NATIONAL PORK BOARD
Request for Proposals
General Call 2017

DEADLINE: Tuesday, November 15th– 5:00 pm CST

The National Pork Board is soliciting research proposals dealing with these categories:

ANIMAL SCIENCE –Animal Science
ANIMAL SCIENCE – Heavy Market Pig
ANIMAL SCIENCE – Sow Lifetime Productivity
ANIMAL SCIENCE – Swine Nutrition
ANIMAL WELFARE
HUMAN NUTRITION – (from pre-approved Letters of Intent only)
PORK QUALITY
PORK SAFETY – Post-Harvest
PUBLIC HEALTH – Antibiotic Use & Resistance
PUBLIC HEALTH – Influenza
PUBLIC HEALTH – MRSA
PUBLIC HEALTH - Other Zoonotic Diseases
PUBLIC HEALTH – Worker Health and Safety
SUSTAINABILITY – Environmental Footprint
SUSTAINABILITY – Water Use/conservation
SWINE HEALTH - Foreign Animal Disease
SWINE HEALTH – General Swine Disease

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NOTES:
Proposal selection will occur in February 2017.
Notification of grant awards will be done by April 2017.
Project funding will begin May 1, 2017.
Requests for second-year funding must be resubmitted.

ANIMAL SCIENCE

The Animal Science Committee of the National Pork Board is soliciting proposals in the areas of **Feed Efficiency, Mitigation of the Impact of Seasonality on Productivity and Sow Lifetime Productivity**. Proposals must be submitted in the attached format to be considered. Projects may cover multiple-years for completion of an entire project. However, proposals for multi-year projects are expected to detail project deliverables and budgets on a year-to-year basis. If proposed projects are for completion of multi-year efforts already in-progress, the proposal must include a narrative of progress and accomplishments to date of the overall research effort. This may be accomplished by including copies of interim or final reports from previously funded research efforts as appendices to the submitted proposal. Proposals will be reviewed by panels of experts for scientific soundness and by pork producers for industry application. Proposals may be returned to the investigator with suggested/requested revisions prior to final funding decisions. Funding for accepted projects will follow final approval by the National Pork Board. *Further enquiries regarding this solicitation can be directed to Chris Hostetler by email chostetler@pork.org or by phone: 515/223-2606.*

Proposals are solicited in these areas only. Proposals submitted that do not adhere to these areas will not be considered further.

ANIMAL SCIENCE – Animal Science

Mitigation of the Impact of Seasonality on Productivity

Seasonal variation affects all producers and all phases of production but, producers have few tools to address seasonal loss in productivity and profitability. Seasonal variation in temperature leads to substantial variation in productivity (average daily gain, feed efficiency and days on feed), pork quality (fat quality as evidenced by iodine value, marbling and belly thickness) and reproductive efficiency (farrowing rate, litter size and sperm production). The following areas of production have been given priority by the Animal Science Committee of the National Pork Board as being the most responsive to seasonality:

1) Reduced weight gain and impaired feed efficiency leading to higher input costs, increased days on feed and lighter market weights
2) Reduced pork quality as evidenced by reduced marbling, belly firmness and elevated iodine values and altered fatty acid profiles of carcass fat
3) Reduced breeding herd efficiency through impaired reproduction as evidenced by prolonged return to estrus, reduced conception rate, higher fall out rate and reduced sperm number and quality.

The Board has dedicated $200,000 to this effort in 2017 however; there is no limit set for the amount of funding requested for individual proposals. Submitted proposals must bring fundamental knowledge and application to mitigate the impact of seasonality on productivity in one or more of these areas. Successful investigation in this area will likely require a variety of disciplines including but not limited to environmental monitoring, nutritional intervention, nutritional physiology and biochemistry, mathematical modeling, carcass fat analysis; proposals should reference these key concepts. Proposals utilizing a multidisciplinary approach are highly encouraged. Preference will be given for research trials conducted under commercial-like conditions and with sufficient replication to make statistically

appropriate conclusions. However, the Committee recognizes that smaller-scale research using environmental chambers may be a necessary approach to answering some of the more basic questions. Submitted proposals must show evidence of sufficient statistical power in relation to primary project objectives and clearly define the role of the study in meeting the objective to deliver cost effective technology.

ANIMAL SCIENCE - Heavy Market Weight Pig

The National Pork Board is soliciting research proposals in the area of **heavy market weight pigs**. It is expected that proposal take a multi-disciplinary approach that will incorporate the following areas: animal welfare, animal science, pork quality, food safety and animal nutrition. All proposals submitted **are highly encouraged** to address at least two of the three areas of focus as described below. **Novel approaches and concepts to the research topics are encouraged**. The Pork Checkoff has allocated $200,000 to this effort. There is no prescribed funding limit for submitted proposals, but the budget request should be appropriate and justified for the proposed work. Researchers are encouraged to find matching funds or in-kind contributions to the project.

Proposals must be submitted in the designated format to be considered. Projects may cover multiple-year efforts; however, project expected deliverables and budgets must be broken down by year. Proposals will be reviewed by panels for scientific soundness and for industry priority. Proposals may be returned to the investigator with suggested/requested revisions prior to making a final funding decision. Funding for accepted projects will follow final approval by the National Pork Board. Further enquiries regarding this solicitation can be directed to Dr. Steve Larsen by email: slarsen@pork.org or by phone: 515/223-2754.

Proposals submitted for the heavy market weight pig RFP will be reviewed by representatives from the Animal Science, Animal Welfare, and Pork Safety, Quality and Human Nutrition Committees. Researchers should expect to hear back regarding funding by the end of April. Proposals are solicited in the following area only. Proposals submitted that do not relate to this area will not be evaluated, scored or considered for funding.

A review of heavy weight market pigs was completed in 2016. A final report summarizing the status of knowledge and future research needs can be found here: http://research.pork.org/Results/ResearchDetail.aspx?id=1963. Below is a list of identified research needs to better understand the impact and needs of heavy weight market pigs. The Committee is interested in live weight ranges from 275lbs to 400lbs.

1) Live Production Focus
   - What is the appropriate k-value space allowance for heavy market weight pigs based on economics?
   - What is the feeder space and waterer space needed for heavy market pigs?
   - How does the gut bacterial population change in heavy market pigs?
2) Harvest/Processing Focus
   - How are larger/heavier carcasses affected by the chilling process?
   - How does carcass size impact pork quality?
3) Consumer Focus

- Does an increase in carcass size affect eating experience?

ANIMAL SCIENCE – Sow Lifetime Productivity

Sow lifetime productivity is defined as the total number of quality pigs a sow weans from the time she becomes breeding eligible until she leaves the herd. This measure of productivity is more encompassing than others because it encompasses both the number of pigs she weans as well as how long she remains in the herd. The Animal Science Committee of the National Pork Board is seeking research proposals that will **decrease piglet mortality** and thereby increase the number of pigs weaned per litter and ultimately Sow Lifetime Productivity. The following areas have been identified as research priorities relative to piglet mortality.

1) Sow and piglet nutrition including nutrient transfer across the mammary gland, milk volume and quality, colostrum consumption, colostrum quality, supplemental feeding systems
2) Facility and equipment design that enhances the microenvironment for the piglet
3) Neonatal piglet management and care such as split suckling, cross fostering and obstetrics.

The Animal Science Committee has dedicated $100,000 to this effort in 2017 however; there is no limit set for the amount of funding requested for individual proposals. Submitted proposals must bring fundamental knowledge and application to improve Sow Lifetime Productivity by focusing on this area. Because this is a multifactorial issue, successful investigation in this area will likely require a variety of disciplines including but not limited to sow nutrition, nutritional intervention for piglets, piglet health, equipment design, manipulation of microenvironment, intensive piglet management; proposals should reference these key concepts. Proposals utilizing a multidisciplinary approach are highly encouraged. Preference will be given for research trials conducted under commercial-like conditions and with sufficient replication to make statistically appropriate conclusions. The committee strongly encourages collaboration with industry partners. Submitted proposals must show evidence of sufficient statistical power in relation to primary project objectives and clearly define the role of the study in meeting the objective to deliver cost effective technology.

ANIMAL SCIENCE – Swine Nutrition

Feed Efficiency

Below is a **ranked** list of research priorities to be addressed by the Feed Efficiency research RFP. The Board has dedicated $300,000 to this effort in 2017 however; there is no limit set for the amount of funding requested for individual proposals. Submitted proposals must bring fundamental knowledge and application to improve feed efficiency. Achievement of these priorities will require a variety of disciplines including but not limited to nutrition, nutritional physiology, biochemistry, immunology, mathematical modeling and ingredient chemistry. Proposals utilizing a multidisciplinary approach are highly encouraged. Proposals should reference key concepts such as caloric efficiency, digestive physiology, ingredient value, dynamic or predictive estimates of nutrient value and disease-related diversion of nutrients. Applied growth assays should be conducted in commercial-like conditions and with sufficient replication to make statistically appropriate conclusions. Nursery trials will be given higher consideration when subsequent finishing performance is monitored and carcass data collected. In order to be considered for funding, submitted proposals must show evidence of sufficient statistical

power in relation to primary project objectives, clearly define the role of the study in meeting the objective to deliver cost effective technology, and address one or more of the following research priorities:

1) Nutrient extraction from low energy feedstuffs including but not limited to the effect of dietary factors on digestibility, gut function and enzyme supplementation
2) Novel feed processing methods or emerging technologies having direct field application in reducing the cost of feed
3) Mechanisms or development of technologies for enhancing quantification of feeding values of dietary ingredients
4) Interaction of nutrition and health including, but not limited to, the effect of nutrition on animal performance, caloric efficiency, nutrient requirements and/or disease persistence when animals are faced with a health challenge

Further Information

- Preference will be given to projects that involve academic and commercial collaboration, except where discovery is needed to establish principles necessary for additional research
- Projects spanning more than one year are not discouraged so that a project is provided sufficient time to deliver desirable outcomes. However, funding of a multi-year project must be justified, with second and third year funding being dependent on sufficient progress of the prior year
- Preference will be given to projects addressing priorities of highest value and/or spanning more than one priority
- A description of methods to assess the economic impact of the research on the swine industry should be included in each proposal. This may necessitate the inclusion of an agriculture economist on the research team.

For information regarding this solicitation, please contact Chris Hostetler by Email (chostetler@pork,.org) or by phone at (515) 223-2006.

ANIMAL WELFARE

The Pork Checkoff Animal Welfare Committee is requesting proposals on issues impacting the welfare of swine. Specific research areas of interest are listed below. All proposals submitted **must** address at least one of the specific research subtopics of interest described below.

All submitted projects should be multidisciplinary in their approach and should include neuroscience, performance, physiology, and behavior when applicable. Experimental designs must have all the appropriate controls to be considered for funding. Proposed methodologies need to be described in detail and behavioral methods and physiological assays used in the study need to be validated. Proposals need to also include power calculations to validate the proposed sample size. Projects that have cooperative arrangements with industry are strongly encouraged and will be prioritized. All approved projects using animals in research for any purpose must be reviewed by an Animal Care and Use Committee (ACUC) or equivalent. An ACUC approval is not only required for future publication of results in a peer reviewed journal, it also ensures a high standard of care for animals used in research in accordance with federal regulations and policies.

The Animal Welfare Committee has $350,000 to fund swine welfare related research. There is no exact funding limit for submitted proposals but the budget request should be appropriate and justified for the work that is being proposed. Researchers are encouraged to find matching funds or in-kind contributions to the project.

Newly submitted multi-year proposals should provide a clear overall vision and objectives for the entire project with a detailed plan of work and budget outline for each of the proposed years. If proposed projects are seeking second-year funding of a previously funded project, the proposal must include a discussion of progress and accomplishments realized from the research efforts to date toward success of the overall research effort. This may be accomplished by including copies of interim or final reports from previously funded research efforts as appendices to the proposal submitted.

Proposals must be submitted in the attached format to be considered. All eligible proposals will be reviewed by a panel of peers for scientific soundness and validity. Final funding decisions will be made by the National Pork Board. *Further enquiries regarding this solicitation can be directed to Sherrie Webb by email swebb@pork.org or by phone: 515/223-3533.*

1. **Management of Compromised Pigs and Timely Euthanasia**
   - Identify and characterize barriers that lead to caretakers not performing on-farm euthanasia in a timely manner.
   - Quantify the possible psychological impact to caretakers when performing on-farm euthanasia. Identify methods or interventions for minimizing this impact resulting in positive caretaker mental health and job satisfaction.
   - Determine optimal management, transport fitness and conditions for cull or compromised pigs to minimize stressors associated with end of production handling, mixing and transportation.
   - Quantify the number of compromised pigs that are successfully moved through the market channel. Various conditions of compromised pigs should be evaluated. This information should be used to develop a fitness to transport model.

- Develop management practices or tools that make handling, moving, or euthanizing compromised pigs on-farm easier for the pig and their caretakers.
- Evaluate treatment pen design and management practices for typical U.S. wean-to-finish production. This includes novel ways for identifying and tracking animals receiving treatment.

2. Painful Procedures and Pain Management

- Identify and validate alternative methods or practices to tail docking that effectively and reliably eliminate tail biting behavior.
- Develop and evaluate potential castration procedural alternatives or modifications that provide for the pig's well-being and maintain acceptable pork quality.
- Identify and validate physiological and behavioral indicators of piglet pain at 0 to 10 days of age.
- Quantify the pharmacokinetic properties of analgesics and local anesthetics for piglets 0 to 10 days of age.
- Evaluate the effectiveness of different analgesic classes (e.g. NSAIDs, local anesthetics, etc.) to reduce the pain associated with castration and/or tail docking.

3. Weaned or Feeder Pig Transport

Proposals should address the impacts of handling and transport before, during and after transport as measured by effects on ADG, ADFI, FE, health status, mortality, and/or incidence of culls. Proposals should address at least one of the following objectives for weaned pigs (3-5 wks of age) or feeder pigs (10-12 wks of age):

- Determine and quantify the main factors and time periods (24hr prior, and/or during transit and/or 24hr post) that result in weaned or feeder pig mortality.
- Quantify and analyze current handling and transport of weaned or feeder pigs to determine best practices and equipment designs that result in good pig welfare, reduced mortality, and minimal impact on post-weaning conditions and performance.
- Determine the proper use of bedding and weather boards/plugs in controlling the internal environment of the trailer so as to provide for the thermal comfort of the pig during cold, moderate, and warm temperatures. Targeted temperatures should reflect those commonly experienced during the winter, spring, and fall in the Midwest and Southern regions of the U.S.A.
- Determine and evaluate effective use of existing and novel cooling mechanisms in controlling the internal environment of the trailer during loading and transport so as to provide for the thermal comfort of the pigs during warm and hot temperatures. Targeted temperatures should reflect those commonly experienced during the summer and fall in the Midwest and Southern regions of the U.S.A.
- Determine the optimal group size for moving weaned piglets from farrowing to the transport trailer.
- Determine best management practices for transporting weaned pigs that are weaned at 2 weeks of age or earlier or have PEDV or other health challenges. This includes special handling considerations, equipment design and managing the internal environment of the trailer so as to provide for the thermal comfort of the pig.

4. **Aggressive and Damaging Behaviors (ear/flank/tail biting)**
   - Explore the impact of genetic influence on the incidence of aggressive and damaging behaviors. This includes inter- and intra-line variation.
   - Determine causation factors for ear or flank biting behaviors, including potential links with animal health.
   - Determine and quantify the relationship between ear biting and ear necrosis and explore solutions.
   - Explore novel strategies to reduce aggression during mixing of sows, weaned, or feeder pigs.
   - Review the benefits of human interaction & enrichment and their impact on preventing aggressive and damaging behaviors in various housing environments.

5. **Farrowing Housing**

   Housing systems used during farrowing and lactation must accommodate for the well-being of the sow and her litter. The focus of this priority is to optimize the environment of a farrowing housing system for the sow and piglets and prevent pre-weaning mortality rather than comparing housing designs. Please note that proposals should evaluate behavior, physiology and productivity of the sows and piglets.

   - Explore ways to adapt current farrowing stall designs to provide more space for larger sows, litters and piglets given fixed space assets of the building.
   - Determine creep space requirements to accommodate at least 30 to 35 pigs/sow/year. Calculations for space requirements must account for changes in weaning age and litter sizes.
   - Evaluate the impact of hinged stalls and timing of opening on piglet mortality. Identify specific design and management aspects to decrease piglet mortality.
   - Explore novel ideas that can accommodate nesting behaviors & promote sow comfort that are bio-secure, animal friendly, caretaker friendly, manure management friendly, and sustainable.

6. **Sow Shoulder Lesions**
   - Investigate and quantify the exact timeline and rate of progression of shoulder lesion development and identify the critical time-points for risk assessment and intervention.
   - Explore flooring types and cooling methods that promote sow movement (standing, postural adjustment) and minimize moisture to maintain good shoulder skin condition and aid in prevention of sow shoulder lesion development and minimize piglet mortality.
   - Identify methods for maintaining good sow body condition throughout lactation, including regular monitoring of BCS and feed systems that promote feed consumption during lactation.
   - Determine the heritability of shoulder ulcers and the susceptibility of different North American genetic lines.
   - Investigate any genetic differences in conformation and structure of the shoulder joint and any correlation with the incidence of shoulder lesions.
   - Optimize existing or develop and evaluate new therapy options for treating shoulder lesions. Therapies should promote wound healing and improve sow comfort by minimizing pain.

- Analyze the financial costs to industry associated with shoulder lesions specifically quantifying such factors as impact of early culling and the sow replacement, medication costs, loss of production, additional labor, and loss of carcass value.

PORK QUALITY AND SAFETY

The Pork Safety, Quality and Human Nutrition Committee is requesting proposals **in the following areas only**. Specific research topics are listed below, not in priority order. All proposals submitted **must** address at least one of the specific research topics of interest described below. **Novel approaches and concepts to the research topics are encouraged**.

There is no exact funding limit for submitted proposals, but the budget request should be appropriate and justified for the work that is being proposed. Researchers are encouraged to find matching funds or in-kind contributions to the project. Multi-disciplinary proposals are encouraged.

Proposals must be submitted in the designated format to be considered. Projects may cover multiple-year efforts. For multi-year projects, project expected deliverables and budgets should be broken down by year. Proposals will be reviewed by panels for scientific soundness and for industry priority. Proposals may be returned to the investigator with suggested/requested revisions prior to making a final funding decision. Funding for accepted projects will follow final approval by the National Pork Board. *Further inquiries regarding this solicitation can be directed to Laura Bachmeier - email: lbachmeier@pork.org or by phone: 515/223-2764.*

Proposals are solicited in the following area only. Proposals submitted that do not relate to this area will not be evaluated, scored or considered for funding.

The topics below are NOT listed in priority order:

PORK QUALITY

Genetic Markers for Pork Quality

1) A Pork Checkoff study has identified five highly significant tenderness genes each associated with Calpastatin activity in fresh pork. As a follow up, research is now needed to determine the associations of these genes with other economically important traits such as growth and lean meat yield and to devise selection programs to select for a more tender product. The Committee would like to also fund research to identify genes associated with color of fresh pork. Fresh pork color is an important quality indicator for consumers purchasing habits.

PORK SAFETY – Post-Harvest

Reducing Salmonella Prevalence in Head Meat

1) The Committee would like to identify ways to reduce the salmonella prevalence in head meat. Below is a list of topics for researchers to consider when developing a proposal:
    a. Testing interventions:
        i. Organic acid wash/rinse
        ii. Water wash/rinse
        iii. Temperature

iv. Novel interventions

b. Identify one or more, or combination of multiple interventions is encouraged
c. Identify where the intervention should be applied and how applied
d. Duration of intervention
e. Studies should report the power available to detect meaningful and realistic changes in Salmonella prevalence and contamination

Foodborne Pathogen Reduction Strategies

1) Addressing foodborne pathogens is a priority for the pork industry strategic plan. The Committee is interested in research to identify foodborne pathogen reduction strategies on the farm and in the packing/ processing areas. Below is a list of topics for researchers to consider when developing a proposal:
    a. Are you addressing pre or post-harvest or a farm to fork approach
        i. On the farm
        ii. Lairage
        iii. Packing plant
        iv. Processing facility
        v. Retail
        vi. Consumer
    b. What products are you evaluating for reduction strategies
    c. What pork products are you applying the intervention
        i. Pig
        ii. Carcass
        iii. Chops
        iv. Roasts
        v. Primals
        vi. Trim
        vii. Offal
    d. Is there a cost associated with the intervention, if so, what is the cost
    e. Need to evaluate both microbiological and quality/organoleptic characteristics
    f. Sampling scheme
        i. What time points are you going to sample
        ii. How often
    g. Testing methodology
        i. Describe the testing methodology
        ii. Describe the performance of the test
    h. If the proposal addressing packaging type, what packaging type are you evaluating

PUBLIC HEALTH

Public Health – Antibiotic Use & Resistance

The Producer/Public Health and Workplace Safety (PPHWS) Committee is soliciting proposals in the areas of **Antibiotic Use and Resistance**. The priorities (not listed in order of priority) and key concepts listed below were developed by a joint committee taskforce with producer and subject matter expert representation from each of the National Pork Board's Science and Technology Committees. The Board has dedicated $600,000 to this effort in 2017 however; there is no limit set for the amount of funding requested for individual proposals.

Proposals must be submitted in the attached format in order to be considered. Projects may cover multiple-years for completion of an entire project. However, proposals for multi-year projects are expected to detail project deliverables and budgets on a year-to-year basis. Regular interim reports are required for both single year and multi-year proposals. Inclusion of preliminary data and evidence of cooperative funding is highly encouraged. Proposals will be reviewed by panels of experts for scientific soundness and by pork producers for industry application. Proposals may be returned to the investigator with suggested/requested revisions prior to final funding decisions. Funding for accepted projects will follow final approval by the National Pork Board. *For information regarding this solicitation, please contact Dr. Dave Pyburn by Email (dpyburn@pork.org) or by phone at (515) 223-2634.*

Proposals are solicited in these areas only. Proposals submitted that do not adhere to these areas will not be considered further.

Below is a list of research areas to be addressed by the **Antibiotic Use and Resistance** research RFP. Submitted proposals must bring fundamental knowledge and application for continuous improvement of antibiotic use best practices in the pork industry. Research in these areas will require a variety of disciplines and therefore proposals utilizing a multidisciplinary approach are highly encouraged. Proposals should reference which priorities and key concepts listed below are being addressed. Animal studies should be conducted in commercial-like conditions and with sufficient replication to make statistically appropriate conclusions. Additionally, proposals should provide a power analysis to document and ensure sample size is adequate. Nursery trials will be given higher consideration when subsequent finishing performance is monitored and carcass data collected. In order to be considered for funding, submitted proposals must show evidence of sufficient statistical power in relation to primary project objectives, clearly define the role of the study in meeting the objective to deliver cost effective outcomes technology, and address one or more of the following research priorities:

1) Alternatives to Antibiotics **(Please Note: This is NOT solicitation for product development)**

- Evaluate alternative interventions to define therapeutic options in the weaning phase.
- Assess the comparative efficacy (prevention, control, treatment) of products that may be used as substitution to antibiotics under controlled disease challenge. The current industry equivalent should be specified in the study.

2) Environmental Fate of Antibiotics

- Evaluate the impact of manure storage pit additives on antibiotic residues/resistance in the manure excrement?

- Assess the use of barn disinfectants as it relates to the potential selection of antibiotic resistance. Studies may also assess the advantages/disadvantages of rotating disinfectant options in barns.

3) Antibiotic Administration

- Evaluate the amount of antibiotics used and route of administration in the nursery phase in terms of antibiotic efficacy and likelihood of selection for antibiotic resistance.
- Assess the use of injectable antibiotic regimens in preweaned piglets on ultimate antibiotic need and potential impacts on the development immunity.
- Evaluate or compare efficacy of current treatment regimens of water antibiotics or injectable antibiotics during coinfections.

4) Mitigations

- Demonstrate the value of prevention uses of antibiotics versus treatment uses.
- Evaluate basic mechanisms for bacterial vaccine development. **It is important to understand that this is NOT solicitation for product development.**
- Identify and characterize genetic markers for diseases of importance in swine production that currently require antibiotic treatment, directly, or indirectly due to coinfection.

Further Information

- Preference will be given to projects that involve multi-disciplinary approaches that may include academic and commercial collaborations, except where discovery is needed to establish principles necessary for additional research.
- Projects spanning more than one year are not discouraged so that a project is provided sufficient time to deliver desirable outcomes. However, funding of a multi-year project must be justified, with second and third year funding being dependent on sufficient progress of the prior year
- A description of methods to assess the potential economic impact of widespread adoption of the research conclusion on the swine industry should be included in each proposal. This may necessitate the inclusion of an agriculture economist on the research team.

PUBLIC HEALTH - other

The Producer/Public Health and Workplace Safety (PPHWS) Committee is also requesting proposals **in the area of worker health and safety and zoonotic diseases**. Specific research topics are listed below, not in priority order. All proposals submitted **must** address at least one of the specific research subtopics of interest described below. **Novel approaches and concepts are encouraged**.

The Producer and Public Health Committee has $200,000 to fund producer/public health, worker health and safety and zoonotic diseases research.

- There is no exact funding limit for submitted proposals, but the budget request should be appropriate and justified for the work that is being proposed.
- Researchers are encouraged to find matching funds or in-kind contributions to the project. Trans-disciplinary proposals are highly encouraged.

- Proposals that include provisions for analysis of the economic impact of the research to the swine industry are encouraged. This may be accomplished by inclusion of an agriculture economist on the research team.
- **To clearly differentiate from proposals addressing swine health issues,** proposals submitted in the area of producer/public health, workplace safety and zoonotic disease should explain for the Producer/ Public Health and Workplace Safety Committee (which will make funding decisions), **how the study will impact/protect public health**. Applicants should use non-scientific language for this purpose.

Projects may cover multiple-year efforts, but . For multi-year projects, project expected deliverables and budgets must be broken down by year. If proposed projects are for completion of a multi-year proposal already in-progress, the proposal must include a discussion of progress and accomplishments realized from efforts to date toward success of the overall research effort. This may be accomplished by including copies of interim or final reports from previously funded research efforts as appendices to the proposal submitted.

Proposals will be reviewed by panels for scientific soundness and for industry priority. Proposals may be returned to the investigator with suggested/requested revisions prior to making a final funding decision. Funding for accepted projects will follow final approval by the National Pork Board. Further enquiries regarding this solicitation can be directed to Karen Hoare by email at khoare@pork.org or by phone: 515-309-6131.

The research topics below are NOT listed in priority order:

PUBLIC HEALTH – Influenza

1. Influenza
    a. Studies to determine the **bi-directional** interspecies transmission of influenza virus (i.e. from people to pigs and pigs to people).
        i. Studies may assess viral ecology, risk factors associated with infection (e.g. what is the potential risk of transmission from barn workers to pigs and/or from pigs to barn workers), host susceptibility and/or host restriction for interspecies transmission.
    b. Studies to assess the impact of interventions on reducing **bi-directional** interspecies influenza transmission and/or or studies to identify potential **new** interventions for mitigation of bi-directional interspecies transfer of influenza virus in pork production facilities.
        i. Studies may access vaccination policy/vaccine use in people and pigs, worker sick leave policy, worker temperature monitoring, hand washing and other physical barriers on the interspecies transmission of influenza in pork production facilities.
    c. Studies, surveys or other methods to characterize influenza dynamics in exhibitors and their pigs through the show pig/exhibitor lifecycle (e.g. at purchase, on-farm, in exhibition settings).
        i. Studies may focus on identifying epidemiologic links to increased or decreased risk of infection for humans or pigs and address strategies to reduce the potential for transmission between human and pigs and pigs and human.

PUBLIC HEALTH – MRSA

1. Methicillin-resistance *Staphylococcus aureus* (MRSA) and multi-drug resistance *Staphylococcus aureus* (MDRSA)
    a. Studies to advance knowledge of staphylococcal biology (not limited to MRSA) in the swine production environment.
    b. Studies to better understand the pathways of swine worker occupational exposure to *Staph aureus* (including MDRSA and MRSA) susceptibility to colonization, factors prolonging carriage/colonization in both humans and pigs, and feasible interventions to reduce the risk of *S. aureus* colonization of workers in pork production facilities.
    c. Studies to better understand the health impacts of swine worker occupational exposure to *S. aureus* (including MDRSA and MRSA)

PUBLIC HEALTH – Other Zoonotic Diseases

1. Other Zoonotic Diseases
    a. Studies of the prevalence, diagnosis, epidemiology and/or human health risk for emerging and re-emerging zoonotic diseases associated with pigs.
    b. Studies to evaluate intervention methods in pork production to protect humans from zoonotic agents that they may be exposed to in pork production facilities.

Note: Proposals for other zoonotic diseases should justify why the topic is relevant to the swine industry and how the study will impact/protect producer, public health, or worker safety.

PUBLIC HEALTH – Worker Health and Safety

2. Research that improves systems for monitoring existing and changing injury and illness burden, including
    a. Studies designed to identify ways to reduce worker injury and illness burden.
    b. Studies that integrate prevention of worker injury and illness with improved production practices.
    c. Studies that evaluate the return on investment of workplace health and safety programs that include direct and indirect costs.
    d. Programs to improve worker health and safety training that incorporate animal welfare with worker health and safety.
3. Novel interventions
    a. Evaluation of exposure interventions (*e.g.*, engineering, work/production practices, worker training or personal protective equipment) that mitigates or eliminates the impact of workplace hazards on worker and animal health. Characterizing the impact of the intervention on current production practices is required. This may be accomplished by performing cost/benefit analyses of the intervention and itemizing annual costs. Using a quantitative approach to evaluate the effectiveness of the intervention practice(s) is highly desirable.
    b. Novel approaches to training workers that integrate good production practices with worker health and safety.

SUSTAINABILITY

The Sustainability Committee solicits proposals in the following areas. The Committee anticipates having $250,000 to fund environmental sustainability research. There is no exact funding limit for submitted proposals but the budget request should be appropriate and justified for the work that is being proposed. Researchers are encouraged to find matching funds or in-kind contributions to the project. Newly submitted multi-year proposals should provide a clear overall vision and objectives for the entire project with a detailed plan of work and budget outline for each of the proposed years. If proposed projects are seeking second-year funding of a previously funded project, the proposal must include a discussion of progress and accomplishments realized from the research efforts to date toward success of the overall research effort. This may be accomplished by including copies of interim or final reports from previously funded research efforts as appendices to the proposal submitted.

Proposals must be submitted in the attached format to be considered. All eligible proposals will be reviewed by a panel of peers for scientific soundness and validity. Final funding decisions will be made by the National Pork Board. *Further inquiries regarding this solicitation can be directed to Allan Stokes by email astokes@pork.org or by phone: 515/223-3447.* Proposals may be returned to the investigator with suggested/requested revisions prior to making a final funding decision.

SUSTAINABILITY – Environmental Footprint

1) A comparison of the carbon, water and land footprint differences between a standard corn and soybean finishing swine diet formulation and four alternative diets of equivalent animal nutritional value formulated based on "least cost formulation" principles. This analysis will be based on full life cycle analysis using available open source data and following recognized and accepted life cycle assessment guidance and methods. The carbon, water and land footprints will be assessed on a per pound live weight and per pig at the farm gate basis. The comparison will also include relative cost differences between the diet formulations based on a cost per pig produced basis.

SUSTAINABILITY – Water Use/Conservation

1) A meta-analysis comparison of the relative strengths and risks to water quality between utilization of nutrient sources from swine manure and commercial fertilizers applied to agricultural crops in the United States. At a minimum this analysis will address differences in application methods employed and estimates of the amount of each nutrient source applied by each application method as well as for each nutrient source and each application method the relative short and long-term impacts on soil health, potential for nutrient mobility through surface runoff and sub-surface leaching, water solubility.
2) Technologies/practices for on-farm manure recycling and water re-use for building cleaning and animal watering. Research must include analysis for potential impacts on carbon, water and land footprints, potential for scale-up to commercial farm operations and cost implications for implementation.

SWINE HEALTH

SWINE HEALTH – Foreign Animal Disease

The National Pork Board's (NPB) Swine Health Committee seeks Principal Investigators (PIs) for funding from Checkoff sources during the financial year that begins May 2017. The NPB Swine Health Committee's mission is to review and act on the strategic health issues which may affect the productivity of swine herds and global trade issues, and to collaborate with other animal health related entities and organizations in order to more effectively solve U.S. swine health issues.

Funding will be considered for select research topics that advance pork industry preparedness and have practical application for prevention, detection, response, and eradication of trade- and commerce-limiting transboundary animal diseases (TADs) of swine. Projects already at an advanced stage of development that delineate clear, practical outcomes with high potential to leverage additional matching funds will also be considered. Priority diseases include: Foot-and-Mouth Disease, Classical Swine Fever and African Swine Fever.

The performance period is May 1, 2017 through May 31st, 2018. This 2017-2018 request for proposals provides a summary of NPB's current research priorities that should direct the focus of these new research efforts. Proposals must be submitted in the required format provided with the RFP in order to be considered. Proposals that do not directly address the listed priorities will NOT be considered for funding. All eligible proposals will be reviewed by a panel of peers for scientific soundness and validity. *Further enquiries regarding this solicitation can be directed to Patrick Webb (pwebb@pork.org) 515-223-3441*

FAD Diagnostics:

1) Improved methods for predicting the antigenic match between vaccines and field isolates (e.g. antigenic cartography); development or validation of DIVA compatible serologic tests with increased sensitivity and specificity
2) Evaluation or improvements of diagnostic performance characteristics (sensitivity and specificity over time post inoculation) for commercially available CSF, FMD, ASF or SVD tests
3) Comparison of analytic sensitivities of commercially available diagnostic kits (FMD, CSF, ASF and SVD) to the standardized protocols approved for used in the National Animal Health Laboratory Network for FAD diagnostics.
4) Improvement of diagnostic sensitivity of PCR tests for FMD, CSF, ASF and SVD.
5) Antibody, antigen and nucleic acid detection in meat juice and other readily available tissue samples utilizing moderate to virulent FMD, CSF, and ASF strains
6) Development of a simple, low cost, penside / point of care diagnostic tool for sensitive detection of FMD virus and/or differentiation of other diseases that cause vesicular lesions in swine.

Novel Technologies for Disease Mitigation

1) Inactivation of airborne pathogens in modern swine production environments

Biosecurity / Transmission of FAD's:

1) Fomites, including survivability & transmissibility through:
   a. Transportation of live swine and germplasm
   b. Fresh or processed meat products
   c. Other plausible fomites and cross-contamination threats in the pork production chain, including the feed ingredient sourcing chain

Cleaning and Disinfection

1) Transport Vehicles, Personnel, and Farm Equipment
2) Reassessment of facility downtime requirements post-cleaning and disinfection
3) Swine and Packing Facilities / Equipment including lairage areas
4) Comingling points (fairs, buying stations, exhibitions.)
5) Disinfectants and/or practices for the decontamination of the environment and biomaterials exposed to ASF, CSF and FMD

Risk Analysis (Swine Specific):

1) Agent-specific aerosol transmission risk (area spread) from and to modern large production populations
2) Risk analysis of FAD spread to and from points of concentrations where swine are routinely commingled (e.g. sale barn, consolidators, lairage, fairs, etc)

Modeling

1) Disease spread and consequences to the pork chain post introduction of an OIE listed trade limiting FAD's of swine (FMD, SVD ASF, CSF) into the U.S. domestic swine herd. All proposals should include the use of real time or near real time data when modeling interstate and intrastate movements of swine for breeding, feeding and slaughter purposes.

SWINE HEALTH – General Swine Disease

The National Pork Board recently established a Strategic Plan for 2015 – 2020. As part of that Strategic Plan, specific goals were determined to be the main focus for the National Pork Board: Build Consumer Trust; Drive sustainable Production; and Grow Consumer Demand. The goal, "Drive Sustainable Production" is of high priority to and can be directly impacted by the Swine Health Committee. Therefore, as part of the efforts to address this goal, the key target listed below will be the basis for the General Swine Disease call for proposals for 2017. The key target is:
1) By 2020, the National Pork Board will develop, with key stakeholders, the identification and diagnostic tools, surveillance and mitigation strategies for the potential elimination of the top domestic swine diseases.

Endemic diseases of swine can negatively impact producer profitability by reduced feed efficiency and average daily gain, by increased death loss or by increased cost of production to manage diseases. The National Pork Board Swine Health Committee is requesting proposals on issues that directly address the goals of the 2015 Strategic Plan. Specific research areas for the General Swine Disease call are listed below. All proposals

submitted must address at least one of the specific research subtopics of interest described below or they will not be considered for funding.

Newly submitted multi-year proposals should provide a clear overall vision and objectives for the entire project with a detailed plan of work and budget outline for each of the proposed years.

For projects seeking second-year funding of a previously funded project, the proposal must include a discussion of progress and accomplishments realized from the research efforts to date toward success of the overall research effort. This may be accomplished by including copies of interim or final reports from previously funded research efforts as appendices to the proposal submitted.

Investigators are encouraged to leverage their research efforts by including additional relevant swine pathogens in the experimental design if the experiment can accommodate it and it is appropriate to do so. Researchers are also encouraged to work with veterinarians in the field to address the entire clinical picture of disease challenges.

Proposals must be submitted in the required format provided with the RFP in order to be considered. Proposals that do not directly address the listed priorities will NOT be considered for funding. All eligible proposals will be reviewed by a panel of peers for scientific soundness and validity. A total of $350,000 is available for the call for proposals. Final funding decisions will be made by the National Pork Board Swine Health Committee. *Further enquiries regarding this solicitation can be directed to Lisa Becton by email lbecton@pork.org or by phone: 515-223-2791.*

Research priorities for 2017:

Strep suis:
In recent years, the swine industry has seen an increase in clinical challenges with *Strep suis*. The pathology of the disease, as defined by lesions in individual animals, has not appeared to change. However, increases in the severity of the clinical presentation, the case frequency and the severity of mortality have all been noted out in the field.

The current beliefs about the pathology, clinical expression and sampling for *Strep suis*:
1) Lesions in individual pigs are not more severe than what we have seen for 25+ years
2) Best isolates to look at are cultures from brain swabs of pigs with CNS signs
3) Cases without complicating disease factors are occurring.
4) Clinical picture (around the world) is increased mortality.
5). Cases at 3 to 5 weeks post wean (6 to 8 weeks of age) have increased.

Therefore, National Pork Board Swine Health Committee is requesting proposals that address these specific issues for *Strep suis*: the change in clinical expression, development of control measures and effective vaccine development.

Routes of infection and pathogenicity
1) Is there a change in the rate of infection due to a potential change in the route of transmission? Can colonization happen from routes other than during parturition?

a) Is there a difference in pathogenicity depending upon the route of transmission (i.e. respiratory transmission vs. potential oral/enteric transmission)?

2) Identify the virulence factors, genes or markers responsible for pathogenesis.

3) Are the serotypes of *Strep suis* in current pig populations changing leading to the different expression of the disease?

a) Compare banked historical vs. contemporary isolates from clinical cases for potential differences.

Serotyping and classification

1) What is the most accurate and effective testing method and useful sample to identify and describe the organism?

a) Compare serotyping using antisera vs. PCR.

2) How can the information gained from "sequencing type" and "virulence markers" be interpreted and can this information predict virulence?

Immunology and antibody production

1) What is the mechanism for development of immunity, antibody production and protection post-infection? Is this protection cross-protective for other serotypes or sequencing types?

Management Strategies

)Identification and development of novel/new vaccine technologies for effective protection against *Strep suis*. To include:

a. Identify effective isolate(s) that can be utilized for broadly protective vaccine (effective against pathogenic isolates).
b. Identify potential genes/markers for use in broadly protective vaccines.
c. Identify the best target for vaccine development (i.e. capsular protein or other target).

2) Does maternal antibody alter the effectiveness of vaccination to piglets?

3) What treatment options or antimicrobial alternative interventions exist to combat *Strep suis* infections for pigs raised without antibiotics?

<u>Enteric Diseases of Swine</u>:

1) **Ecoli:** *Producers are concerned about increased E coli activity in growing pigs as a result of management practices in farrowing such as pig holding on-farm and long duration transport. Mitigation strategies such as vaccination, medication, and management are all important topics worth additional investigation.*
   a) Identify the mechanism of action for oral E coli vaccines and how to take advantage of that for implementation of vaccines.
   b) Identify production protocols that alter and/or reduce the colonization and proliferation of E. coli (diminish or eliminate clinical disease) that can be incorporated into daily production practices.

2) **Rotavirus:** *Science today allows us to better understand this virus. Greater predictive control may lie within better understanding of the virus and its epidemiology.*
   a) Develop Group specific (A, B & C) assays that can measure the change in immune response and antibody levels following vaccination/exposure to help ensure maximum efficacy of the intervention.
   b) Do certain factors (dam/pig immune status, parity, and P&G serotype) vary the herd level disease/ pathogenesis of Group C in young pigs?

c) Develop the mechanism/format to collect P&G serotype/genotype data for the creation of a database of sequences for Rotavirus A, B, & C and track the dissemination around the US.

3) **SECD:** *Much has been learned about SECD in a short amount of time. Additional questions remain about gilt development, potential long term effects of exposure and why some herds break back to active infection following a period of stability.*
   a) Does age at acclimatization affect level and length of effective immune response?
   b) What is the post-epidemic epidemiology of herds that still experience outbreaks?
      i) What is the underlying mechanism/reason for subsequent outbreaks of PEDV at the same farm after the initial outbreak?
      ii) What is the immune status of herds experiencing recurrent outbreaks? Are there differences that exist in immunity within the herd vs. individual sows that permit additional outbreaks?
   c) What characteristic or property of the virus that allows for persistence after active immune response?

<u>Mycoplasmal diseases</u>:

1) Mycoplasma hyopneumonia:
   a) What is/are the most effective method(s) to introduce negative gilt replacements into a positive sow herd to minimize the subsequent shedding of Mycoplasma to the offspring of primiparous gilts? Do those methods vary by production type?
      i) Are there differences between continuous flow sites vs All-In/All-Out production flow?
      ii) Develop methods to effectively provide natural exposure for negative gilts prior to entering a positive herd.
         (1) Develop methods that producers and veterinarians could use to create/secure an infectious culture to provide exposure for the "seeder" gilts.
         (2) Refine methods of exposing "seeder" gilts to build better immunity in the naïve replacement population.
         (3) Is the use of "seeder" pigs effective for consistent exposure?
            (a) Is there a protocol that can provide for the consistent inoculation of "seeder pigs"?
         (4) How many positive pigs per negative gilt are needed for effective exposure?
         (5) Development of rapid and accurate diagnostic testing to confirm gilt exposure.
      iii) Determine the impact of vaccine strategies and timing of administration (age) as part of an acclimatization strategy: i.e. single dose vs. two dose vaccine.
   b) Evaluation of antimicrobial-alternative control methods in Wean to Finish populations.
   c) Establish sensitivity and specificity levels of different sampling techniques for early detection.
      i) What is the PCR prevalence in oral fluids and is there a correlation of PCR results from oral fluids and clinical signs?
      ii) How best can PCR oral fluid testing be utilized as part of a plan to control clinical disease in W/F populations?
   d) What is the most effective method to reduce the shedding and transmission of a M. hyopneumonia to piglets during lactation? Points to consider include:
      i) Is there a parity effect of shedding during lactation: i.e. gilt vs. sow?

ii) Does cross-fostering alter shedding patterns of Mycoplasma?
iii) Does the amount of shedding correlate to colonization and subsequent risk of clinical disease in the piglets?
iv) Determine the impact of parity on maternal immunity (P1s vs. older parities) for piglet vaccination effectiveness.

2) M. hyosynoviae and M. hyorhinis:

a) Develop differential antibody assays for M. hyorhinis and M. hyosynoviae.
b) What is the PCR prevalence in herds using oral fluids surveillance?
   i) Is there a correlation of PCR results from oral fluids with clinical signs?
c) Identify the pathogenesis of disease for these organisms.
d) Are there genetic markers to help identify pathogenic organisms through whole genome or partial sequencing methods?
   i) Development and evaluation of effective vaccines of pathogenic isolates.
e) What treatment options or antimicrobial alternative interventions exist for Mycoplasma-caused lameness in herds raised without antibiotics?

<u>Influenza A Virus – Swine (IAV-S)</u>:

1) Epidemiology
   a) Understand the mechanisms of influenza virus transmission and maintenance within herds and develop strategies to decrease transmission among gilts and sows with the goal to minimize shedding of the virus in gestation and in farrowing (reduce virus shed to suckling or ready-to-wean pigs).
      i) Develop an effective gilt acclimatization method(s) to maintain stability for IAV-S in herds.

2) Vaccinology
   a) Investigate novel adjuvants or immune-modulatory agents that result in robust clinical protection (mucosal delivered, long lived, broadly cross-protective and/or reduce the number of vaccine boosters).
   b) Develop novel influenza control plans for piglets with maternal immunity (e.g. overcoming maternal antibody interference, vaccination in the face of maternal antibodies) to produce influenza A negative weaned pigs.
   c) Develop novel IAV-S vaccine prototypes

3) Identify IAV-S genetic changes important for antigenic drift or increased virulence in swine.