

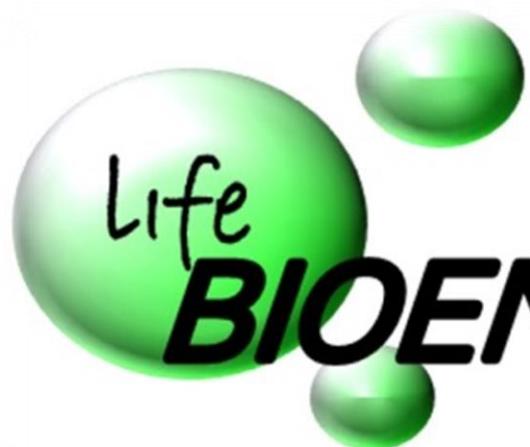
# ESTRATEGIAS DE ADMINISTRACIÓN ORAL DE MOLÉCULAS BIACTIVAS Y MICROORGANISMOS



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Universidad de Almería

September 28<sup>TH</sup> 2018

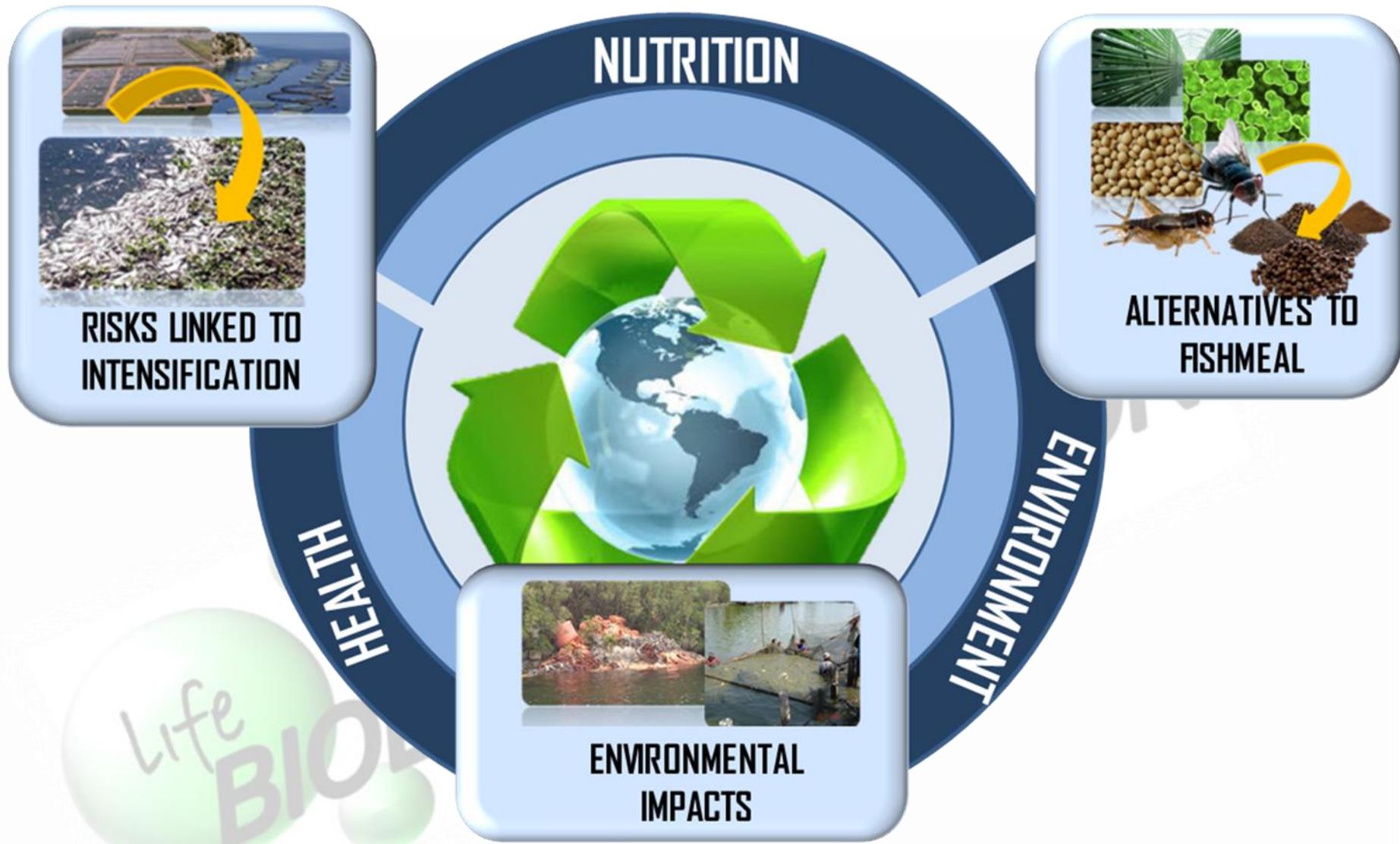




EBT

UNIVERSIDAD  
DE ALMERÍA

Customized solutions for unusual aquafeeds



## Diversifying nutrient sources



Customized diets with sustainable ingredients

## Innovative feeds



## Reducing environmental impacts



## Promoting health and welfare



Diet formulas with health promoters

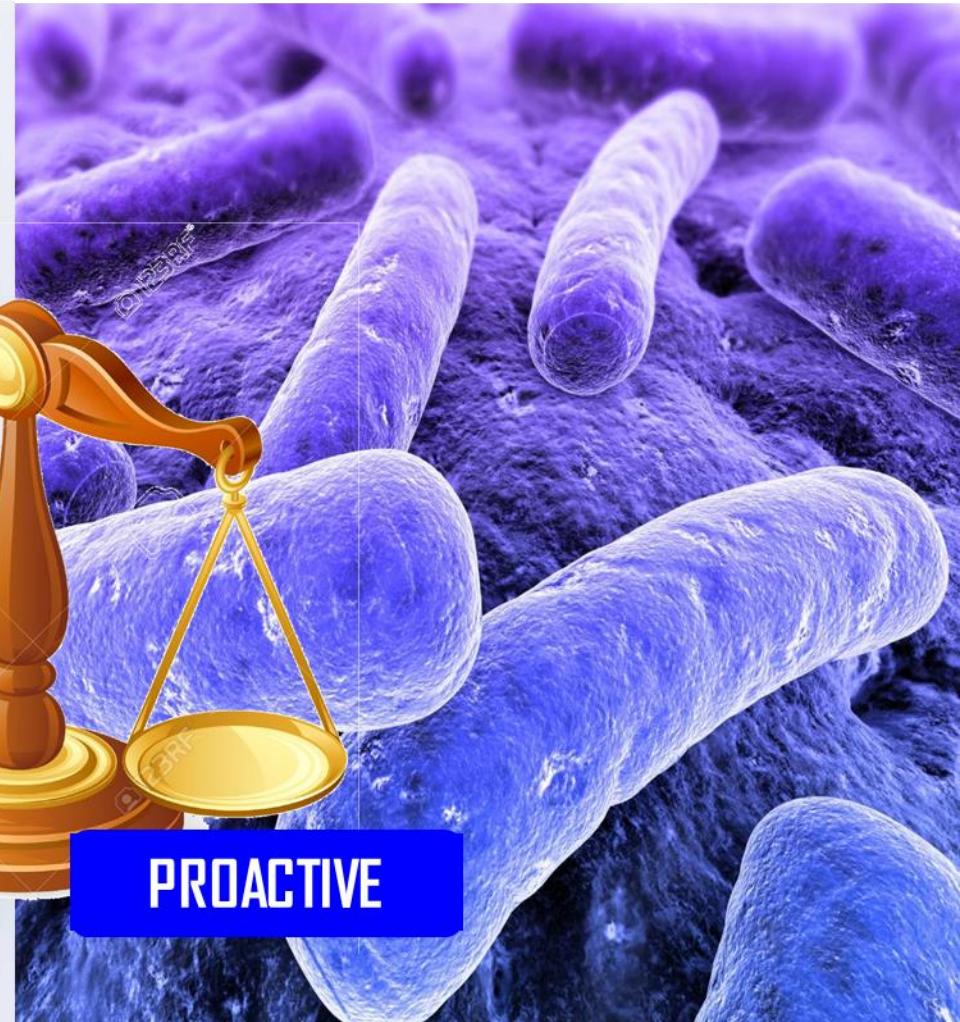
life

BIOENGINEERING

# HEALTH MANAGEMENT APPROACHES



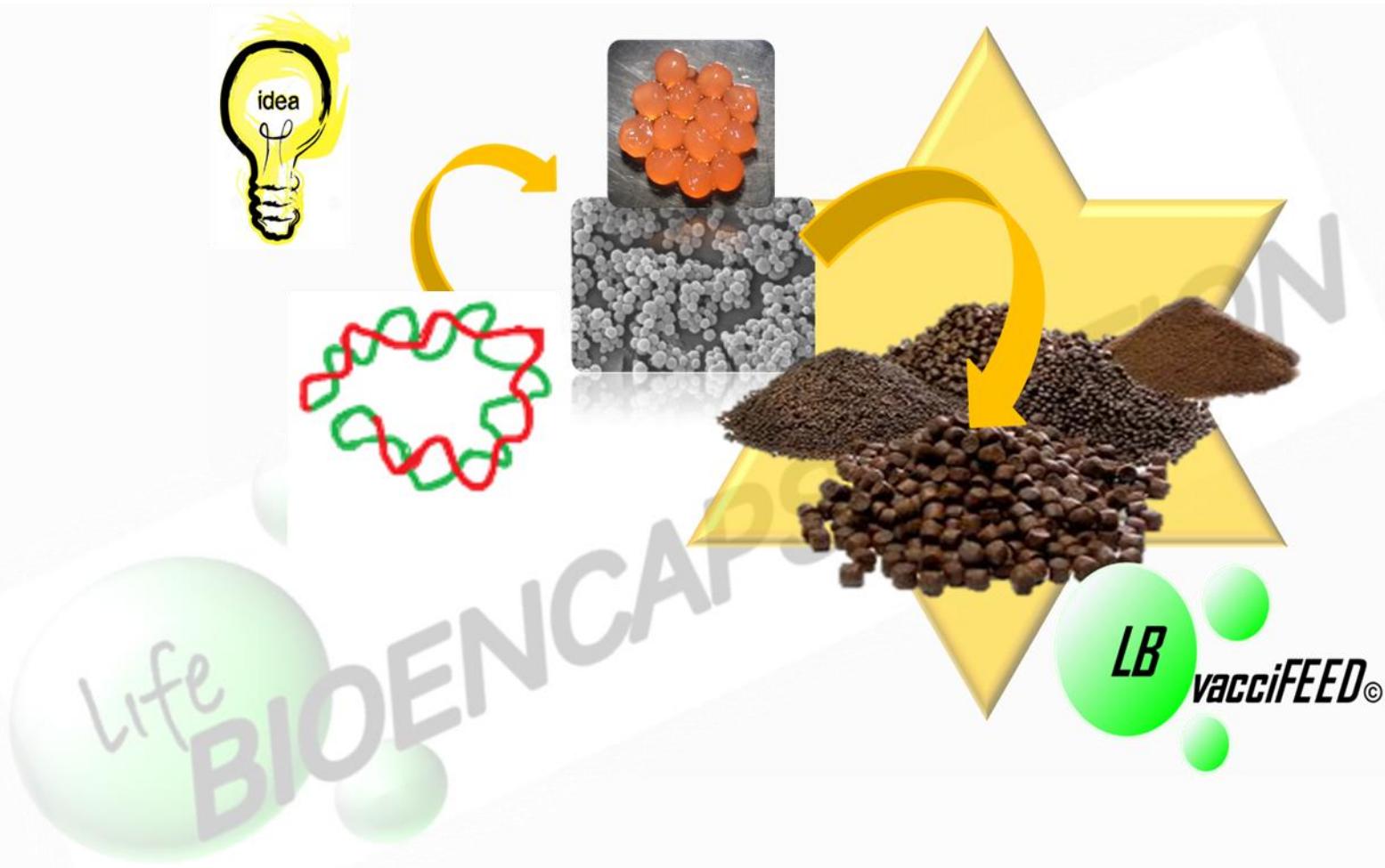
REACTIVE



PROACTIVE

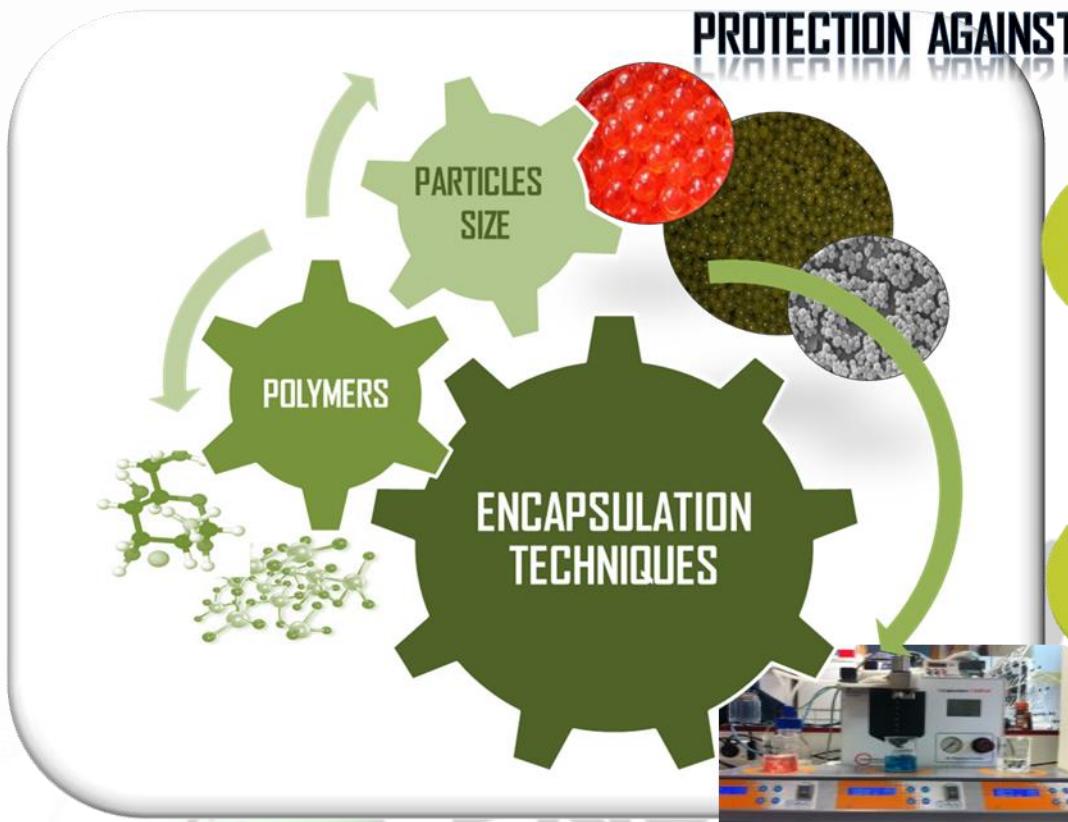


# KEY ACTIVITIES



# KEY ACTIVITIES

## ENCAPSULATION



PROTECTION AGAINST



**FEED PROCESSING**



**GUT BARRIERS**

life  
**BIOEN**

# KEY ACTIVITIES

## KEY ACTIVITIES THROUGHOUT THE ENCAPSULATION PROCESS:



What function must be encapsulate substance/microorganism achieve at its final destination?

What is the optimum ingredient concentration in the particle?

What processing conditions must the capsule overcame before releasing its content?

Which particle size, density, and stability requirements for the encapsulated for the encapsulated substance?

Which are cost constraints of the ingredients?

# KEY ACTIVITIES

## ENCAPSULATION: ISOLATED PROTEIN

6

M.I. Sáez et al. / Animal Feed Science and Technology xxx (2015) xxx–xxx

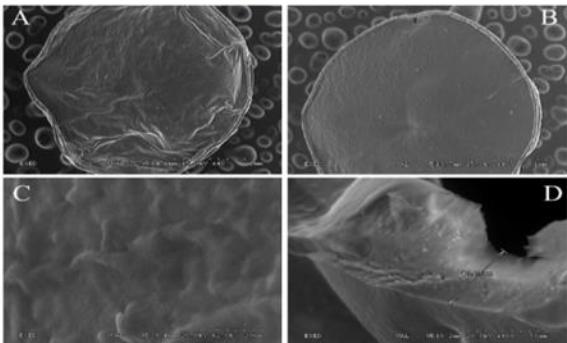
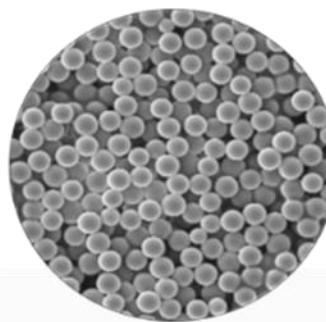


Fig. 3. SEM images of external (A and C), and internal (B) structure of alginate-chitosan beads. Detail of external wall thickness (D) of capsules containing  $30 \text{ g L}^{-1}$  alginate and  $1 \text{ g L}^{-1}$  chitosan.



Animal Feed Science and Technology xxx (2015) xxx–xxx

Contents lists available at ScienceDirect



Animal Feed Science and Technology

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



### Effect of alginate and chitosan encapsulation on the fate of BSA protein delivered orally to gilthead sea bream (*Sparus aurata*)

M.I. Sáez, A.M. Barros, A.J. Vizcaíno, G. López, F.J. Alarcón, T.F. Martínez \*

Departamento de Biología y Geología, Área de Zoología, Universidad de Almería, Carretera de Sacramento s/n, 04120, Almería, Spain

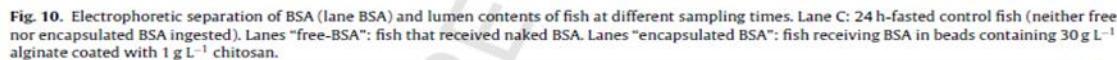
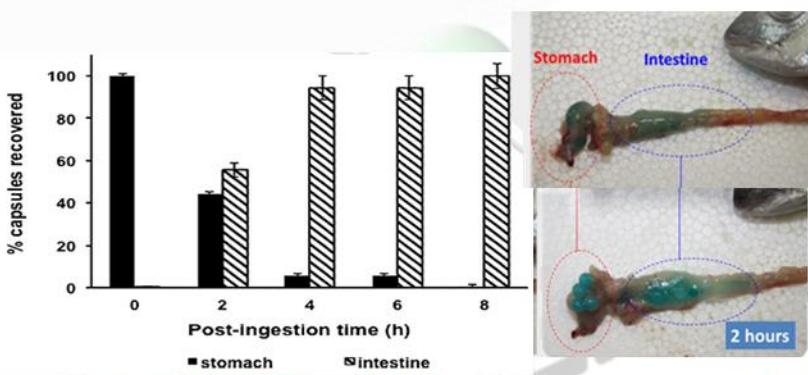
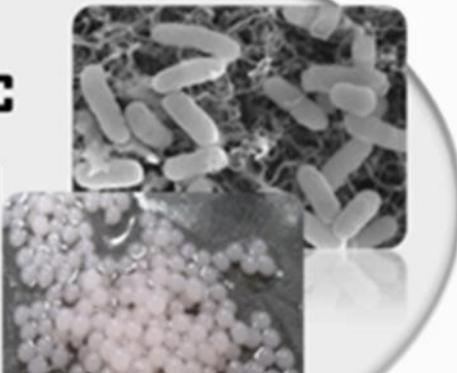


Fig. 10. Electrophoretic separation of BSA (lane BSA) and lumen contents of fish at different sampling times. Lane C: 24 h-fasted control fish (neither free nor encapsulated BSA ingested). Lanes "free-BSA": fish that received naked BSA. Lanes "encapsulated BSA": fish receiving BSA in beads containing  $30 \text{ g L}^{-1}$  alginate coated with  $1 \text{ g L}^{-1}$  chitosan.

# KEY ACTIVITIES

## ENCAPSULATION: PROBIOTIC BACTERIA

Probiotic  
Bacteria  
**SpPdp11**



Aquaculture Research, 2012, 43, 106-116

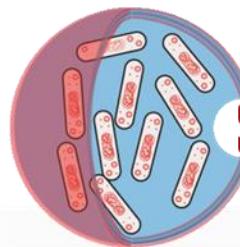
dok 10.1111/j.1365-2109.2011.02809.x

**Calcium alginate capsules for oral administration  
of fish probiotic bacteria: assessment of optimal  
conditions for encapsulation**

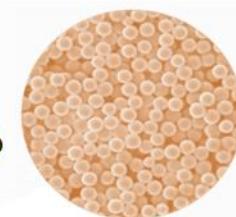
Pablo Rosas-Ledesma<sup>1</sup>, Juan Manuel León-Rubio<sup>1</sup>, Francisco Javier Alarcón<sup>2</sup>, Miguel A. Moriñigo<sup>1</sup>  
& María Carmen Balebona<sup>1</sup>



**Survival of encapsulated probiotic cells  
through the gastrointestinal tract of  
Senegalese sole**



**SpPdp11**



PATENT 201100385

# KEY ACTIVITIES

## ENCAPSULATION: PROBIOTIC YEAST

PATENT in process

The collage illustrates the encapsulation process and its applications:

- Top Left:** A petri dish showing bacterial growth.
- Top Right:** A red banner with the text "PATENT in process".
- Middle Left:** A series of images showing the encapsulation process: 1. Orange yeast cells; 2. Pink yeast cells; 3. White yeast cells; 4. Yellow yeast cells.
- Middle Right:** A school of fish swimming in water.
- Bottom Left:** Scanning electron micrographs (SEM) of yeast cells and capsules.
- Bottom Center:** A bar graph titled "Inmunoglobulinas totales" showing total immunoglobulins in mg/ml for five groups: CONTROL (yellow), A- 0,1 (red), A- 0,01 (pink), I- 0,1 (blue), and I- 0,01 (light blue). The Y-axis ranges from 0 to 14 mg/ml. Letters above the bars indicate statistical significance: 'b' for CONTROL, 'a' for A- 0,1 and I- 0,1, and 'b' for I- 0,01.
- Bottom Right:** A bar graph titled "T- BARS" showing T-bars in mg MDA/Kg for five groups: CONTROL (yellow), A- 0,1 (dark red), A- 0,01 (pink), I- 0,1 (blue), and I- 0,01 (light blue). The Y-axis ranges from 0,0 to 3,0 mg MDA/Kg. Letters above the bars indicate statistical significance: 'a' for CONTROL, 'c' for A- 0,1 and A- 0,01, 'b' for I- 0,1, and 'b' for I- 0,01.

life BIOEN

ENCAPSULATION

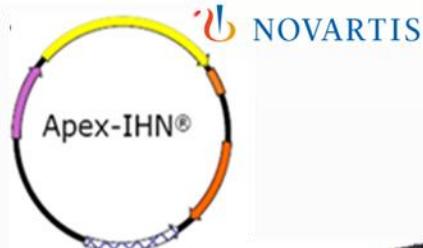
T- BARS

# KEY ACTIVITIES

## DNA VACCINES IN AQUACULTURE

DNA VACCINES

APEX-IHN



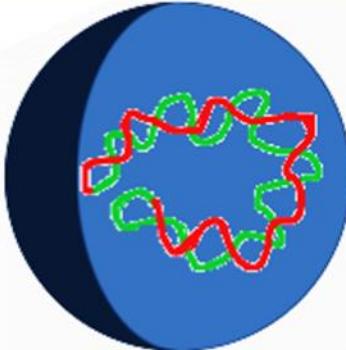
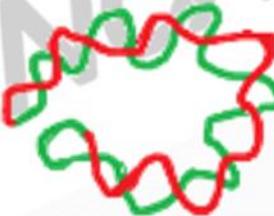
CLYNAV

Elanco



life

BIOENCAPSULATION



# KEY ACTIVITIES





витаминный комплекс  
**BLU**

# FROM LAB TO FARM



BIOENCAPSULATION



# TEAM-BACKGROUND

SPIN-OFF 2016



**Mabel Sáez**

AGRICULTURAL ENGINEER, PhD

**Tomás Martínez**

VETERINARIAN, PhD

**Javier Alarcón**

BIOLOGIST, PhD

Animal nutrition

Fish nutrition

Health and animal welfare

Feed formulation and technologies  
for production

Bioencapsulation

Food and feed technology

Industrial processes

# AREAS OF EXPERTISE

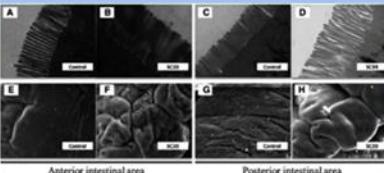
## DIGESTIVE PHYSIOLOGY



Two fish models are shown, one facing left and one facing right, illustrating the digestive system.

**Anterior intestinal area** and **Posterior intestinal area** are labeled.

Micrographs A-H show histological sections of the anterior and posterior intestinal areas. Labels include: **A**, **B**, **C**, **D** (Anterior intestinal area); **E**, **F**, **G**, **H** (Posterior intestinal area). Scale bars are present in each panel.



Scanning electron micrographs (SEM) of the **Anterior intestinal area** and **Posterior intestinal area** are shown. Each area has four panels labeled A through H, with scale bars.

## ORAL DELIVERY OF BIODEACTIVE MOLECULES/CELLS



Illustration of green capsules containing various internal structures, likely representing probiotics or particles.

**Probiotics**, **DNA/proteins**, and **Particles** are labeled.



Illustrations corresponding to the labels: **Probiotics** (green rod-shaped bacteria), **DNA/proteins** (blue helical structure), and **Particles** (grey hexagonal shapes).

## AQUAFEED MANUFACTURING



A collage of images related to aquafeed manufacturing, including:

- Top left: A tray of small, round feed pellets.
- Top right: Two trays of feed pellets with labels: **1.00**, **2.00**, **3.00**.
- Middle left: A tray of feed with small green pieces.
- Middle right: A tray of feed with larger, irregular pieces.
- Bottom left: A tray of feed with small, dark brown pieces.
- Bottom right: A tray of feed with large, irregular pieces.
- Center: A photograph of a **FEEDING LINE** with a machine and pipes.
- Bottom center: A tray of feed with large, irregular pieces.
- Bottom right: A tray of feed with large, irregular pieces.



Large piles of different types of aquafeed are shown, including dark brown, light brown, and greenish-brown materials.

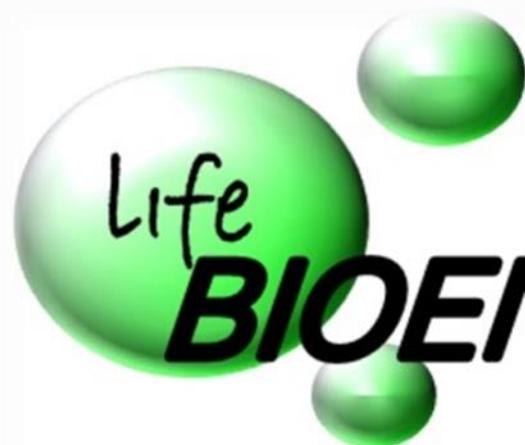
TRANSVERSALITY



# RESOURCES



Lab and pilot scale platform for feed manufacturing and encapsulation



**EBT**

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**Customized solutions for unusual aquafeeds**

**Gracias por su atención**

Mabel Sáez Casado