Funding opportunities at the National Institute of Food and Agriculture: program priorities and tips for successful grant writing

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Abstract

The National Institute of Food and Agriculture is the agency within the United States Department of Agriculture that provides extramural funding for competitive grants in research, education and extension. Several grant programs exist in this agency that support both basic and applied research in bovine reproduction, the most notable of which is the animal reproduction program area priority within the Agriculture and Food Research Initiative. Other programs within this initiative, while not dedicated solely to work in reproductive biology, also include opportunities for work on reproduction. The animal health and disease program area of this initiative provides funding for research on infectious diseases of the reproductive tract. The critical agriculture research and extension and the exploratory research program area priorities are two unique opportunities that offer funding for work in all areas in the food and agricultural sciences, including reproduction in cattle. Opportunities for education support at the agency include the predoctoral fellowships, postdoctoral fellowships, and research and extension experiences for undergraduates program, as well as the National Needs Graduate and Postgraduate Fellowship Grants, Higher Education Challenge Grants and Higher Education Multicultural Scholars programs. To stimulate technological innovations in the private sector, Small Business Innovation Research program competitively awards grants to qualified small businesses to address important problems in agriculture. To address veterinary shortage situations, especially those in food animal medicine, the Veterinary Medicine Loan Repayment program helps qualified veterinarians offset a significant portion of debt incurred in pursuit of their veterinary degrees in return for service in designated high-priority veterinary shortage areas. The Veterinary Services Grant program provides funding for education, extension, and training in veterinary medicine of agricultural animals, as well as grants to enhance rural veterinary practices. Most federal grant programs are highly competitive, so skill and experience in applying for grants is needed to achieve success in securing grant funding. Recommendations for preparation of a meritorious grant proposal include careful reading of the program announcement, solicitation or request for applications to fully understand the scope, eligibility and requirements of the program; writing the grant proposal well in advance of the submission deadline to allow time for thoughtful preparation, critique by an experienced colleague, revision, and proof reading; and understanding the review process and criteria by which the proposal will be evaluated.

Keywords: Beef, dairy, cattle, reproduction, federal funding, competitive grant, veterinary

Introduction

The Food, Conservation, and Energy Act of 2008 (Public Law 110-246; i.e., 2008 Farm Bill) authorized the creation of the National Institute of Food and Agriculture (NIFA) from its predecessor agency (the Cooperative State Research, Education and Extension Service) within the U.S. Department of Agriculture. NIFA is authorized by the U.S. Congress to provide extramural competitive and capacity grant funding for research, education and/or extension projects in the food and agricultural sciences. More than 30 different competitive grant funding opportunities are offered by NIFA annually. Several of these programs support work in bovine reproduction; however, each program has specific programmatic priorities, eligibility restrictions, and other requirements that may be statutory and/or specifically designed by NIFA to target national needs or prevent duplication. This paper briefly reviews the priorities, eligibility restrictions and other requirements for these opportunities. Some important strategies for writing grant proposals to enhance success in obtaining competitive grants from NIFA and other funding agencies are also discussed.

As do most Federal grant funding agencies, NIFA uses "application" as the official term for grant proposal, and these two terms will be used interchangeably during the subsequent discussion. NIFA and most other Federal funding agencies require submission of grant applications electronically through www.grants.gov. Submission of a grant application requires several additional steps beyond downloading the funding opportunity announcement (FOA) or Request for Applications (RFA, sometimes referred to as request for proposals or RFP) that solicits grant applications. These steps include completing the official application package specifically associated with the FOA; obtaining a Data Universal Numbering System (DUNS) number from Dun and Bradstreet; and registering via the System for Award Management to conduct business with the Federal government. All of these steps must be completed prior to electronic submission of a grant application to www.grants.gov.

The Agriculture and Food Research Initiative (AFRI) Competitive Grant Program

The AFRI program was initially authorized in the 2008 Farm Bill to replace the National Research Initiative, which was in existence since 1991. The 2014 Farm Bill (Agricultural Act of 2014, Public Law 113-79) subsequently reauthorized the AFRI program to competitively award research, education and extension grants in six broad priority areas of agricultural and food science. These priority areas are: a) Plant Health and Production and Plant Products; b) Animal Health and Production and Animal Products; c) Food Safety, Nutrition, and Health; d) Bioenergy, Natural Resources, and Environment; e) Agriculture Systems and Technology; and f) Agriculture Economics and Rural Communities. In 2018, NIFA reorganized the AFRI program into three RFA (see https://www.nifa.usda.gov/afri-request-applications) that address the six Farm Bill priority areas. These RFA are the Foundational and Applied Science RFA, the Sustainable Agricultural Systems RFA, and the Education and Workforce Development RFA. Each of these RFA provides opportunities for research, education and extension projects in bovine reproduction, as discussed subsequently.

AFRI Animal Reproduction program area priority

Included within the Animal Health and Production and Animal Products priority area of the AFRI Foundational and Applied Science RFA is the Animal Reproduction program area priority. This program area priority has been in existence in various forms since before the beginning of the National Research Initiative and has undergone substantial modification over that time.[1] It currently solicits basic and applied research projects on molecular, cellular, genomic, genetic and whole animal aspects of reproductive biology to improve reproductive efficiency or enhance reproductive management of agricultural animals, including cattle. Projects are solicited in four broad priority areas: a) gonadal function, including production, function, and preservation of gametes; b) hypothalamic-pituitary axis; c) embryonic and fetal development, including interaction between the conceptus and its uterine environment; and d) microbiome of the reproductive tract. These priorities were developed based, in part, on input from stakeholders.[2] Collectively, these three priorities are intended to span the entire spectrum of reproductive biology in farm animals. Grant types solicited by the Animal Reproduction program area priority are standard grants, conference grants, and Food and Agricultural Science Enhancement (FASE) grants (i.e., strengthening standard grants, new investigator grants, strengthening conference grants, seed grants, equipment grants, and sabbatical grants). Whereas eligibility for most AFRI grants is very broad and includes almost all entities within the U.S., the intent of the FASE program is to strengthen and build capacity. Therefore, institutional and individual eligibility for FASE grants is subject to specific restrictions. A detailed description of all AFRI grant types, including eligibility requirements, is available at https://nifa.usda.gov/resource/afri-request-applications-resources. Description of the FASE program can be accessed at https://nifa.usda.gov/afri-fase-epscor-program.

Other AFRI program area priorities within the Foundational and Applied Science RFA

Although not dedicated solely to work in reproductive biology, other programs within AFRI also include opportunities for work on reproduction. For example, the AFRI Animal Health and Disease program area priority supports projects focused on diseases of livestock and aquaculture species,

including those affecting the reproductive tract with impacts on fertility. For cattle, these include metritis, brucellosis, leptospirosis, infectious bovine rhinotracheitis, bovine viral diarrhea, vibriosis and trichomoniasis. The Critical Agriculture and Research and Extension (CARE) program area priority solicits projects that integrate late-stage applied research with extension to quickly yield solutions to local, regional, or national problems that can be rapidly implemented by agricultural producers. The Exploratory Research program area seeks innovative, proof-of-concept projects in areas not previously addressed or where a novel approach could result in high impact breakthroughs. Finally, the program titled "Dual Purpose with Dual Benefit: Research in Biomedicine and Agriculture Using Agriculturally Important Domestic Animal Species" is an interagency program offered jointly by NIFA and the Eunice Kennedy Shriver National Institute of Child Health and Human Development. The FOA for this program is posted on the website of the National Institutes of Health, and NIFA's support for this program is derived from the Foundational and Applied Science program. The scientific priorities for the Dual Purpose with Dual Benefit program include assisted reproductive technologies, developmental programming, stem cell biology, metabolism related to obesity and adiposity, and infectious reproductive diseases. The program is entering its ninth and final year of existence, and the deadline for submission of applications was September 27, 2018.

AFRI Sustainable Agriculture Systems RFA

The Sustainable Agriculture Systems RFA is new in AFRI in 2018. It solicits large, systems-level Coordinated Agricultural Projects (CAP) with budgets up to $10 million for 5 years in duration. Priorities for this program include increasing agricultural productivity; optimizing water and nitrogen use efficiency; protecting yield losses from stresses, diseases, and pests; reducing food-borne diseases; and advancing development of biobased fuels, chemicals, and coproducts. Thus, a project including bovine reproduction, within the broader context of dairy or beef production systems, could fit the priorities of Sustainable Agriculture Systems program. Grant applications submitted to the Sustainable Agriculture Systems program area must be fully integrated. The NIFA definition of an integrated project is one that includes and integrates in a meaningful way at least two of the three components of the agricultural knowledge system (i.e., research, education and extension).[3] For CAP grant applications submitted to the Sustainable Agriculture Systems program area, all three components of the agricultural knowledge system are required. A more detailed description of the CAP grant and integrated project types can be found at https://nifa.usda.gov/resource/afri-request-applications-resources.

AFRI Education and Workforce Development RFA

Several opportunities exist within the AFRI Education and Workforce Development RFA for educational projects on bovine reproduction. Pre- and postdoctoral fellowships are offered to support scholarly training within all six of the AFRI Farm Bill priority areas, including animal health and production and animal products.[4] Applications are submitted by the individual pre- or postdoctoral scholar, typically through the student's institution. Up to two years of funding can be requested to support student projects that are research, education or extension focused. Projects may also be integrated. Eligibility for AFRI fellowships is restricted to U.S. citizens, nationals and permanent residents. Additional eligibility restrictions are based on progress toward completion of the doctoral degree for predoctoral fellowships and time after completion of the doctoral degree for postdoctoral fellowships; further details are clearly described in the RFA.

The Education and Workforce Development RFA also provides opportunities for undergraduate student fellowships in the Research and Extension Experiences for Undergraduates (REEU) program area. The REEU program area solicits applications from institutions of higher education to provide substantial experiential learning opportunities in research and extension for undergraduate students. As with the other program areas in this RFA, the REEU program area is not restricted to any one discipline within the food and agricultural sciences but broadly covers all disciplines; however, grant applications can emphasize specific disciplines and sub-disciplines, such as bovine reproduction.

Other Higher Education Competitive Grant Programs

NIFA offers several funding opportunities that support education in the food and agricultural sciences, including education focused on animal production and health. Each of these programs can support educational programs on cattle reproduction.

The National Needs Graduate and Postgraduate Fellowships Grants Program provides grants to support a group of graduate and postgraduate fellowships, typically at a single institution.[4] A major difference between this program and AFRI Predoctoral Fellowships is that the application is submitted by a team of faculty mentors instead of the individual predoctoral scholar. A second major difference is that a National Needs Graduate and Postgraduate Fellowships grant can support several fellowships on a single grant, whereas each AFRI Predoctoral Fellowship supports the scholarly activity of only one individual student.

The Higher Education Challenge Grants Program focuses on improving formal baccalaureate, master's, or doctor of veterinary medicine (DVM) degree programs and curricula in the food and agricultural sciences. Projects supported by this program will: 1) address a state, regional, national, or international educational need; 2) involve a creative or non-traditional approach toward addressing that need that can serve as a model to others; 3) encourage and facilitate better working relationships in the university science and education community, as well as between universities and the private sector, to enhance program quality and supplement available resources; and 4) result in benefits that will likely transcend the project duration and USDA support.

The purpose of the Multicultural Scholars Program is to increase multicultural diversity of the professional and scientific workforce in the food and agricultural sciences. This program funds competitive grants to colleges and universities to provide scholarships to support recruitment, retention, mentoring, and training of multicultural scholars in higher education programs leading to either a baccalaureate degree within food and agricultural science disciplines or to the DVM degree. These include animal science, dairy science, and veterinary degree programs.

Small Business Innovation Research (SBIR) Program

The SBIR program provides grants to qualified small businesses to support research related to important scientific problems and opportunities in agriculture that could lead to significant public benefits. A major goal of this program is to increase private sector commercialization of innovations derived from USDA-supported research and development efforts. The SBIR program offers both Phase I and Phase II grants. Funding for Phase I projects supports research to prove the scientific or technical feasibility of an approach or concept. Successful Phase I awardees may apply for Phase II funding to support continued research that may lead to the development of a new product based upon results obtained during Phase I. Topic areas in the Phase I solicitation include Animal Production and Protection, with emphasis on three priorities: 1) improving production efficiency (including improved fertility of livestock); 2) improving the safety and/or quality of end products derived from animals; and 3) improving animal health and well-being. Thus, the SBIR program has supported and will continue to support projects focused on bovine reproduction.

Veterinary Medicine Loan Repayment and Veterinary Services Grant Programs

The Veterinary Medicine Loan Repayment Program (VMLRP), authorized by the National Veterinary Medical Services Act (Public Law 108-161), aims to help qualified veterinarians offset a significant portion of the debt incurred in pursuit of their DVM degree. In return for loan repayment assistance of up to $25,000 per year, awardees agree to provide veterinary services in certain high-priority, NIFA-designated veterinary shortage situations (https://nifa.usda.gov/vmlrp-map) for three years. VMLRP awards are made competitively, and priority is given to agreements with veterinarians for the practice of food animal medicine.

The Veterinary Services Grant Program was authorized by the 2014 Farm Bill as a companion program to the VMLRP to incentivize service in veterinarian shortage situations. This program expands on the educational loan repayments offered under the VMLRP by offering competitive grant funding for

education, extension and training programs with an emphasis on food animal medicine and food safety. Projects may include veterinary telemedicine and other distance-based education, and should focus on providing veterinary students, veterinarians, veterinary technicians, and/or other health professionals the skills needed to relieve veterinarian shortage situations or support veterinary practices public health. Grants are also available to support establishment or expansion of veterinary services to relieve veterinarian shortage situations in rural areas across the U.S.

Tips for Successful Grant Writing

Obtaining a grant from a funding agency is a highly competitive process. Available funding is limited and grant application submission rates are high such that most Federal funding agencies are generally only able to fund 10 to 20% of the applications submitted. A very common situation is one in which the amount of funding needed to support all of the high quality proposals submitted to a program far exceeds the amount of funding available. Whereas poor ideas will not be funded regardless of how well they are presented in a grant application, many excellent ideas go unfunded because they are not well packaged and presented.[5,6] Thus, improving the packaging and presentation of the good ideas in a grant application can increase its likelihood for success, a process often referred to as grantsmanship.[5,6] Given the highly competitive nature of the granting arena, developing skill and gaining experience in grant proposal writing is paramount to achieving success. This paper will highlight a few of the many strategies and recommendations for enhancing success at writing grant proposals, regardless if the application is submitted to NIFA or another funding agency.

The first strategy is to carefully read the FOA, RFA, RFP, program announcement or whatever the solicitation may be called. These FOA are a treasure trove of valuable information such as the program or agency's funding priorities, eligibility restrictions, proposal preparation guidelines, submission deadlines, funding restrictions, review criteria, and contact information of program staff. All of this information is critical to proposal preparation. For example, a clear understanding of the program's funding priorities allows the applicant to determine if his/her project is highly relevant (and thus more likely to form the basis for a successful proposal) or lies on the fringes with less relevance, thereby allowing the applicant to avoid the scenario of “trying to force a square peg into a round hole”. Knowing the eligibility restrictions can prevent futile submission to a program for which one is ineligible. Other guidelines in the solicitation will facilitate better planning and preparation of an application, including instructions for developing an appropriate budget and organizing the application according to the recommended or required format.

A second important recommendation is to start preparing the grant application early and well ahead of the submission deadline.[5,6] This includes organizing the project team, developing a timeline for proposal preparation, obtaining critical feedback on a penultimate draft of the proposal from knowledgeable colleagues, and allowing sufficient time to complete administrative procedures at your institution to permit submission of a mistake-free application by the submission deadline. For new programs that are in their first year of solicitation, information describing program priorities may be unavailable or insufficient to begin proposal preparation ahead of RFA release. However, for many other programs the priorities are fairly consistent from year to year or change only slightly. Experienced and successful proposal writers recognize this and begin early! Work on applications to these programs can and should be initiated well before the anticipated release of the RFA. In contrast, waiting until just a month or two before the submission deadline limits the time available for serious polishing and may preclude the opportunity to obtain critical feedback from experienced and successful colleagues. Some of the most frequent criticisms from reviewers of unsuccessful proposals are that the application appeared to be prepared in a rush, was not thoughtfully assembled, and was not carefully proofread.

Starting the writing process early also facilitates on-time submission of the proposal, ideally well ahead of the submission deadline. At most academic institutions, the sponsored projects office requests receipt of the final proposals from the applicants up to two weeks before the submission deadline. This time is required to add additional information to the proposal and carefully submit multiple applications from their institution to meet the same submission deadline. Electronic submission of applications during

the last few hours or minutes before the deadline increases the likelihood that mistakes will be made during the submission process that lead to an application being rejected. Early submission well ahead of the deadline is also preferred because if the applicant finds important technical or scientific errors in the proposal, they can request withdrawal of the initial application followed by resubmission (ahead of the deadline) of a revised application. It was suggested[6] that proposals should not be submitted too early or too late relative to the deadline because proposals are often reviewed in the order submitted, and being reviewed in the middle of a review panel meeting provides a more favorable outcome than review towards the beginning or end. However, our experience indicates that order of review does not influence final ranking of a proposal (R = 0.168 - 0.100, mean = 0.038 for 4 panels each reviewing 75 to 119 proposals). Thus, the hypothesis that it is better to submit an application so that it arrives in the middle of the pack is not tenable and that suggestion should be rejected. The best advice is to start preparing the grant application early and then submit it well before the deadline!

Two other recommendations that go hand-in-hand are to understand the review criteria and learn about the review process. Most funding agencies publish the criteria by which applications will be evaluated, either in the solicitation or on their website. At NIFA, all RFA include the specific review criteria for each program. Understanding the review criteria provides valuable insight into the required components of the proposal; how to best organize ideas, objectives, and expected outcomes; and components or aspects of the proposal that will be weighted more heavily than others by the reviewers.

Learning the review process requires greater effort than understanding the review criteria but also can be extraordinarily enlightening. The review process used by NIFA has been described previously[7] and is available on the NIFA website (https://nifa.usda.gov/resource/nifa-peer-review-process-competitive-grant-applications). Moreover, funding agencies are continuously looking for expert peer reviewers to provide thoughtful, detailed and critical evaluations of proposals upon which to base funding decisions. Serving as either an ad hoc reviewer of a few proposals or as a review panel member to review a larger cohort of proposals can provide an opportunity to gain significant insight into the review process while contributing an important service to the greater scientific community. Whereas service as an ad hoc reviewer may require several hours to review each proposal and provide detailed written reviews (which are typically submitted electronically), service on a review panel involves substantially more time and effort. After reviewing each assigned proposal individually and submitting written reviews, panelists typically devote several days to discussing proposals as a group, either virtually or in person at the funding agency's location. Each review panelist may be asked to evaluate as many as 10 to 20 applications. This provides an invaluable learning opportunity because there is typically a wide range in the quality of proposals submitted to any program. A first-time panelist quickly observes what to do and what to avoid when preparing a proposal, and it becomes readily apparent how poor packaging of an otherwise good idea can reduce its chance of garnering funding.

Most agencies maintain an extensive database of expert reviewers, derived in part from previous applicants to the agency's funding opportunities. For experts who wish to volunteer their service as a reviewer but have no previous history with a specific agency, addition to a reviewer database may be possible by contacting the program staff who manage programs for which they have appropriate expertise. A brief email highlighting how the individual's expertise aligns with the program's priorities along with a detailed curriculum vitae will assist the program staff in adding you to the reviewer database. Program staff usually value this information and appreciate the volunteering of service as a reviewer. First-time reviewers should keep in mind, however, that program staff will often evaluate a new reviewer's ability to provide critical and thoughtful reviews by requesting an ad hoc review or two before inviting them to serve on a review panel. Most agencies also exclude applicants to the program from reviewing proposals during that funding cycle in order to avoid conflicts of interest, either actual or perceived.

The strategies and recommendations discussed herein are just a few of those that can be considered to improve the quality of a grant application; many other important suggestions are excluded from this discussion due to space limitations. Recommended additional resources on grantsmanship are available on the NIFA website (https://nifa.usda.gov/resource/nifa-peer-review-process-competitive-

grant-applications) and elsewhere.[5,6] Collectively, these resources provide a myriad of suggestions which, when utilized carefully and effectively, can improve the quality of grant applications and enhance the likelihood of success.

Summary and Conclusions

NIFA is the agency within USDA that provides extramural funding for competitive grants in the food and agricultural sciences. Several NIFA competitive grant programs support work on various aspects of reproduction in beef and dairy cattle. As with most Federal grant programs, NIFA grant programs are highly competitive; thus, skill and experience in grant writing are essential to secure grant funding. Whereas poor ideas are rarely funded, many excellent ideas are not funded because they are poorly packaged into a weak grant proposal. Improving the quality of the proposal through superior grantsmanship can greatly enhance the likelihood of garnering funding.

Acknowledgments

The findings and conclusions in this publication have not been formally disseminated by the U.S. Department of Agriculture and should not be construed to represent any agency determination or policy.

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