Guidelines for writing your research proposal

BIOCHEMISTRY 703 /GENETICS 703
Spring, 2004

Goals

The preparation of a research proposal in this course is intended to help you write research proposals in the future. The skills are very similar whether the data are yours (as in a Prelim) or those of others (as in this proposal). If you can write a great proposal here, you probably have the skills to do the same with your prelim and someday, with the grant you will need to write to support your lab.

In addition, the proposal provides you with an opportunity to learn about one or more areas in depth, develop your own ideas, and put into practice many of the approaches discussed in class.

Selecting your proposal topic

Your proposal will be based on the results presented in a paper that is selected by one of the 703 faculty. Specifically, you will use those results as the beginnings of your own new line of experiments.

The three papers are posted on our course web site: as PDF files. In addition, we have provided additional PDFs that might provide some background information or broader context for the papers. http://www.biochem.wisc.edu/biochem703/

You need to rank the papers according to your preference of which you want to use to write the research proposal. We hope that every one will get his/her first choice, but will have to split the class evenly among the three topics.

General guidelines

Your proposal will be evaluated using the same criteria that are used explicitly at NIH study sections. This part of the evaluation can make or break a proposal.

(1) Importance of the questions asked and likely impact of the answers
(2) Feasibility of the experiments
(3) The novelty and creativity of the design of the experiments.

In addition, you will be graded on other aspects that are also absolutely critical for writing a successful grant proposal (though not explicitly scored at NIH).

(4) Knowledge of topic.
(5) Clarity of writing. (Topic sentences, good grammar and syntax, proper paragraph organization).
(6) Appropriate and knowledgeable referencing.
(7) Figures that make the point clearly, but do not go overboard.

As with grant proposals, we encourage you to discuss your research proposal with your colleagues, but your writing should be your own. In particular, ask your colleagues to read a draft of your proposal and give you comments on each of the aspects numbered above. In general, a proposal is greatly improved by having others read it. Before handing in your

proposal, we strongly recommend that you read through your written work multiple times – at least once for each of the items described above.

The pre-proposal

On March 12, you will turn in the first part of the proposal, which we have dubbed a "pre-proposal." The function of this pre-proposal is to develop the intellectual framework for the experiments that you plan to propose. You must define clearly the question you are asking and the general approach you plan to take; you must present the reasons why the question is important and the reasons why the approach you plan to take is likely to succeed; you must provide sufficient background to understand the proposed experiments.

Format: be concise and clear

Page limits (see below) are provided as guidelines. Please follow these guidelines as well as you can: one page more or one page less is OK. NIH proposals are sent back without review when the type is too small or the margins too narrow: with that in mind, we ask that you use a 12 pt Times font, standard (1 inch) margins, and double space your work. *Proposals that grossly exceeds the page limits or do not follow these other guidelines will be returned for revision without grading.*

Page 1: SPECIFIC AIMS

- *Big picture*. Short paragraph describing the **big** problem that you plan to address in the proposal. For example, your first sentence might start: "The broad objective of the proposed research is . . . "Make sure the general problem is clearly stated.
- *General Approach*. Short paragraph briefly describing the approach you plan to take. For example, your first sentence might start: "The approach I plan to take is . . . . " Explain what organism you plan to use and what general approach you will take (e.g. genomic, molecular genetic, genetic, biochemical, combined approaches).
- *Aims.* A list of your specific aims, which can either of two forms. They can be posed either as questions or statements. For example: an aim might be stated as "What is the molecular mechanism by which gene product X directs process Y?" or "Specific aim 1 is to elucidate the molecular mechanism by which gene product X directs process Y."

Page 2: SIGNIFICANCE AND APPROACH

- *Signifiance.* In the first half of the page, describe the broad significance of the proposed research. In this section, you must answer the questions: who cares? and why bother? Tell us **why** this research should be done. What will the impact be of your research?

- *Approach.* In the second half of the page, describe what approach you plan to take to the proposed research *and defend taking that approach*. Why is this approach the best way to answer the questions posed? Why have you selected the organism that you plan to use, if you plan to use one? Why have you focused on the gene or protein that you have focused on. Why will you do a genetic screen? Or why will you examine cellular location? Why are the general approaches you have decided on the most powerful ones for answering the question you have posed?

Pages 3-5: BACKGROUND

Describe the background needed to place the proposed research in context. Discuss only what is necessary for context and the reader's comprehension. Do not present information that is not relevant; pare down the background to a minimum: A proposal is not the place for an encyclopedic discussion of the literature, even if it is well done and scholarly. Similarly, do not go over the data in the paper you have selected as your launching point: present only those results and conclusions that are relevant to your proposed experiments. Focus on those particular results in the paper or papers you selected that provide the driving force for the experiments you will propose.

References must be included.

Page 6: PROPOSED EXPERIMENTS

Outline the experiments that you plan t will be described in depth in your complete proposal. Organize them according to your specific aims. (Your complete proposal will involve a major expansion of this section, as well as revisions of what came before.)

The complete proposal

On April 5, you will turn in your complete research proposal. Format guidelines are the same as those outlined for the pre-proposal.

Page 1: AIMS

Same as pre-proposal – revise as necessary according to comments

Page 2: SIGNIFICANCE AND APPROACH

Same as pre-proposal – revise as necessary according to comments

Page 3-8: BACKGROUND

Describe the background needed to place the proposed research in context. Also describe the results of experiments that you will use to serve as the backbone of your proposed research. These results should be taken from the papers assigned, and any others you identify as relevant to your proposal.

References must be included.

Pages 9-14: PROPOSED EXPERIMENTS

Describe proposed experiments. The experiments should be designed so that two people, working effectively, would have them done in 1-2 years. Stay within those limitations: one of the most common criticisms of proposals at every level is that they are unrealistically ambitious.

Give sufficient detail that we can evaluate the experiments. Experimental design is critical. Will the experiment answer the question? What positive and negative controls will you use to interpret your experiments? Will a negative result be meaningful? Do your critical experiments depend upon some as yet unknown result that might or might not be true? (A common shortcoming.) If your experiment does not work, what is your alternate plan. Include references for any major techniques that you use.

Page 15: CRITICAL SUMMARY

Summarize how your proposed experiments will address the questions you posed on page 1, and what you expect to learn by completing the proposed experiments. Be succinct. This can be done in half a page.