
Instructions for Preparation of the Research Proposal

General Formatting Instructions:

The proposal should and should be similar in format to an F30/F31 fellowship application. The student should describe experiments to be performed by a single graduate student over the course of three years with assistance from a technician or undergraduate researcher.

- (1) Use Arial or Calibri 11pt font
- (2) Margins should be 0.5" on all four sides
- (3) Number pages in the footer, and put your name in the header of each page.
- (4) The entire document should be no more than **8 pages**, single spaced (1 page Specific Aims, 7 pages Research Strategy). References, Data Management Plan, Authentication of Key Resources and Respective Contributions are not included in this limit. [This is 1 page longer than an F30/31 application to allow easier incorporation of a 3rd aim into a proposal prepared during a grant writing class].

Where to find guidance:

- (1) Enroll in a Grant Writing class – the following CSU Classes may be appropriate:

• MIP680 (1cr)	Grant Writing	Spring
• BC701(1cr)	Grant Proposal Writing & Reviewing	Fall
• NB771 (1cr)	Writing, Submitting & Reviewing Grants	Fall
• BSPM530/SOCR530(1cr)	Scientific Writing	Spring
• BZ544 (2cr)	Presenting Research in Biology	Fall
• HES700 (3cr)	Professional Skills in Bioenergetics	Fall

- (2) Ask your advisor for copies of previously funded applications or look at those provided by NIAID:

<https://www.niaid.nih.gov/grants-contracts/three-new-f31-sample-applications>

- (3) Use internet resources: <https://www.niaid.nih.gov/grants-contracts/write-research-plan>

Specific Aims

Start with a brief paragraph summarizing the background and clearly describing the hypothesis to be tested. Generally there should be minimal experimental detail in this section. This section should be *no more than 1 single-spaced page*.

AIM 1: Title of Aim

Brief summary of goals of this aim and the experiments planned (3-5 sentences)

AIM 2: Title of Aim

Brief summary of goals of this aim and the experiments planned (3-5 sentences)

AIM 3: Title of Aim

Brief summary of goals of this aim and the experiments planned (3-5 sentences)

Three aims should be described. Two aims based on your current projects and the third aim should be developed independently for the purpose of this exam. The aims should be approved by the committee prior to completion of the remainder of the proposal.

Tips: A good proposal is based on a solid testable hypothesis. *Make sure you clearly state the hypothesis!!* The aims should test your hypothesis and your experiments should support the aims. Do not propose a fishing expedition at the end of which you will “see what you get”. Your aims should generally be independent. i.e. Aim 2 should be able to move forward without successful completion of Aim 1.

These documents might be helpful:

- a) <https://www.niaid.nih.gov/grants-contracts/winning-application-specific-aims>
- b) <https://www.biosciencewriters.com/NIH-Grant-Applications-The-Anatomy-of-a-Specific-Aims-Page.aspx>

Below are the instructions for this section as described by NIH:

State concisely the goals of the proposed research and summarize the expected outcome(s), including the impact that the results of the proposed research will exert on the research field(s) involved.

List succinctly the specific objectives of the research proposed, e.g., to test a stated hypothesis, create a novel design, solve a specific problem, challenge an existing paradigm or clinical practice, address a critical barrier to progress in the field, or develop new technology.

Research Strategy

This section should be divided into “Significance” and “Approach”. Seven single-spaced pages are permitted. If you have three aims the significance and approach for each may be addressed together or separately. Preliminary data is optional, but should be drawn from your own work or work done in your advisor’s lab to support your hypothesis and/or demonstrate feasibility of the approach. The preliminary data can be incorporated into the research strategy in any section.

Instructions from NIH:

Start each section with the appropriate heading—Significance, Approach. Cite published experimental details in the Research Strategy section and provide the full reference in the Bibliography section

Significance

~1-2 pages. This section should address both the background and significance. It should only comprise information necessary for the reader to understand the significance of the proposed experiments. Tell the reader why your planned research is important.

Dos and Don'ts for this section:

Do be succinct. Avoid rambling and repetition.

Do organize this section with subheadings to help the reader stay focused.

Do keep paragraphs and sentences short - describe one idea per paragraph.

Don't review every aspect of the literature in minute detail – stick to what is relevant to this project. For example, do not waste valuable space discussing epidemiology of a disease when your study focuses on molecular biology!

Do show that you have a good grasp of the current literature by citing recent papers supporting your assertions.

[Recent generally means within the last 5 years]

Do use figures to clarify concepts – borrow from published papers (with appropriate citations), or draw your own.

Guidelines provided by NIH:

- Explain the importance of the problem or critical barrier to progress that the proposed project addresses.
- **Describe the strengths and weaknesses in the rigor of the prior research (both published and unpublished) that serves as the key support for the proposed project.**
- Explain how the proposed project will improve scientific knowledge, technical capability, and/or clinical practice in one or more broad fields.
- Describe how the concepts, methods, technologies, treatments, services, or preventative interventions that drive this field will be changed if the proposed aims are achieved.

Approach

This section should form the majority of the proposal (~4-5 pages). The approach section is critical for demonstrating you have developed a clear, organized and thoughtful study design that tests the central hypothesis. You should carefully think through what the results of each experiment might look like and how they will be interpreted to support or negate your hypothesis. You should discuss any potential problems and how they may be circumvented.

Dos and Don'ts

Do design each Aim to be independent of the outcome of other aims as much as possible.

Do use figures where appropriate (e.g. to describe vectors etc).

Do make sure your experiments are clearly relevant to the aims of the project and test the hypothesis.

Do discuss why your chosen approach is better than others that may be available.

Do emphasize any novel concepts, tools or techniques that you describe.

Don't waste valuable space on recipes and excessive experimental detail. For example, it is sufficient to state that you will use pcDNA3.1 as an expression vector. It is not necessary state that 20ng of pcDNA3.1 will be digested with 1U of BamH1 in buffer 3 (NEB) for 2hrs.

NIH Suggestions:

- Describe the overall strategy, methodology, and analyses to be used to accomplish the specific aims of the project.
- Describe plans to address weaknesses in the rigor of the prior research that serves as the key support for the proposed project.
- Describe the experimental design and methods proposed and how they will achieve robust and unbiased results.
- Discuss potential problems, alternative strategies, and benchmarks for success anticipated to achieve the aims.
- If the project is in the early stages of development, describe any strategy to establish feasibility, and address the management of any high risk aspects of the proposed work.
- Explain how relevant biological variables, such as sex, are factored into research designs and analyses for studies in vertebrate animals and humans.

Additional Sections

References

The references should be formatted in a similar way to those of a journal such as Genes & Development, J. Biol. Chem. or J. Virol. Full information including the title and names of up to 5 authors should be included in the reference list at the end. Within the text, you may use the first author plus the year, or a numerical citation. References are not included in the page limit.

Authentication of Key Biological and/or Chemical Resources (up to 1 page)

Key biological and/or chemical resources include, but are not limited to, cell lines, specialty chemicals, antibodies, plasmids, qRT-PCR primers, animal models and other biologics. Key biological and/or chemical resources:

- may differ from laboratory to laboratory or over time
- may have qualities and/or qualifications that could influence the research data
- are integral to the proposed research.

The quality of resources used to conduct research is critical to the ability to reproduce the results. The student should determine which resources used in their research fit these criteria and describe how they will be authenticated.

<https://grants.nih.gov/policy/reproducibility/resources.htm>

Data Management Plan (up to 1 page)

Provide a 0.5 page summary explaining how you are planning to manage the data gathered in the course of your project. It should address the following questions:

1. What type of data will you collect and how will you describe and catalog it?
2. How will you store and keep secure your data?
3. How will access to your data be provided once the project is completed? Who will be able to access, under what conditions and for how long?

Respective Contributions (up to 0.5 page)

Describe the collaborative process between you, your advisor(s) and others (e.g. peers, lab mates) in the development, review, and editing of this proposal. Also discuss the roles you and others will play in accomplishing the proposed research.