

Animal Food & Nutrition Consortium 2019 Proposal Guidelines & Instructions

Deadline for Application

Please submit proposals to Adam Redhead via email, a_redhead@ncsu.edu by **Tuesday, March 26, 2019 5pm**

Program Requirements

Purpose

The mission of the Animal Food & Nutrition Consortium (AFNC) is to promote innovation and advances in the nutrition, metabolism and gastrointestinal health of production and companion animals. The focus will be on precompetitive research topics, driven by industry needs.

The proposed research projects must demonstrate the potential to bridge basic (fundamental) and applied (translational) research to accelerate the pace of discovery and application of new technologies, with a focus on animal nutrition and its impact on food and companion animal health and productivity.

Who May Apply

All faculty members of NC State University are eligible to apply.

- The principal investigator (PI) must hold a full time tenure-track or tenured faculty appointment, or an equivalent appointment as a full time research faculty with a dedicated independent lab. Visiting scientists, post-docs and other non-permanent positions are eligible as Co-PIs.
- Junior faculty are strongly encouraged to apply.
- ⊗ *A PI/Co-PI may have no more than one active award from the Consortium at the same time.*

Research Topics

- Review the Proposal Topic Submission Forms provided along with this Request For Proposals (RFP). Investigators are encouraged to communicate directly with Company Contacts listed on Research Topic Descriptions (attached) for additional clarification before submitting a proposal.
- Proposals should respond to Research Topics distributed with this RFP. *A PI or Co-PI may be included on only ONE proposal submission per Research Topic.*
- Additionally, PIs may submit one Proposal in a research area not covered by the Research Topics if it falls under the purview of AFNC.

Funding Requirements

See “Budget Guidelines” on page 2 for additional budget information.

- A maximum of \$50,000/year for up to 1 year can be requested.
- Requested funds may include salaries/fringe benefits for researchers and support personnel **but may NOT include salaries/fringe benefits for PI or Co-PIs as defined under “Who May Apply.”**
- Requested funds may be used for travel, supplies, current services, and other direct costs related to the project.

Review Process

The Proposal review process is as follows:

- Proposals will be distributed electronically to Industrial Advisory Board (IAB) representatives from Member companies for review. IAB representatives will rank proposals for commercial potential, conformance with Research Topics and mission of AFNC.
- The top proposals will be subjected to a second round of discussion and final ranking for funding at the IAB meeting scheduled for May 13, 2019.

Funding decisions will be made at the IAB meeting. The decisions of the IAB are final.

- Proposals approved for funding will be uploaded into PINS by the PI and include: a Statement of Work, Budget with a Budget Justification and a copy of the IAB meeting minutes that lists projects selected for funding.

Post-award Reporting

PIs are expected to provide a progress report or final report at the annual IAB meetings, as appropriate. Quarterly interim reports to Consortium Members are strongly encouraged.

Confidentiality

The IAB will endeavor to maintain the confidentiality of all applicants' information. However, the applicant is responsible for not disclosing any information that should not be discussed outside of the IAB meeting. Similarly, Research Topics are not to be disclosed outside the university, including to other industry members.

Application Instructions

General Proposal Formatting Guidelines

- Use standard font (such as Calibri, Cambria, or Times New Roman) no smaller than 12 point.
- Page set-up should be for single-spacing on 8½"x11" paper.
- Number each page.
- Margins should be 1".
- Each section should be titled using the headers listed below.
- Do **not** use logos or letterhead on **any** pages of the Proposal.

Proposal Requirements

The Proposal must include the following sections. The project description cannot exceed three (3) pages (as indicated below). This limit does NOT include the Title Page or Letter(s) of Support.

- **Title Page:** Include Project Title, PI (Co-PI), Amount Requested, Research Topic
- **Research Plan (maximum 2 pages):** List objectives with brief descriptions of each. Include a Statement of Work, a description of

the project, and justification in terms of potential for significant contribution to the study of animal nutrition and health. PIs are encouraged to include a discussion of project deliverables.

- **Budget and Budget Justification (maximum 1 page):** A maximum of \$50,000/year for up to 1 year can be requested. See Budget Guidelines below.
- **Letters of Support:** Include letters of support from collaborators (if applicable).

Budget Guidelines

Allowable items include:

- Salaries and fringe benefits for research team and other personnel.
 - **Requested funds** may include salaries and benefits for researchers and support personnel. Funds can NOT include salary and fringe benefits for the PI or Co-PIs.
 - All investigators **must** be included, with percent effort, on the Budget Sheet.
- Materials and supplies (itemize; group into categories no larger than \$5,000).
- Equipment
- Travel to research sites (for projects involving two or more institutions/organizations or if research requires offsite visits).
- Travel to national and international conferences (only if presenting research findings from this project).
- Current Services
- Other direct costs
- Do not include indirect costs (F&A) in the budget as NC State overhead (10%) has already been charged to the Consortium.

For further information or queries, please contact Adam Redhead at a_redhead@ncsu.edu or 919-515-5332

ANIMAL FOOD & NUTRITION CONSORTIUM

RESEARCH TOPIC

Submitted by: Joan Torrent

Company: Oligo Basics USA LLC

Contact name: Joan Torrent

Email: jtorrent@oligobasics.com

Proposed Title of Project:

Amino acid supplementation-disease interactions affecting the incidence of wooden breast in broiler chickens

Proposed Research Project Outline and Deliverables:

The degenerative myopathy known as wooden breast (WB) has been increasingly observed in the breast muscle of commercial broilers during the last decade. Preliminary research concerning WB has focused predominantly on defining meat quality or histopathological characteristics of affected tissue. Additionally, some researchers have begun to investigate the genetic basis of WB.

Although WB occurs spontaneously in multiple commercially available modern broiler strains under a variety of growing conditions worldwide, it can be reliably increased by feeding diets with high amino acid (AA) density. Likewise, strategically reducing the concentration of AA critical to breast muscle accretion, such as digestible Lys (dLys), during specific phases of growth can reduce the incidence of WB.

The company submitting the proposal works both in the US and Brazil and a non-scientific observation of the author is that companies seemed to be more affected or much more worried about wooden breast in the US than in Brazil. Not only that, but the author has bought chicken breast with WB characteristics at least twice during the last 12 months in the US and could not find anyone reporting such a problem in Brazil (I spent the whole month of December in Brazil). If that were really the case, this observation might point to factors that affect WB incidence in chickens relating to how chickens are reared in those two countries. Performance results are similar if not better in Brazil than in the US, so differences could not be attributed to lower growth rates. Slaughter weights tend to be higher in the US than in Brazil and the incidence of WB increases with age, so this could partially explain the differences. However, slaughter weights have been steadily increasing in Brazil and are now probably around 45 days, which is not much different from the slaughtering age of many US companies. Diets are corn/soy based in both countries and genetics are the same (Cobb/Ross).

One large difference between the two countries is the use of the coccidiosis vaccine. Cocci vaccines are widely used in the US but practically never used in Brazil. Could cocci vaccines increase the rate of WB? This is probably counter intuitive, as ionosphere toxicity actually produces a muscle degeneration similar to WB and a cocci challenge decreases growth rate. Therefore, one should assume that cocci vaccines should decrease the incidence of WB. However, coccidiosis results in high inflammation and decreases amino acid digestibility (2016 Poultry Science 95:1573–158). The greatest losses in digestibility were those of the branched-chain amino acids (BCAA). Branched-chain amino acids, especially leucine, influence the adaptive response of skeletal muscle. Leucine supplementation has been described as a potential non-pharmacological tool able to stimulate both muscle anabolism and decrease catabolism and to modulate glucose homeostasis. The mammalian target of rapamycin (mTOR) signaling pathway is necessary for cellular protein synthesis regulation. High dietary leucine activates target of rapamycin signaling pathways in skeletal muscle of neonatal chicks to stimulate muscle protein synthesis (2014, Poultry Science, 93, 1: 114–121). BCAA can directly modulate the protein turnover of the muscle cell in order to counteract the catabolic and anti-anabolic effects of the inflammatory stimulus, and WB seems to be triggered by inflammatory stimuli. Therefore, could a deficiency of BCAA or more specifically of leucine (or an imbalance of BCAA/Lys) during the cocci challenge trigger the changes that lead to WB? As Lys digestibility is decreased much less than BCAA digestibility, could there be an increase in dLys/dBCAA that could also lead to an increase in WB?

Proposed studies

1. Identify the effects of Leucine and/BCAA deficiency or dLys/dBCAA relationships on WB incidence.
2. If (1) does have an effect on WB, study the effects of cocci vaccine interactions with BCAA supplementation on WB.

ANIMAL FOOD & NUTRITION CONSORTIUM

RESEARCH TOPIC

Submitted by: Hongyu Xue

Company: Amlan International

Contact name: Hongyu Xue

Email: Hongyu.Xue@amlan.com

Proposed Title of Project:

Development of simple, rapid, sensitive methods for specific detection of food-borne pathogenic bacteria in poultry farming and food diagnostic laboratories

Proposed Research Project Outline and Deliverables:

The culture-based techniques were used as the gold standard for the detection of these pathogens, i.e., *Salmonella* spp., *Campylobacter* spp., *Shigella* spp. and *Listeria* spp.. But the conventional culture-based procedures require multiple subculture steps, biochemical and serological confirmation, which were time-consuming and labor-intensive. Molecular technologies, such as real-time PCR assays, might not be available for commercial or field labs given the fact that specialized laboratories, complicated equipment and trained personnel are needed. Further, PCR-based technologies may not have the ideal performance in samples containing low numbers of bacterial cells. A simple, rapid, sensitive, and specific approach for detection of *these food-borne pathogens* in broiler/layer farming field and food diagnostic laboratories. In my opinion, this is an apparent gap which needs to be filled with some pioneering research that can be 'catalyzed' by the Consortium. It would add significant value to the diagnostic use, especially early diagnosis of certain pathogenic bacteria, in the real operations and field. To my knowledge, there are some potential techniques that hold promise to this end, e.g., Loop-mediated isothermal amplification (LAMP) and immunosensor. Valuable 'translational' research is warranted to mature them into meaningful and practical tools which can be used in the real world and impact the animal production operations.

ANIMAL FOOD & NUTRITION CONSORTIUM

RESEARCH TOPIC

Submitted by: Christine Brøkner

Company: Hamlet Protein A/S

Contact name: Christine Brøkner

Email: CHR@Hamletprotein.dk

Proposed Title of Project:

Diet induced oxidative stress and inflammation in relation to animal health – short and long-term effects

Proposed Research Project Outline and Deliverables:

Oxidative challenge or mild inflammation is not only related to pathogenic infections and hygienic status on farm level but is also caused by feed ingredients used in diet formulation.

It is hypothesized that the more “clean ingredients used in basal diets” e.g. the higher digestibility, lower content of ANF’s etc. the less challenged the animals are and the more likely they are to stay healthy.

Clean diets can be achieved by multiply ways e.g. adding different components to the diet; however, the focus of this research proposal is to only work with refined feed ingredients while at the same time considering the overall production cost.

Purpose of this research topic is:

- To gain more knowledge about the multiple interaction between nutrient components like crude protein, nutrient digestibility and ANF’s on short and long term effect in young mono-gastric animals.
- The effect of early growth state subclinical oxidative stress / inflammation on animal performance, impact on overall performance cost short- and long-term effects.
- To investigate the effect of early inflammation /oxidative stress on performance prior to the inflammation develops into a more chronical stage.
 - o Identify major dietary ANF’s and antigens from feed ingredients used in basal diet formulation
 - Trypsin, Beta-conglycinin, non-protein nitrogen, phytate, NSP etc.

- Identify upper and lower levels for ANF's and to quantify the effect on overall performance cost and health specific parameters
- Effect on gastro-intestinal development in young animals when exposed to ANF's, antigens, undigested protein (free nitrogen or non-protein nitrogen) incl. long-term effect in animals.
 - Interesting parameters to investigate, histology and morphology of tissue samples, tight junction cytokines and biogenic amines
- Longer-term effect of subclinical inflammation on performance and other production parameters.
 - Interesting inflammatory markers to investigate, haptoglobin, vitamin E
- Identify effect of ANF's on oxidative status in animals by parameters like e.g. reactive oxygen metabolites, ferric reducing ability of plasma, glutathione peroxidase or other enzymes, advanced oxidation protein products, Thiobarbituric acid-reactive substances, protein carbonyl and MDA.

Note (Adam Redhead): For this research topic, a proposal can be generated for all of the research objectives or a subset of the objectives.

ANIMAL FOOD & NUTRITION CONSORTIUM

RESEARCH TOPIC

Submitted by: Haitham Yakout

Company: Adisseo Inc. (Nutriad)

Contact name: Haitham Yakout

Email: Haitham.yakout@adisseo.com

Proposed Title of Project:

Animal nutrition management enhance gut health, performance

Proposed Research Project Outline and Deliverables:

The gastrointestinal tract (GIT) is a complex ecosystem heavily influenced by different animal production practices. Therefore, optimal functionality of GIT is essential for sustainable animal production. Key components of GIT functionality include; diet, effective structure and function of the gastrointestinal barrier, host interaction with the gastrointestinal microbiota, effective digestion and absorption of feed and effective immune status.

Possible solutions; Improving animal intestinal integrity, functionality, performance and health through research advancements in proper nutrition management. This can be achieved through finding tools/ways or practices with meaningful relationships between the host mucosal immune system, the microbiome, and feed ingredients.

In turn, this directly affects the animal's intestinal functionality, performance and health. Although 'normal' microbiota of production animals has yet to be clearly defined, we know that optimal gut function is characterized by a normal, stable, and diverse GIT microbiota and an intact GIT barrier.

ANIMAL FOOD & NUTRITION CONSORTIUM

RESEARCH TOPIC

Submitted by: Haitham Yakout

Company: Adisseo Inc. (Nutriad)

Contact name: Haitham Yakout

Email: Haitham.yakout@adisseo.com

Proposed Title of Project:

Gut microbiome and its interaction on health and the Gut, early feeding with optimum feeding programs and their impacts on immune status, production and overall health

Proposed Research Project Outline and Deliverables:

One of the key stimulators of intestinal development in the chick is physical exposure to feed, while feed withholding delays the onset of gut development. The functional development of the intestine as a digestive and absorptive organ appears to be closely related to its development as some major lymphoid organs, an influencing component of the mucosal immune system, that have evolved to provide protection against pathogens encountered by the gut. This function is particularly important in birds. Therefore, there is a critical need for developing different innovative strategies and/ or feeding programs to promote gut health that if applied would limit/ reduce pathogens and diseases in raised farm animals.

ANIMAL FOOD & NUTRITION CONSORTIUM

RESEARCH TOPIC

Submitted by: Haitham Yakout

Company: Adisseo Inc. (Nutriad)

Contact name: Haitham Yakout

Email: Haitham.yakout@adisseo.com

Proposed Title of Project:

Tracking gut health and the microbiome [broilers, turkeys & swine]

Proposed Research Project Outline and Deliverables:

1. Use of Biomarkers and big data to help track and prevent or alleviate enteric diseases caused by internal and external factors
2. Identify microbiome structure and bacterial groups especially in monitoring and identifying the level of immunity or subclinical disease level in large population group

ANIMAL FOOD & NUTRITION CONSORTIUM RESEARCH TOPIC

Submitted by: Haitham Yakout

Company: Adisseo Inc. (Nutriad)

Contact name: Haitham Yakout

Email: Haitham.yakout@adisseo.com

Proposed Title of Project:

Connecting undergraduate students with industry and academic experts, they may not otherwise have the opportunity to interact through extracurricular seminars

Proposed Research Project Outline and Deliverables:

Looking for alternatives, 'Non-traditional' approaches to connect two very separate worlds: Academia and Industry. Both have very different goals and mindsets. Students wishing to enter industry can only hope that they have the minimum experience required to enter industry, but many have no experience. What can be done to bridge the gap between academia and industry?

A support system is needed to ensure a focused involvement of both academia and industry. Academic institutions should develop systems and procedures to ensure that industry expectations are met without any compromise on academic aspirations. That is, optional coursework or classes; extracurricular seminars with industry professionals;

ANIMAL FOOD & NUTRITION CONSORTIUM

RESEARCH TOPIC

Submitted by: Paula Barngrover

Company: Premex Inc

Contact name: Paula Barngrover

Email: paula.barngrover@premexinc.com

Proposed Title of Project:

Gut Health Biomarkers

Proposed Research Project Outline and Deliverables:

A work has been initiated towards finding biomarkers that will show gut health as a quantitate fact.

There is research worldwide about it. A metanalysis that extracts the information from available knowledge and creates research to do deeper in that knowledge will be interesting. Mathematical models that allows us to predict gut health or gut inflammation, so the industry can act before the animals get sick. Same way today the industry measures performance with feed conversion. The industry needs an standardized way to measure gut health.

Deliverable:

- Correlations of biomarker levels and performance.
- Institutionalization of the gut health measurement by NCSU.

**ANIMAL FOOD & NUTRITION CONSORTIUM
RESEARCH TOPIC**

Submitted by: Paula Barngrover

Company: Premex Inc

Contact name: Paula Barngrover

Email: paula.barngrover@premexinc.com

Proposed Title of Project:

Non Antibiotic Therapy technologies efficacy test

Proposed Research Project Outline and Deliverables:

We have many alternatives in the market that offer same efficacy of Antibiotics in animal protein production. We need to have a technology developed that helps us see as a fact how effective is a non-antibiotic technology versus an antibiotic under commercial conditions.

Deliverable: identification of the marker for efficacy and its assay to measure it.

ANIMAL FOOD & NUTRITION CONSORTIUM
RESEARCH TOPIC

Submitted by: Paula Barngrover

Company: Premex Inc

Contact name: Paula Barngrover

Email: paula.barngrover@premexinc.com

Proposed Title of Project:

Measurement of intestinal tract activity in pigs

Proposed Research Project Outline and Deliverables:

Develop a non-invasive technology that allow us to sample gut in Pigs, so we can start the work that has been done in poultry.

Deliverable: Tracking technology

ANIMAL FOOD & NUTRITION CONSORTIUM
RESEARCH TOPIC

Submitted by: Paula Barngrover

Company: Premex Inc

Contact name: Paula Barngrover

Email: paula.barngrover@premexinc.com

Proposed Title of Project:

Artificial Intelligence

Proposed Research Project Outline and Deliverables:

In our effort to increase certainty in our livestock farming decision, we need artificial intelligence to be part of farming. Develop an economical model that optimizes livestock production using artificial intelligence models. Developing of tools that allows us to measure critical factors in livestock production in an affordable way.

ANIMAL FOOD & NUTRITION CONSORTIUM

RESEARCH TOPIC

Submitted by: Marcos Rostagno

Company: Phytobiotics North America

Contact name: Marcos Rostagno
Email: m.rostagno@phytobiotics.com

Contact name: Meghan Schwartz
Email: m.schwartz@phytobiotics.com

Contact name: Alexandre Zocche
Email: a.zocche@phytobiotics.com

Proposed Title of Project:

The Effect of Intestinal Inflammatory Response on Nutritional Requirements and Digestibility in Poultry – Broilers, Turkeys and Pullets/Layers

Proposed Research Project Outline and Deliverables:

The proposed research theme is broad in nature and can be approached in different ways, including the use of different challenge models (e.g., coccidia, necrotic enteritis/*Clostridium perfringens*, sanitary/hygienic, etc.). Moreover, it can be developed in different poultry species, which will have implications for the type of experimental design.

This is an area of critical need for the U.S. poultry industry, which is facing difficulties in the process of reducing/avoiding the regular use of antimicrobials. This is the type of knowledge that can only be acquired in academic/experimental settings, as it requires appropriate design and controls, not possible under commercial conditions, such as positive/negative controls, different challenge levels, appropriate number of replicates and experimental units. It is our understanding that NCSU possesses the expertise and physical capability to develop this type of research projects.

This is essentially an intersection area between nutrition and health, with great potential impact for the U.S., as well as global poultry industry.

Outcomes and deliverables should include detailed final report(s), publication(s) in peer-reviewed journal(s), and presentations in scientific and industry events.