

Writing a Grant Application: A Technical Checklist

1. Essentials

- a. Significance
- b. Sound hypotheses
- c. Productivity and demonstration of feasibility -- high quality results and figures
- d. Logical development of experimental design
- e. Can you do everything you propose to do in the time requested – “Overly Ambitious” is one of the most common criticisms of young investigators.

2. Before you start

- a. Is it really time to write this grant application? Is it premature?
- b. Should you write that paper first?
- c. Plan ahead and don't rush -- give yourself 2-3 months to prepare the grant application.
- d. Arrange with colleagues or mentors to review a first draft of your specific aims early (6 weeks or so) just to make sure you are on the mark.

3. Specific aims

- a. Do the aims address interesting and significant issues?
- b. Are they hypothesis-based?
- c. Are they "win-win" – i.e., will an outcome consistent with the null hypothesis still be a contribution to the field?

4. Background

- a. Clear, well organized -- use subheadings where possible. Make sure the significance of the topic is explicitly stated.
- b. State clearly where the gaps in knowledge exist in the field that your results will address.
- c. Make sure your references reflect an updated knowledge of the field.

5. Preliminary results

- a. Draw as much as possible on your past productivity; emphasize how your previous work leads to the present proposal or at least demonstrates feasibility of methods to be used.
- b. Do not show preliminary results that are not of high quality -- this is your chance to represent yourself.
- c. Make sure that the major methods to be used in the proposed work are reflected by preliminary results. (If you do not have expertise or preliminary results with a technique, make sure you list a solid, experienced consultant or collaborator and include a letter agreeing to the collaboration, and specifically stating just what the collaborator will contribute.)
- d. Show detailed numbers and representative raw data where necessary, especially if this is work that is unpublished.

- e. Put time and effort into preparing meticulous figures, graphs, or tables; this is your chance to demonstrate rigor and organization that will increase the reviewer's confidence that you can carry out the project.

6. Experimental design

- a. This is one of the most common places where the text is insufficient. This is not just a place to tediously list group sizes, detailed methods, etc. This is the place to demonstrate your ability to think knowledgeably and logically.
- b. Develop your aims; of all the sections this may well be the part of the grant application upon which you spend the most time.
- c. What happens if your first specific aim doesn't work out as you have predicted? Will aims 2, 3 and 4 then be rendered useless? Where do you go if the first step fails? Have multiple working hypotheses.
- d. One method that often works is to divide this section into subheadings after *each* specific aim is restated, as follows:

Specific Aim #

- i. **Rationale:** How does this design relate to your hypotheses? What is your reasoning (in detail)?
- ii. **Methods:** List general approaches first, explaining why the methods you propose are the best available for your questions. (*Caveat:* if you realize that you do not have the best, most direct methods for your questions, you need to rethink your aims or incorporate collaborators or new preliminary data showing feasibility with the necessary techniques.)
**Don't forget to address statistical analysis.
- iii. **Anticipated results:** You need to spend a great deal of thought as to potential outcomes and their likelihood. Explain how you will interpret the different outcome scenarios and how these results relate to your hypotheses. This is an opportunity to demonstrate creativity and enthusiasm for the data to be obtained, and show that they will be properly analyzed.
- iv. **Problems and pitfalls:** Be honest with yourself. If this section feels horribly uncomfortable, it is because you are probably trying an experiment that is not feasible. All experiments have pitfalls, but extraordinarily large pitfalls are likely to be unreasonable; hence, this section should serve as a reality test. Explain the pitfalls, and how alternate approaches will be used to overcome them if they occur. Do not think that avoiding mentioning a pitfall is a good strategy - it usually doesn't work. The reviewer will very likely notice the pitfall and believe that you are not aware of it, decreasing confidence in your ability to manage the data.

7. Timetable

- a. Not a futile exercise, although it does not need to take up an inordinate amount of space. The idea is here to take it seriously and use it as a reality check for yourself.
- b. Remember, this is a required element of the grant application, and the reviewers will use it to gauge your commitment, time resources and planning ability.

Common Mistakes in NIH Grant Applications

The Specific Aims provide the framework for the application.

Problems with Specific Aims:

- Too ambitious, too much work proposed
- Unfocused aims, unclear goals
- Limited aims and uncertain future directions

There are five major review criteria for NIH research grant applications including: Significance, Approach, Innovation, Investigator and Environment.

Problems with Significance:

- Neither significant nor exciting
- Lack of compelling rationale
- Incremental and low impact research

Problems with Experimental Approach:

- Too much unnecessary experimental detail
- Not enough detail on approaches, especially untested ones
- Not enough preliminary data to establish feasibility
- Feasibility of each aim not shown
- Little or no expertise with approach
- Lack of appropriate controls
- Not directly testing hypothesis
- Correlative or descriptive data
- Experiments not directed towards mechanisms
- Limited discussion of potential pitfalls and alternative models or hypotheses
- Inadequate discussion of proper data analysis and interpretation of data

Problems with Innovation:

- *Lack of new or original ideas*

Problems with Investigator:

- No demonstration of expertise or publications in approaches
- Low productivity, few recent papers
- No collaborators recruited or no letters from collaborators

Problems with Environment:

- Little demonstration of institutional support
- Little or no start-up package or necessary space and equipment

NIH Websites

THE FUNDING COMPONENTS OF NIH

The NIH Homepage:

<http://www.nih.gov>

Homepages of the NIH Institutes and Offices:

http://www.nih.gov/institute_initials/

THE NIH GUIDE FOR GRANTS AND CONTRACTS:

Program Announcements (PAs) and Request for Applications (RFAs):

<http://www.nih.gov/grants/guide/index.html>

Research Areas of Interest to the Extramural Programs at NIH Institutes

<http://grants.nih.gov/grants/oer.htm>

General Grantsmanship

All About Grants

<http://www.niaid.nih.gov/ncn/grants/default.htm>

Grant writing tips

http://grants.nih.gov/grants/grant_tips.htm

Quick Guide for Grant Applications:

<http://deainfo.nci.nih.gov/EXTRA/EXTDOCS/gntapp.htm>

Application Receipt, Referral and Review at Center for Scientific Review:

<http://www.nih.gov/grants/funding/submissionschedule.htm>
and

<http://www.csr.nih.gov/>

Electronic Submission of Grant Applications

<http://era.nih.gov/ElectronicReceipt/>

NIH Modular Grant Information, Q&A,

Sample Budget and Biosketch:

<http://www.nih.gov/grants/funding/modular/modular.htm>

THE REVIEW PROCESS

The Five Review Criteria for Most NIH applications:

<http://grants.nih.gov/grants/guide/notice-files/NOT-OD-05-002.html>

Descriptions of Initial Review Groups at the Center for Scientific Review:

<http://www.csr.nih.gov/review/irgdesc.htm>

NIH Center for Scientific Review Study Section Rosters:

<http://www.csr.nih.gov/committees/rosterindex.asp>

DATA ON ACTIVE GRANTS

NIH Award Data and Trends:

<http://www.nih.gov/grants/award/award.htm>

CRISP, NIH-funded research projects:

<http://www.crisp.cit.nih.gov/>

THE SPECIAL PROGRAMS AT NIH

R03/Small Grant Program

<http://www.nih.gov/grants/funding/r03.htm>

R21 Exploratory/Developmental Grant Program

<http://www.nih.gov/grants/funding/r21.htm>

NIH Grants to Foreign Institutions:

http://www.nih.gov/grants/policy/nihgps/part_iii_5.htm#awardsforeign

THE NIH NEUROSCIENCE BLUEPRINT

<http://neuroscienceblueprint.nih.gov>

THE NIH ROADMAP

<http://nihroadmap.nih.gov/initiatives.asp>

BIOMEDICAL INFORMATION SCIENCE AND TECHNOLOGY INITIATIVE (BISTI)

<http://www.bisti.nih.gov>

BIOENGINEERING CONSORTIUM

<http://www.becon.nih.gov>

BIOMEDICAL INFORMATICS RESEARCH NETWORK

<http://www.nbirn.net>

National Institutes of Health (NIH) Intramural Research Program

National Institutes of Health (NIH) Visiting Program

<http://www.nih.gov/od/ors/dirs/isb/isb.htm>

<http://www.nih.gov/od/ors/dirs/isb/aboutnihvp.htm>

National Institutes of Health (NIH) Intramural Programs Phone List

http://oacu.od.nih.gov/training/acuc_coord.pdf

Neuroscience-Related Intramural Program at NIH

<http://www.neuroscience.nih.gov/>

National Institute of Neurological Disorders & Stroke (NINDS) Intramural Programs

http://intra.ninds.nih.gov/Study_areas.asp

NINDS F05 International Neurological Science Fellowship Program

http://www.ninds.nih.gov/funding/grant_mechanisms.htm#INSF

National Institute of Mental Health (NIMH) Intramural Program

<http://intramural.nimh.nih.gov/>

National Institute on Drug Abuse (NIDA) Intramural Program

<http://www.nida.nih.gov>

NIDA International Visiting Program

<http://www.nida.nih.gov/about/organization/International/INVESTHome.html>

National Institute on Alcohol Abuse and Alcoholism (NIAAA) Intramural Program

http://www.niaaa.nih.gov/intramural/web_lcs/images/EYE-MOV.HTML

National Institute of Child Health and Human Development (NICHD)

Intramural Program

<http://dir2.nichd.nih.gov/>

National Institute on Aging (NIA) Intramural Program

<http://www.nia.nih.gov/research/intramural/>

National Institute on Deafness and Other Communication Disorders (NIDCD) Intramural Program

<http://www.nidcd.nih.gov/research/about/mission.asp>

National Institute of Dental and Craniofacial Research (NIDCR) Intramural Program

<http://www.dir.nidcr.nih.gov/dirweb/dirhome.asp>

NIDCR International Activities

<http://www.nidcr.nih.gov/research/international/intlhome.asp>

National Eye Institute (NEI) Intramural Program

<http://www.nei.nih.gov/intramural/index.htm>

Websites of US and International Funding Organizations and Contacts

The Neuroscience Research Funding Contacts in the US Federal Government

<http://www.nimh.nih.gov/researchfunding/neurofed.pdf>

International Brain Research Organization (IBRO)

<http://www.ibro.org>

The Human Frontier Science Program (HFSP)

<http://www.hfsp.org>

The Wellcome Trust

<http://www.wellcome.ac.uk>

The Howard Hughes Medical Institute (HHMI)

<http://www.hhmi.org>

Updated 08/24/2007