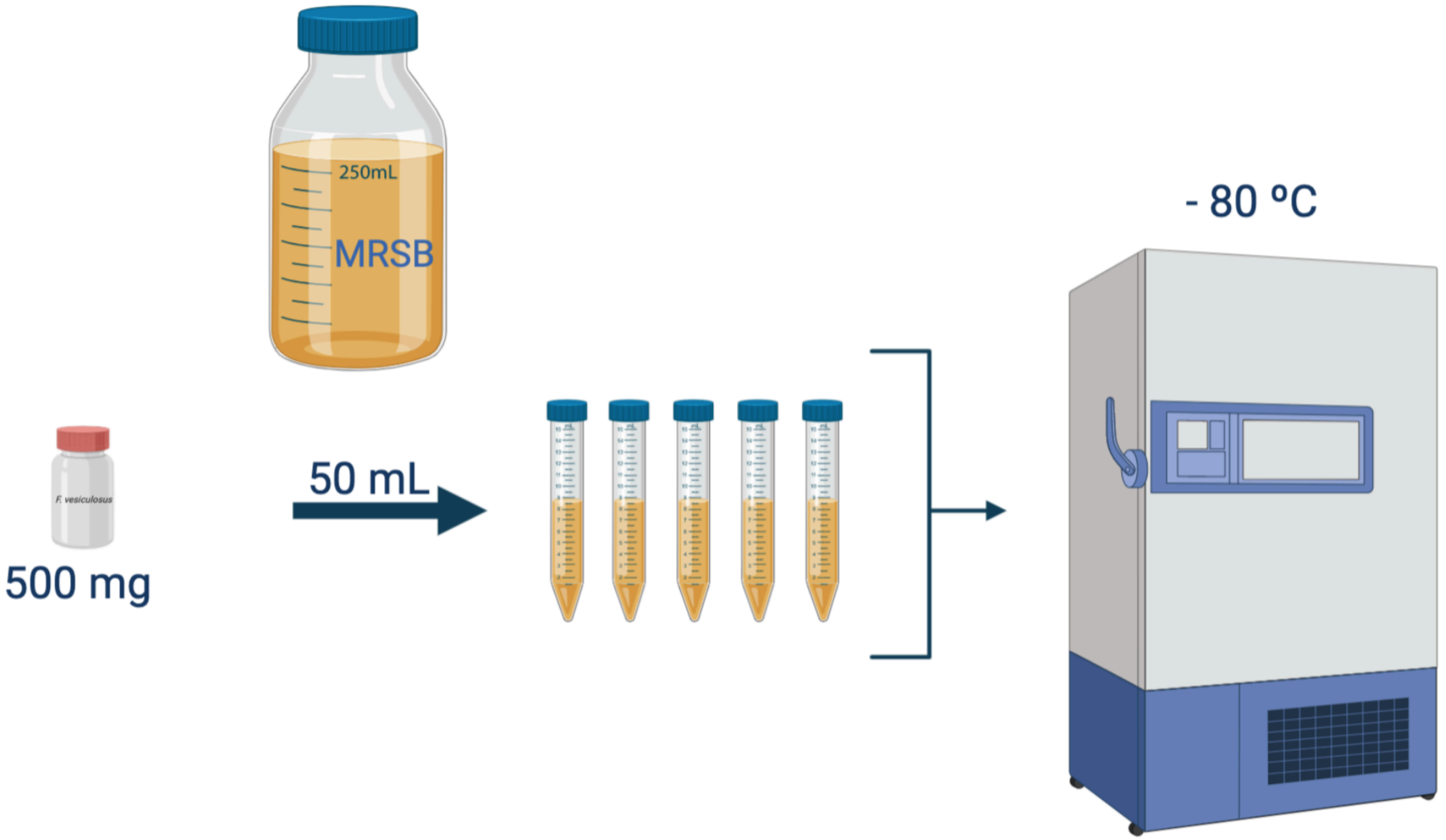
L. reuteri lyophilisate (CECT 925)

Preparation with glycerol

L. reuteri (3,0 ± 0,6) x 10^9 UFC/mL
Stored frozen at - 80 ºC

Methods

Preparation of stock solutions of fucoidan

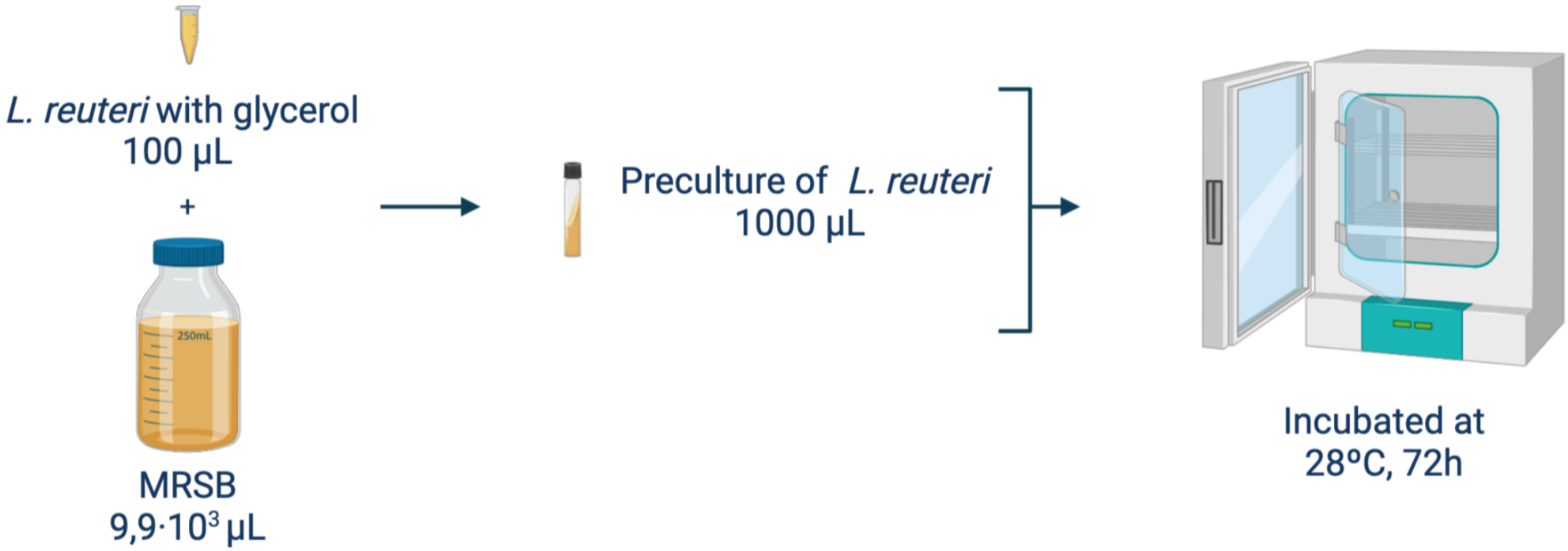


Pictures created with Biorender

Facultat de Ciències Biològiques

Methods

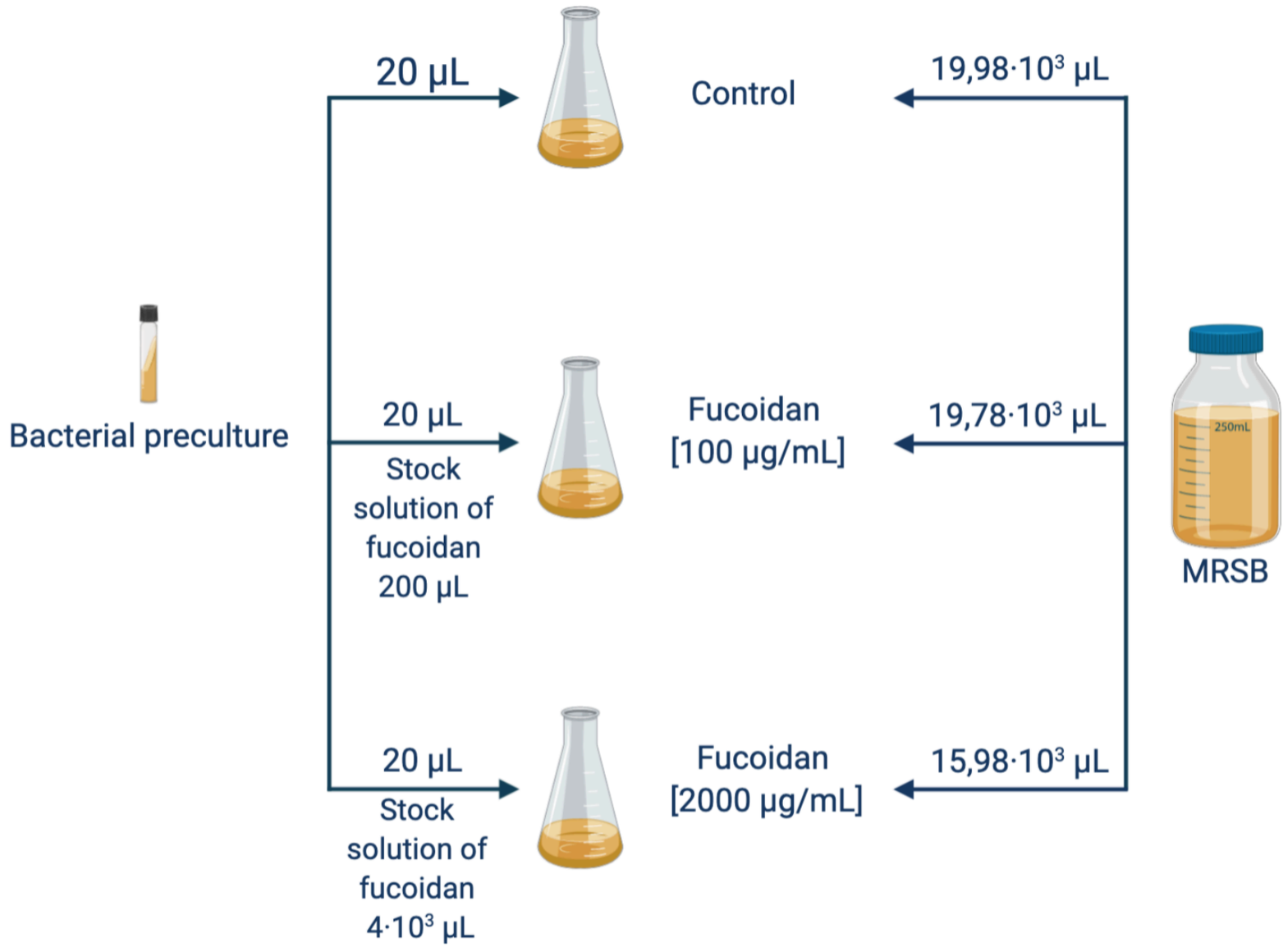
Preparation of bacterial preculture



Pictures created with Biorender

Methods

Preparation of cultures

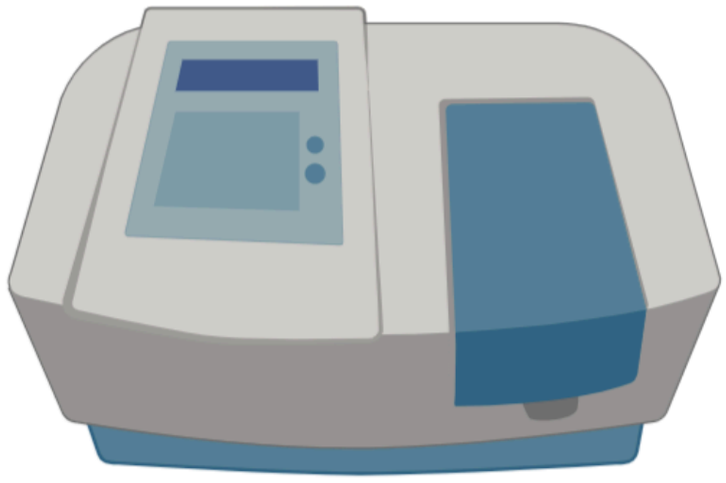


Pictures created with Biorender

Methods

Spectrometer measurements

1 mL aliquots from cultures of both the control and fucoidan trials were taken in triplicate and the corresponding absorbances were measured



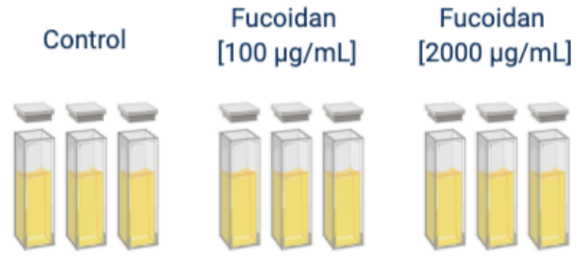
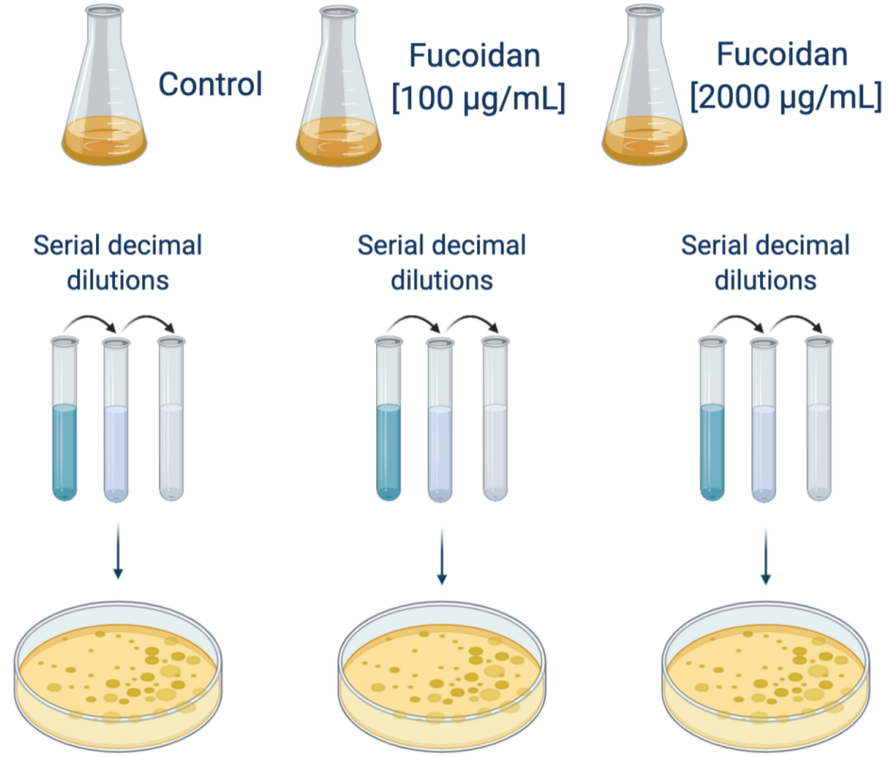


Plate seeding

Serial decimal dilutions and MRSA seeding were performed at different times during the incubation period. The plates were incubated in an oven at 28 °C, during 48 h



Pictures created with Biorender

Conclusions

+

Fucoidan *F. vesiculosus* [2000 µg/mL]
Prebiotic potencial on *L. reuteri*
2,21 ± 0,19 cicles Log_{10}

Fucoidan from *Phaeophyceae* algae
Prebiotic capacity
Improvement of allergic symptoms
Antimicrobial

PROMISING FUTURE NUTRACEUTICAL

Pictures obtained from:
https://www.shutterstock.com

GENERALITAT VALENCIANA
Conselleria d'Innovació, Universitats, Ciència i Societat Digital

Probiotic *Lactobacillus reuteri* growth improved under fucoidan exposure

1st International Electronic Conference on Food Science and Functional Foods
10 - 25 November 2020

VNIVERSITAT DE VALÈNCIA Facultat de Ciències Biològiques

Neus Ricós-Muñoz
Sergi Maicas
Mª Consuelo Pina-Pérez