



B.E.A.D.S.

Bio-engineered micro Encapsulation of Active agents Delivered to Shellfish

ASSG conference

Oban, 23-24 October 2012

BEADS

Bio-engineered micro Encapsulation of Active agents Delivered to Shellfish

www.projectbeads.eu

Jean-Pierre Lacaze



Presentation outline

- Introduction & project overview
- Microencapsulation
- Work package (WPs) overview
- Results
- Conclusion



BEADS – Overview & Aims

- FP7-SME-2010-1 (01/03/2011-28/02/2013)
- Follow-up Spies-Detox project (FP6-SME)
- Exploitation of microencapsulation process to deliver active agents to a wide range of shellfish
- Aims:
 - active detoxification (domoic acid, okadaic acid)
 - more effective depuration of pathogens (bacteria, viruses)
 - utilisation of microencapsulated immunostimulants to boost response of flat oysters against attack by Bonamia
 - demonstration of active agents using commercial shellfish depuration



WP1

Investigate use of detoxifying bacteria delivered by micro-encapsulation to sites of toxins in shellfish

Lead partner: **marinescotland
science**



WP1- Investigate use of detoxifying bacteria delivered by micro-encapsulation to sites of toxins in shellfish

Tasks & Objectives

- Isolation, characterisation and identification of toxin degrading bacteria focusing on DA & OA
- Investigate parameters which may significantly influence degradation of algal toxins by selected bacteria
- Develop a 'probiotic' diet of active toxin degrading bacteria delivered through microcapsules and released in the digestive tract of shellfish

WP2

Investigate the use of administered micro-capsules as an aid to effective and efficient depuration

Lead partner:



WP2 - Investigate the use of administered micro-capsules as an aid to effective and efficient depuration

Objectives

- To design protocols using fluorescent microbeads to approve the suitability of shellfish purification systems
- To define a panel of bacteria with potential activity against pathogens
- To determine the best method for microencapsulation of selected bacteria
- To investigate viability of applying microencapsulated diets to increase the depuration process of the shellfish from pathogens



WP3

**Investigate the use of immuno-stimulants
or delivery of direct anti-Bonamia agents**

Lead partner:



WP3 - Investigate the use of immuno-stimulants or delivery of direct anti-Bonamia agents

Objectives

- Determine what size and types of microencapsulated beads can be used to target particular oyster tissues
- Determine if microencapsulated beads can be used to provide a more targeted delivery of probiotics or immuno-stimulants to *Ostrea edulis* infected with Bonamia
- Determine if the beads are targeting relevant tissues and organs where infection is present and if they are enhancing the immune system of the infected oyster
- Determine if there is a dose-time immune response by *O. edulis* to encapsulated beads with immuno-stimulants
- Determine if there is reduction in the prevalence of infection and/or intensity of infection over time after exposure to immuno-stimulants



WP4

Demonstration of results of detoxification/depuration at commercial depuration plants

Lead partner:



WP4 – Demonstration of results of detoxification/depuration at commercial depuration plants

Objectives

- Determine the potential of probiotic diets to detoxify shellfish in a commercial setting
- Design “alternative” protocols using fluorescent microbeads (as a proxy for bacteria or virus) for shellfish depuration system approval
- Determine the increase of the efficiency of shellfish depuration of bacterial and viruses using microencapsulated probiotics



Microbeads



Degradation of micro algal toxins



Challenge test



Depuration of bacteria/viruses



Demonstration at commercial depuration plants



Assessment of:

Toxin concentrations during purification process

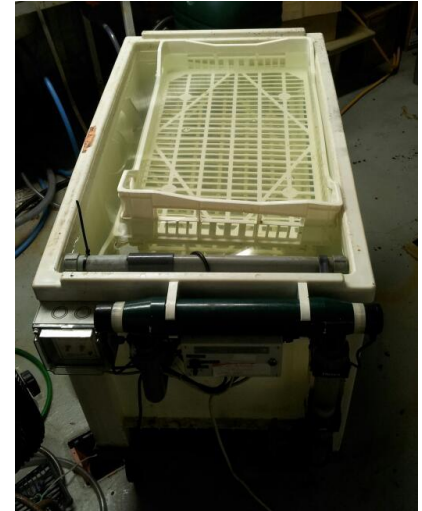
Microbeads clearance rates

Bacterial and viral clearance rates



Conclusions

- Determined optimum microcapsules size preferably ingested by flat oysters and mussels
- Microencapsulation of active agents is a good technique delivery to the digestive tract of shellfish
- In vitro experiments shown OA and DA could be utilised by bacteria/bacteria mixes at 12C and 20C
- 3M21 was identified as presenting anti-pathogen activity against *Listeria monocytogenes*
- 2 bacterial isolates were found to have some activity against *E. coli*
- The microbeads are successfully crossing the intestinal epithelium of flat oysters





Our 12 participants.....

www.projectbeads.eu

North Bay Shellfish Ltd



The Food and Environment Research Agency



UNIVERSIDADE DE SANTIAGO DE COMPOSTELA



GWENT GROUP
ADVANCED MATERIAL SYSTEMS



MARISCOS RIA DE VIGO, s.l.



ASSOCIATION OF SCOTTISH SHELLFISH GROWERS



ANFACO CECOPESCA
Centro Técnico Nacional de Conservación de Productos de la Pesca



ORKNEY FISHERIES ASSOCIATION



CZS Coastal Zone Services Ltd



GlycoMar

