

**Wednesday September 5<sup>th</sup> – Archibald / Campbell**  
**Nutrition and Fish Health**  
**Moderator - Andre Dumas ( Center for Aquaculture Technologies )**

1:45 PM	<b>Nutrition and Fish Health</b>	<u>da Silva</u> - Health Modulation through Nutrition
2:00 PM		<u>Galagarza</u> - Uncovering the Effects of a Dietary Supplementation of <i>Bacillus subtilis</i> Strains for Improved Fish Health
2:15 PM		<u>Jakob</u> - Functional Diet for the Control of <i>Piscirickettsia salmonis</i>
2:30 PM		<u>Papanna</u> - A Pathology Case Study of Cultured <i>Pagrus pagrus</i> in the Mediterranean-Ionian Sea of Greece
2:45 PM		<u>Trullas</u> - Effect of Jerusalem Artichoke-Prebiotic Supplemented Diets on Growth Performance and the Expression of Antioxidant Related Genes in Juvenile Red Tilapia.



**8<sup>th</sup> International Symposium on Aquatic Animal Health**

September 2-6, 2018 - Charlottetown, Prince Edward Island, Canada



## Health Modulation Through Nutrition

Polyana F. da Silva\*, Julia Mullins, Carlos Zarza, Linda Jensen, Charles McGurk

Skretting Aquaculture Research Centre, Sjøhagen 3, 3rd floor, 4016 Stavanger, Norway  
[polyana.silva@skretting.com](mailto:polyana.silva@skretting.com) [julia.mullins@skretting.com](mailto:julia.mullins@skretting.com) [carlos.zarza@skretting.com](mailto:carlos.zarza@skretting.com)  
[linda.jensen@skretting.com](mailto:linda.jensen@skretting.com) [charles.mcgurk@skretting.com](mailto:charles.mcgurk@skretting.com)

The aquaculture industry's major economic losses have to date, been primarily due to disease, which remains a key constraint to its continued growth. Although the development of efficacious vaccines has mitigated several bacterial and viral syndromes, such an approach has not proven successful in countering several key fish pathogens, whereas crustaceans do not even possess the immune pathways necessary for traditional vaccination approaches. Also, there is still heavy reliance on the administration of therapeutic agents, with on-growing concern for the antimicrobial resistance against the limited portfolio of chemotherapeutants currently authorised. Consequently, there has been increased focus on holistic integrated management programmes, within which the benefits of high quality functional feeds become more apparent.

It is widely recognised that nutritional modulation can have a profound effect on the overall performance of fish, and that certain feed additives, besides satisfying the dietary nutrient requirements for maximum growth, can reduce the impacts of pathogenic diseases by supporting inherent immune defences, countering oxidative stress while also limiting pathogen replication and shedding while supporting recovery from infections. Consequently, functional nutrition has become established as a core component of best practice for health and welfare control in aquaculture globally.

Skretting's Aquaculture Research Centre has been focused on the development and validation of functional nutrition strategies for more than 30 years. The world's first commercial fish health diet "RESPONS" was successfully launched by Skretting Norway in 1992, with continued research since then, leading to a range of diets to mitigate negative health impacts in farmed fish and shrimp.

The effects and potential role of Skretting's functional feeds on the overall health performance of fish and shrimp constitute a major topic of this presentation.

**Conference Session Designation:** ( Nutrition and Fish health )

**Presentation Format:** ( Oral )



**8<sup>th</sup> International Symposium on Aquatic Animal Health**

September 2-6, 2018 - Charlottetown, Prince Edward Island, Canada



## Uncovering the Effects of a Dietary Supplementation of *Bacillus subtilis* Strains for Improved Fish Health

Oscar A. Galagarza<sup>1\*</sup>, Stephen A. Smith<sup>2</sup>, and David D. Kuhn<sup>1</sup>.

<sup>1</sup> Department of Food Science and Technology, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061, USA. [osgar2@vt.edu](mailto:osgar2@vt.edu) [davekuhn@vt.edu](mailto:davekuhn@vt.edu)

<sup>2</sup> Department of Biomedical Sciences and Pathobiology, Virginia–Maryland College of Veterinary Medicine, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061, USA [stsmith7@vt.edu](mailto:stsmith7@vt.edu)

Aquaculture is one of the fastest growing food-producing sectors, with potential to address the future concerns of global food insecurity. Despite its major contributions to total fish production, the intensification and rapid expansion of aquaculture continue to be constrained by bacterial diseases, resulting in major economic losses to the industry. Given that traditional methods of antibiotic use remain controversial in the modern era, probiotics have been explored as an alternative method for both improved animal health and disease protection. The field of probiosis in aquaculture has advanced in recent years, but much remains to be revealed in terms of dosage, specific strains characterization, and mode of action of the biological agent.

To contribute to the body knowledge on application of probiotics for improved fish health, our laboratory has investigated the supplementation of direct feeding of spores of the strains of *Bacillus subtilis* O14VRQ and NZ86. The studies have consisted in dietary supplementation of the two strains in four different species of fish, including Pacific white shrimp (*Penaeus vannamei*), striped catfish (*Pangasius hypophthalmus*), Nile tilapia (*Oreochromis niloticus*), and giant pangasius (*P. sanitwongsei*). The work in Pacific white shrimp and striped catfish showed that, after challenge with either *Aeromonas hydrophila* or *Edwardsiella ictaluri*, mortalities and number of observed clinical signs of infection were significantly decreased ( $p < 0.05$ ). These results revealed the potential of both strains of *B. subtilis* to enhance disease resistance. Additionally, the study in tilapia confirmed stimulation of innate immunity by both bacilli strains, as a plausible mode of action. The work in giant pangasius, which is currently ongoing, is aimed to further validate the effects of strain NZ86 in the innate immunity of the host.

All together, these findings enhance the knowledge on the applicability of these two strains to help alleviate the problems of disease in aquaculture, which is vital for the continued growth of fish farming to achieve a healthier foodfish supply.

**Conference Session Designation:**

( Nutrition and Fish Health )

**Presentation Format:**

( Oral )



**8<sup>th</sup> International Symposium on Aquatic Animal Health**

September 2-6, 2018 - Charlottetown, Prince Edward Island, Canada



## Functional Diet for the Control of *Piscirickettsia Salmonis*

Eva Jakob<sup>1\*</sup>, Rodrigo Diaz<sup>1</sup>, Javier Gonzalez<sup>3</sup> and Simon Wadsworth<sup>4</sup>

<sup>1</sup> Cargill Innovation Center Colaco, Camino a Pargua km57, Colaco, Chile [eva\\_jakob@cargill.com](mailto:eva_jakob@cargill.com) [rodrigo\\_diaz@cargill.com](mailto:rodrigo_diaz@cargill.com)

<sup>2</sup> Cargill Aqua Nutrition, Freire 130, Piso 6, Puerto Montt, Chile [javier\\_gonzalez@cargill.com](mailto:javier_gonzalez@cargill.com)

<sup>3</sup> Cargill Innovation Center, Dirdal, Norway [simon\\_wadsworth@cargill.com](mailto:simon_wadsworth@cargill.com)

Bacterial diseases remain a problem in the aquaculture industry and although against some of them successful vaccine strategies have been implemented like *Aeromonas salmonicida* and *Vibrio spp*, others are more complicated to manage. Especially intracellular bacteria like *Piscirickettsia salmonis* and *Renibacterium salmoninarum* still require the use of antibiotics. For the Chilean salmon industry the control and management of *P.salmonis*, causative agent of SRS, is of major importance. The development of a functional diet to reduce the severity of the disease and therefore reduce the use of antibiotics is an important part of an integrated disease management strategy. Health diets have been assessed in the past against a number of viral pathogens including piscine reovirus (PRV) as well as salmon alpha virus (SAV). Optimization of dietary protein: dietary energy ratios was thought to be an important component of the improved protection observed. The aim of the study was to develop a dietary formulation that can significantly reduce the mortality in Atlantic salmon challenged with *P. salmonis*. The three test formulations contained optimized raw materials, varying digestible protein and digestible energy concentrations, as well as a mix of nucleotides and peptidoglycan as functional compounds. A cohabitation challenge using *P. salmonis* was conducted under controlled conditions at the Cargill Innovation Center at Colaco, Chile. A cohabitation infection model was used to allow for a more natural disease progression. Each diet group was evaluated in 4 replicates containing 120 fish each. The main outcome was survival and growth, however samples were taken for histopathology as well as gene expression. Results showed >30% increase in relative percent survival for the test diets compared to the control diet, as well as a significant increase in growth.

**Conference Session Designation:**

( Nutrition and Fish Health )

**Presentation format:**

( Oral )



**8<sup>th</sup> International Symposium on Aquatic Animal Health**

September 2-6, 2018 - Charlottetown, Prince Edward Island, Canada



## A Pathology Case Study of Cultured *Pagrus pagrus* in the Mediterranean-Ionian Sea of Greece

Kantham K. Papanna<sup>1</sup>\* & David Groman<sup>2</sup>

<sup>1</sup> Department of Fish Pathology, Nireus Aquaculture S.A., Chiliadou Doridos, Greece 33056  
[k.papanna@nireus.com](mailto:k.papanna@nireus.com)

<sup>2</sup> Aquatic Diagnostic Services, Atlantic Veterinary College, University of Prince Edward Island, Charlottetown, Prince Edward Island, Canada [groman@upei.ca](mailto:groman@upei.ca)

In recent years the farming of *Pagrus pagrus* in the Mediterranean is emerging as a new species of aquaculture-diversification under commercial on-growing, besides the traditionally cultured sea bass and sea bream. The currently adopted *Pagrus pagrus* species for farming in the Mediterranean appears to be a more desired species than the previously existed *Pagrus pagrus* species two decades ago, which has now disappeared and is non-existent in aquaculture. The presently adopted species of *Pagrus pagrus* grows faster and acquires a good colour pattern similar to any known brightly coloured *Pagrus* or red fish species. Further the morphological features of the currently farmed *Pagrus pagrus* seems to resemble that of *Pagrus* major cultured in Japan at present, both in terms of colour and shape making it more attractive for the farmers interested in diversification. For this reason its taxonomical status to be called as *Pagrus pagrus* synonymous with the old species is called in to question and there are proposals to review the taxonomic position of the current species and its name as *Pagrus pagrus*.

This conference presentation, describes a Pathology case study centered on the new *Pagrus pagrus* species cultured under commercial production conditions in Mediterranean Ionian sea based on new commercial fish feeds that are being tried and developed. Hatchery produced juveniles have been cultured since 2010, under commercial conditions fed on commercial feed pellets. While the production of the species on a small scale was appreciably good and encouraging in 2011, the fish stocked in 2011 and 2012 developed characteristic pathologies in the visceral organs in the size groups of around 200 to 500 gram fish. The clinical pathological picture was more drastic in the bigger size groups than the smaller size groups. While the liver spleen and the kidney were most affected in terms of pathological manifestations, other organ pathologies were also evident in the affected fish. This presentation will describe the findings of this case study and will highlight the potential causes for these pathological and histological changes observed.

**Conference Session Designation:**

( Nutrition and Fish Health )

**Presentation Format:**

( Oral )



**8<sup>th</sup> International Symposium on Aquatic Animal Health**

September 2-6, 2018 - Charlottetown, Prince Edward Island, Canada



## Effect of Jerusalem Artichoke-Prebiotic Supplemented Diets on Growth Performance and the Expression of Antioxidant Related Genes in Juvenile Red Tilapia.

Clara Trullas<sup>1</sup>, Mariya Sewaka<sup>1</sup>, Channarong Rodkhum<sup>2</sup>, Nantarika Chansue<sup>3</sup>, Surintorn Boonanuntanasarn<sup>4</sup>, Nopadon Pirarat<sup>1\*</sup>

<sup>1</sup> Wildlife Exotic and Aquatic Pathology-Special Task Force for Activating Research, Department of Pathology, Faculty of Veterinary Science, Chulalongkorn University, Bangkok 10330, Thailand [nopadonpirarat@gmail.com](mailto:nopadonpirarat@gmail.com)

<sup>2</sup> Department of Veterinary Microbiology, <sup>3</sup> Department of Veterinary Medicine, Faculty of Veterinary Science, Chulalongkorn University, Bangkok, Thailand

<sup>4</sup> School of Animal Production Technology, Institute of Agricultural Technology, Suranaree University of Technology, Nakhon Ratchasima, Thailand

An experiment was conducted to investigate the effect of Jerusalem artichoke-supplemented diet on the growth performance and the expression of antioxidant related genes in juvenile Red Tilapia. Red tilapia fish (average body weight of  $14.08 \pm 0.53$  g) were fed with basal (control, C),  $5.0 \text{ g kg}^{-1}$  JA-supplemented (5 JA), and  $10.0 \text{ g kg}^{-1}$  JA-supplemented (10 JA) for 4 weeks. Weight of the fish were measured at the beginning and end of the experiment. After feeding 4 weeks, the liver tissue were randomly collected. The results revealed that the growth performance the WG, SGR and ADG of fish fed with the 5 JA and 10 JA diets were significantly ( $P < 0.05$ ) higher than for fish fed the control diet. The prebiotic diet (5 JA and 10 JA) showed significantly increase the expression of the *gpx1* gene (1.94- and 1.57-fold) and *gst* gene (3.53- and 4.2-fold) in Red tilapia. Moreover, the gene expression profiles of *gr* gene revealed that the fish fed the prebiotic diet (10 JA) showed significantly up-regulated by 3.17 fold. The expression analysis of *cat* and *sod* of fish fed the prebiotic diet (5 JA and 10 JA) were higher ( $P > 0.05$ ) than those fed the control diet but were not statistically significant. Our study indicated that the Jerusalem Artichoke supplemented diets enhanced growth performance and, the expression of antioxidant related genes in juvenile Red Tilapia.

**Conference Session Designation:**

( Nutritional and Fish Health )

**Presentation Format:**

( Oral )



**8<sup>th</sup> International Symposium on Aquatic Animal Health**

September 2-6, 2018 - Charlottetown, Prince Edward Island, Canada

