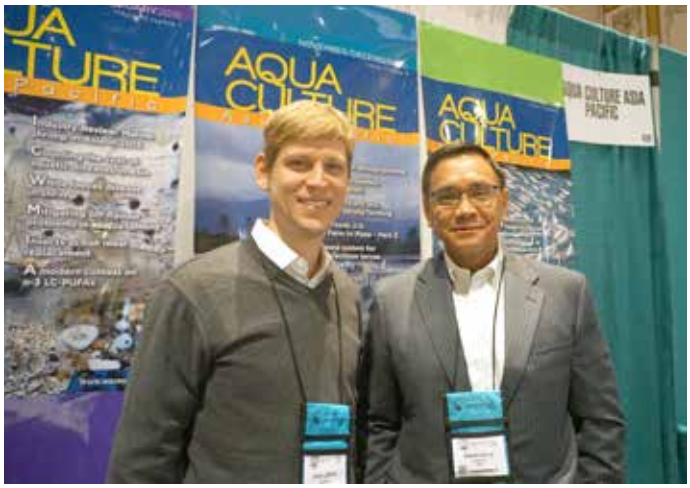
Innovating for alternatives to marine proteins at Aquaculture 2016



Allan LeBlanc (left) and Dennis Leong, VP Business Development

Aquaculture is expanding rapidly, putting pressure on the use of fish meal, a major dietary protein for several aquaculture species. Although, inclusion levels of fish meal have dropped in feeds for several species, demand still exceeds supply for high quality fish meal, leading to rising prices. Research to identify alternatives to fish meal are often presented at aquaculture conferences such as Aquaculture 2016, held in Las Vegas from February 22-26.

Single cell protein from methane fermentation

Josh Silverman, founder and Chief Product and Innovation Officer, Calysta Inc. proposed FeedKind™ protein as traceable, sustainable and cost effective alternative for fish meal. FeedKind is produced via natural fermentation with non GMO organisms.

Silverman developed a methane fermentation technology to create innovative industrial products from sustainable sources and founded Calysta Inc. In 2014, it acquired Norwegian company BioProtein A/S Norway, creating a synergy of two technologies, Calysta's novel natural gas conversion technology using methane for high value chemicals and fuels and BioProtein's technology to directly convert natural gas into biological products.

In his presentation, Silverman said that. "For aquaculture in particular, FeedKind Aqua protein has been demonstrated to perform significantly better than fishmeal in promoting growth and health in Atlantic salmon. The composition of FeedKind Aqua protein is comparable to fishmeal, and superior to many novel protein sources under development. FeedKind is approved in the European Union and the production process has been validated commercially. The product is expected to be available in the marketplace in 2018."

FeedKind Aqua has 71% crude protein with an amino acid profile superior to plant sources in terms of lysine, methionine and cysteine, tryptophan, threonine and isoleucine. The 10% crude fat comprising short chain, saturated fatty acids contributes to a firm flesh texture in fish. It has a shelf life of a year and consistency of composition batch to batch is assured.

"As a company we are focussed on FeedKind for the moment. We believe that this is good alternative for aquaculture. We just completed series C funding and Cargill is on board to partner for commercial production in North America. This commercial plant is expected to be online in 2018. Production will be in the 15,000 tonne range initially, and we can expect to scale up to 200,000 tonnes in the future," said Allan LeBlanc, Product Manager.

"Calysta's aim is to provide an alternative to fish meal for aquaculture species as well as for livestock production. We believe there will be a market for FeedKind around the world and market adoption of this ingredient is the core goal of the company.

"At the moment we have approval to sell into the EU. On the EU register of feed materials, it is a single cell protein suitable for all aquaculture species. Globally, we are targeting the salmon feed industry as this industry has previously used several thousand tonnes of FeedKind protein. Next will be the seabass and seabream in Europe, and we are evaluating additional species in Asia, with shrimp feed a high priority."

Marketing into Asia

According to LeBlanc, Calysta is actively evaluating South East Asia markets. "At the moment, approval is pending to enter these countries. Each country will have their own set of processes for registration and timeline for marketing clearance.

"The aquafeed industry in Asia is an important future market, partly because we see that there are species constrained with the use of quality feed. We are looking for partners, both academic and commercial and hiring for local and technical sales."

Algae for aqua feeds

The Algae Biomass organisation conducted a session on algae for aqua feeds. In his introduction to the session, John Benemann, MicroBio Engineering, Inc. said that a major attraction of microalgae is their potential to substitute fish oil and fish meal. Current commercial microalgae production is relatively small-scale, globally less than 20,000 tonnes of biomass is produced annually by autotrophic cultures (grown in sunlight and CO_2), and

Dr Geoff Horst (middle) with Shelley Turner (left) and Daniel F Villamar at the Algal Scientific booth.

Meagan Wairama and Chris Wilcox (left). Nutrinsic manufactures a single-cell protein product called ProFloc™. The facility in the US is now online and is capable of producing 5,000 tonnes of ProFloc™ per year. At the conference, Andy Logan, R&D vice president, presented results on a trial where the single cell protein progressively replaced up to 100% fish meal in feeds for 10 g vannamei shrimp. It was concluded that ProFloc™ can replace up to 100% of high-quality fishmeal in feeds for this shrimp.

WAS-APC student board member, Noe Noe Lwin, USSEC (left) and students at Auburn University, Lay Nguyen (Vietnam, tilapia/catfish), Sirirat Chatvijitkul (Thailand, tilapia/catfish), and Van To (Vietnam, shrimp)

approximately an equal amount by fermentation. *Spirulina*, the main microalgae currently cultivated is used for some specialty aqua feeds. Microalgae for aqua feeds are also produced by dark fermentations, a rapidly growing business. Seaweeds with several million tonnes being produced commercially is another rapidly expanding ingredient for animal and aquaculture feeds.

A promising new ingredient for the aqua feed industry is algal meal made from *Schizochytrium* sp, which is a rich source of docosahexaenoic acid, DHA. **Vikas Kumar** from the Aquaculture Research Centre, Kentucky State University presented work done using of ALL-G-Rich™ algae meal, *Schizochytrium* sp. (65% lipid, 27% of which is docosahexaenoic acid, DHA) as a fish oil replacement in a fish meal (25% fish meal) based diet and fish meal free plant protein-based shrimp diet (51% soybean meal). The trial was conducted with juvenile vannamei shrimp. He concluded that the microalgae (*Schizochytrium* sp.) can be used as a replacement for fish oil in both fish meal and plant protein based shrimp diets.

AlgaMUNE and AlgaGLUCAN are beta-1,3-glucan products of Michigan, USA based biotech developer Algal Scientific. According to **Dr Geoff Horst**, CEO, Algal Scientific started five years ago growing algae in large amounts. Algamune is produced by growing a selected strain of natural, non-GMO microalgae (*Euglena gracilis*) in a controlled and sterile fermentation system so that it contains more than 50% by weight of beta-1,3-glucan. Unlike other sources of beta glucan, such as yeast, mushrooms, and oats, this product contains only the pure, unbranched form of beta-1,3-glucan. There are no beta-1,6 side chains and it is not bound to other cellular components such as cell walls.

As a result, this beta-1,3-glucan is highly bioavailable. Controlled laboratory research at the University of Arizona has shown that Algamune incorporated into shrimp feed at a concentration as low as 500g/tonne increases survival after a challenge with highly virulent white spot syndrome virus (China strain). In a presentation, Yamamoto and colleagues at Texas A&M University showed some immunostimulatory effects in tilapia fed diets supplemented with the product at inclusion rates of 200 mg/kg of dry diet. Fish were challenged with a virulent strain of *Streptococcus iniae*.

Canada based Jefo is a global leader in non-medicated performance feed additives. From left, Herve Lucien-Brun, Ramon Jimenez, Jan Breckman and Dr Kabir Chowdhury.

The Wenger team, from left, Brian Streit, Jesse Mitchell, Marilyn Edelman and Joe Kearns.