BIORIGIN AND THE NEMO PROJECT: 4 YEARS ON

For the last four years, Biorigin's leading β-glucan product MacroGard® has been the subject of a European Marie Curie ITN project known as NEMO. Researchers in the NEMO project have been investigating the capabilities of beta-1,3/1,6-glucan, MacroGard® to balance the immune system and its application in aquaculture. As the project draws to a close, what has this project meant for Biorigin and the aquaculture industry?

Biorigin develops feed ingredients for the animal feed industry. All their ingredients are based on derivatives of yeast (*Saccharomyces cerevisiae*); a natural substance, produced in an environmentally friendly and sustainable manner. Biorigin offer a range of products such as, autolyzed yeast with excellent palatability and digestibility, organic selenium yeast and purified mannanoligosaccharides for intestinal health. Though undoubtedly, their most specialised and studied product is purified β-1,3/1,6-glucan known commercially as MacroGard®.

MacroGard® is β-1,3/1,6-glucans, purified from yeast cell walls. Studies show that beta-glucans enhancean organism's natural defences against common pathogens and stressors. Pathogens frequently develop resistance to pharmaceutical treatments and so the pharmaceutical industries constantly struggle to produce new alternatives for the prevention of diseases. Yeast β-1,3/1,6-glucan is recognized as a natural substance that helps strengthen the immune system rather than targeting pathogens directly. β-glucan can act as a preventative measure (prophylaxis) to infection rather than a cure and provides an ecological, long-term alternative to feed antibiotics.

The availability and structure of β-glucans should not be assumed identical between products, as there are large bioactive differences. MacroGard® is world renowned and the most widely documented β-1,3/1,6-glucan for animal feed.

In 2007, Biorigin and 8 other European partners, both commercial and academic, were awarded a major research and development contract by the European Commission, under Marie Curie Initial Training Networks (ITN). Such contracts are extremely competitive due to their high remuneration value and prestige. That year, €240million in total was awarded to Marie Curie ITNs for research and training activities; only 65 of 905 applications were awarded funding. This contract was for €3million, issued under the European Union's Seventh Framework Programme (FP7) for a project known as 'NEMO'.

Partner	Location	Employed Student Origin	Position held
Biorigin	Norway (Oslo)	England	MPhil
Tetra	Germany (Melle)	England	MPhil
Biomar	Denmark (Brande)	Sweden	MPhil
University of Veterinary Medicine	Germany (Hannover)	Poland England	Post Doc PhD
Danish Technical University	Denmark (Copenhagen)	Columbia Poland	PhD PhD
Wageningen University	Netherlands (Wageningen)	Denmark Denmark Italy	Post Doc PhD PhD
Keele University	UK (Keele)	Germany France Spain	PhD PhD Post Doc
University of Plymouth	UK (Plymouth)	Germany	PhD
Institute of Ichthyobiology and Aquaculture	Poland (Golysz)	England Ukraine	PhD PhD

Table 1: Partners and researchers of the NEMO project

NEMO, whose full title was **'Training network on protective immune modulation in warm water fish by feeding glucans'**, was a 4 year project (2008-2012) to investigate various aspects of β-glucan activity in fish. Across the partners, 16 researchers were employed. Table 1 summarises the partners and researchers of the NEMO project.

Each partner had its own roles within the NEMO project. MacroGard®, the β-glucan product chosen for research due to its vast documentation and guarantee of bioactivity was provided by Biorigin. Technical information and support was co-ordinated by Managing Director Rolf Nordmo.

With a growing global demand for food protein and the immense growth of the aquaculture industry in the last few decades, there has been

Biorigin
Art in Natural Ingredients

Europe: Vosseschijnstraat, 59
182 Haven, Antwerpen, Belgium
Tel. +32 3 542 4377

Brasil: Rua 15 de Novembro 865
18680-900 Lençóis Paulista, São Paulo
Tel. +55 (14) 3269 9200

fresh impetus for the research and development of substances beneficial for fish health and that could help control the frequent disease outbreaks in aquaculture. β-glucans were a prime candidate for further research.

Those involved in the NEMO project have been investigating MacroGard®'s role and effect on, for example, **gene expression, innate phase proteins, cell apoptosis, gut physiology, membranal composition, the inflammatory response, binding mechanisms, neutrophil extracellular traps (NETs) and wound healing.** Fours years on, as the NEMO project draws to a close, there have been many interesting and exciting new discoveries with regards to MacroGard®.

NEMO has been a very valuable project for Biorigin. Not only has it generated further documentation for MacroGard®, supporting it as the most documented β-glucan for use in animal feed, but is has highlighted new areas that could benefit from β-glucan application and kept Biorigin at the forefront of β-glucan research. The NEMO project enabled research on a large scale over a relatively short period of time and the dissemination of recent findings across European feed and aquaculture industries. Biorigin and the NEMO group have attended and participated in many events over the last four years. Key events have included the 15th conference of the European Association of Fish Pathologists (EAFP) in September 2011 and a conference entitled 'Prebiotics and probiotics in medicine, veterinary sciences and aquaculture: the future' held at Keele University, September 2012. For both of these events, Biorigin and the NEMO group provided sponsorship, gave numerous oral and poster presentations, organised social events and distributed materials.

New relationships, both in the aquaculture business and academia, have been formed and there is the prospect of future research and collaborations. Both brand and company have been strengthened as a whole.

Many papers have already been published by the NEMO group in highly acclaimed journals, and many more are expected in the near future. In a broader spectrum, as the knowledge of β-glucans grows, so does the acceptance of their immunomodulating capabilities and their potential as a natural, sustainable method for maintaining healthy livestock and increasing productivity. This could have significant impact in increasing turnover for related industries, enhancing cost-benefit for the end users (farmers) and contributing to meeting growing global food demands.

For more information please contact Ole Fretheim, mailto:ole.fretheim@biorigin.net or Rolf Nordmo, mailto:rolf.nordmo@biorigin.net

NEMO members: Geert Wiegertjes, Danilo Pietretti, Rolf Nordmo, Ilgiz Irnazarow, Anders Østergaard, Nicolas Pionnier, Sarah Harris, Mikolaj Adamek, Michael E. Nielsen, Anne Hjørngaard Larsen, Niels Hjermitslev, Dan Merrifield, Dieter Steinhagen, Graham Brogden, Patrick Frost, Natalia Vera Jiminez, Holger Kühlwein, Anna Sych, Inge R. Fink, Dominika Przybylska, Joanna Miest and Rebecca Heavyside. Missing NEMO members and close associates: Simon Davies, Gerd Grossheider, Alberto Falco, Martin Lingqvist, Patrycja Jurecka, Verena Schroers and Ole Fretheim.