**SANFEED Application-form 2017/2018**

**1. Personal data**

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| Full Name: |
| Name under which you publish: |
| Fiscal ID number: |
| ID document: |
| Birth date: |
| Nationality: |
| Gender: |
| Father's name: |
| Mother's name: |
| Work address: |
| Residential Address: |
| Work Phone: |
| Residential Phone: |
| Email: |
| Fax: |
| Cell phone: |

**2. Academic degrees**

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| Year: |
| Degree: |
| Final grade: |
| Degree granting institution: |
| School/College/Campus: |
| Thesis title (if applicable): |
| Supervisor: |
| Co-supervisor: |
| Scientific area: |
| Number of curricular years: |
| Program title: |

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| Year: |
| Degree: |
| Final grade: |
| Degree granting institution: |
| School/College/Campus: |
| Thesis title (if applicable): |
| Supervisor: |
| Co-supervisor: |
| Scientific area: |
| Number of curricular years: |
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| Year: |
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| Final grade: |
| Degree granting institution: |
| School/College/Campus: |
| Thesis title (if applicable): |
| Supervisor: |
| Co-supervisor: |
| Scientific area: |
| Number of curricular years: |
| Program title: |

**3. Present research interests:**

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| 2. |  |
| 3. |  |

**4. SANFEED topic(s)**

*Candidates can apply to one or more topics, and the case of multiple choices the topics should be ranked (1 to 5) according to the preference:*

* **Topic I: Modulating the protein profile and technological value of milk, emphasizing on casein enrichment through a nutritional approach (WP1)**

**Supervisory team:** António Mira Fonseca (REQUIMTE, LAQV, ICBAS-UP) and Isabel Ferreira (REQUIMTE, LAQV, FF-UP)

**Industrial Representative:** António Manuel Gomes Godinho (Sorgal – Soja de Portugal)

*Nowadays, the dairy industry is been more concerned with the health and technological aspects of milk and milk products, and with the possibilities of modifying their composition, namely by dietary approaches. The main objective of this proposal is to evaluate feeding strategies, at both rumen and whole animal levels (including trials with lactating dairy cows), towards the increase of dietary nutrient use efficiency and technological value of milk. Milk protein profile (especially casein enrichment), a key point to assess technological value of milk, will be evaluated by size exclusion and reversed-phase high-performance liquid chromatography/UV. Additionally, the amino acids (AA) profile (with the exception of tryptophan) will be determined by acid hydrolysis method and further derivatization. All AA (except tryptophan) will be separated by gas chromatography-mass spectrometry (GC/MS). Environmental implications of the novel feeding strategies might be expected through their impact on greenhouse gas emissions and nitrogen excretion while increasing energy and nitrogen efficiency. At the farm level, novel strategies will contribute for an improvement of production efficiency and for a raise in the economic value of milk resulting in an increase in the income over feed cost.*

* **Topic II: Identification and detection of biomarkers for carbohydrates and proteins fermentation pattern in ruminant animals (WP1)**

**Supervisory team:** Inês Maria Valente (REQUIMTE, LAQV), Ana Rita Cabrita (REQUIMTE, LAQV/ICBAS-UP), Hugo Oliveira (INL).

**Industrial Representative:** Francisco Castanheira (Alltech), Luís Ferreira (AGROS)

*The high economic importance of livestock in the world requires a constant concern with the productivity efficiency of the sector, which greatly depends on feeding practices and disease control. The products of rumen fermentation have distinct functions in animal metabolism and consequently in the ruminants’ health and nutritional status. Imbalanced diets containing high levels of fermentable carbohydrates or proteins are related to several consequences in ruminants’ efficiency by alterations in feed intake and degradability, besides having consequences in animals’ health. As example, diets containing high levels of starch decrease fibre digestion since starch hydrolysis and fermentation produces high amounts of volatile fatty acids and lactic acid. Besides, the decrease of the rumen pH can lead to ruminal acidosis. Acidosis has a high economic impact in the livestock sector as it highly affects not only feed intake but also the overall animal performance, being also associated to other health issues such as diarrhea, rumen mucosal damage, inflammation and liver abscesses, and laminitis. This project aims the characterization of the products arising from the ruminal fermentation of carbohydrates and proteins, that can constitute biomarkers of fermentation pattern contributing to the diagnosis of digestive and metabolic upsets. After an in vitro profiling of products from ruminal fermentation of different diets, the presence and identification of these markers will be assessed in animals from commercial dairy farms. The development of integrated systems for in-vivo detection of the identified biomarkers or other physical-chemical parameters will be prosecuted.*

* **Topic III: Modeling biofilm microbial community to optimize water quality and fish health in a marine Recirculating Aquaculture System (WP2)**

**Supervisory team:** Ana Paula Mucha (CIIMAR), Catarina Magalhães (CIIMAR), Eliane Silva (ICBAS-UP)

**Industrial Representatives**: Isidro Blanquet (Sea8), Diogo Rosado (Sea8)

*Recirculating aquaculture systems (RASs) provide opportunities to reduce water usage and to improve waste management and nutrient recycling, making intensive fish production compatible with environmental sustainability. Managing disease outbreaks pose speciﬁc challenges in RAS in which a healthy microbial community contributes to water puriﬁcation and water quality. Minerals, drug residues, hazardous feed compounds and metabolites may accumulate in the system and affect fish health, quality and safety. How the different factors interact and inﬂuence the ﬁsh and the various puriﬁcation reactors are still poorly understood. The main objective of this proposal is to model the microbial communities of a marine RAS, with special emphasis on the biofilter, in order to control water quality and bacterial infections throughout the production cycle. The work will be developed in a sole hatchery, and will start with the characterization of the microbial communities both from the biofilters and from the fish microbiomes. In this phase, a characterization of the water quality in the different compartments will be carried out, not only in terms of physico-chemical parameters but also in terms of pathogenic bacteria, with special focus on Tenacibaculum maritimum. After, experiments will be developed in the laboratory in which the microbial communities of the biofilms will be modeled to control water quality and the presence of pathogenic bacteria. At a later stage, the modeling process will be optimized at laboratory trials using fish, water and biofilm inoculum from the hatchery, and finally implemented in the real system in order to validate its efficiency.*

* **Topic IV: Improving immune function in newborn calves through milk replacer and starter supplementation (WP3)**

**Supervisory team:** Alexandra Correia (IBMC/i3S), Margarida Maia (REQUIMTE; LAQV, FC-UP) and Manuel Vilanova (ICBAS-UP/IBMC/i3S)

**Industrial Representative:** Isabel Ramos (CAVC), Elisabete Martins (INVIVO NSA)

*Newborn calves are susceptible to intestinal and respiratory infectious diseases. In the first weeks of life, antibodies passively transferred via colostrum can provide immune protection from infection. However, in the period when the level of maternal antibodies already declined and the calf’s immune system did not yet reach functional maturity, there is a higher susceptibility to these infectious diseases. Therefore, boosting systemic and mucosal immunity in calves during this period would expectedly reduce calf morbidity and mortality. This goal may be achieved by using immune modulators in the form of dietary supplements, that could assist calves during immunity development. β-glucans, usually of yeast origin, have proven immune-stimulating properties, inducing innate cell activation, enhanced cytokine production and a change in the metabolic state of the cell with a shift from oxidative phosphorylation to aerobic glycolysis, a phenomenon known as “trained immunity”. Purified yeast extracts are also rich in bioactive peptides. Although the characterization of these molecules is very recent, there is compelling evidence supporting the contribution of these peptides to the reinforcement of the intestinal barrier and protection of the host. Microalgae are also good candidates to use as diet supplements. They contain high levels of protein and are good sources for lipids and carbohydrates, including β-glucans. Additionally, these organisms can be easily enriched with micronutrients or biomolecules of interest. The main objectives of this study are: 1) to characterize in vitro the effect of purified yeast extracts enriched in β-glucans and bioactive peptides on the immune function of selected bovine leukocyte populations; 2) to assess in vivo and ex-vivo the effect of milk replacer supplementation with purified yeast extracts enriched in β-glucans and bioactive peptides on calves’ immune function; 3) to assess in vivo and ex-vivo the effect of starter supplementation with microalgae on calves’ immune parameters.*

* **Topic V: Gut health improvement in marine fish and shrimp through fortified diets: focus on inflammatory condition, immune status and microbiota diversity (WP3)**

**Supervisory team:** Benjamín Costas (CIIMAR), Paulo Martins da Costa (ICBAS-UP), Cláudia Serra (CIIMAR)

**Industrial representative**: Jorge Dias (SPAROS)

*The concept of maintaining animal health through the best possible nutrition is well-accepted in modern animal farming. Particularly for fish and shrimp production, there has been a compelling need to increase the dietary use of alternative protein sources including by products from agriculture, fisheries or the slaughtering of terrestrial production animals. Plant proteins (PP) are currently the most important alternative to fish meal (FM), given their high availability and good price. Alternative ingredients must provide nutritious diets that effectively grow aquatic species with minimal environmental impact and produce high-quality flesh to confer human health benefits in a cost-effective manner. However, a recognized disadvantage in most plant-derived nutrient sources is the presence of heat stable antinutritional factors (ANF) that may condition its nutritional value by altering digestion and nutrient utilization. Consequently animal homeostasis could be compromised increasing its susceptibility to oxidative stress. Nowadays, short-chain fatty acids (SCFAs) and pro- and prebiotics are currently being orally administered to farmed animals in order to improve their growth performance, immune status, antioxidative system and disease resistance. SCFAs showed high potential for improving intestinal absorption, increasing epithelial cell proliferation, differentiation and motility in humans and livestock. Prebiotics are important additives which may improve fish health status by modulating the host gut microbiota. These are non-digestible fibers that can selectively improve growth and/or activity of bacteria from the gut microflora, that have received considerable attention due to their health benefits to fish. The main goal of this proposal is to provide a better understanding of the influence of SCFAs, prebiotics and probiotics supplementation in extreme diets on gut integrity, microbiota diversity, immune mechanisms (including inflammation) and disease resistance in fish and shrimp. This project should allow the development of fortified commercial diets with specific knowledge-based formulations, hence supporting better farming results in terms of growth and disease susceptibility of aquatic animals. The project should focus on Nile tilapia (*Oreochromis niloticus*) and Pacific white shrimp (*Litopenaeus vannamei*) as target species to develop commercial solutions. A holistic approach using transcriptomics, immunohistochemistry, histology, plasma immune parameters, nutrient digestibility and growth/challenge trials will be used. This project will develop standardized models for gut dysbiosis in both tilapia and shrimp. Growth trials will be planned with a bacterial (fish) or a viral (shrimp) challenge at the end. Data gathered in this proposal will assist on the development of biomarkers for inflammation and immune condition in fish and shrimp.*

**5. Research project synopsis** (maximum 5,000 characters including spaces)

*Candidates have to prepare a project synopsis by themselves for evaluation of their* skills, abilities and capabilities, and *that should include:*

1. *Summarized state of the art related to the selected topic (about 1000 characters);*
2. *Proposal of a timely objective for a PhD thesis within the topic mentioned above, or the preferential one, if multiple topics have been chosen (about 300 characters);*
3. *Brief description of tasks to be developed to attain the objectives proposed above (about 3700 characters).*