

How to Write a Grant

[Or: One way to skin a cat (among many).]

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DEFINING THE QUESTION.

- READ, READ, READ - with pencil and paper at hand.
- Pose questions as you go - HOW, WHAT IS RESPONSIBLE FOR...
- Identify one interesting, important and novel QUESTION.
- Articulate your hypotheses, if appropriate, but BE CAREFUL NOT TO BIAS THE SCIENCE!
- Bounce your ideas off of colleagues.
- Check out web to see what's known and, especially, if someone has already answered your question (or thinks they have...).

DEFINING THE APPROACH.

- Consider MULTIPLE approaches without regard to what is possible.
- THINK about which would best enable you to address the question.
- Choose one or two that can FEASIBLY be used for your GRANT [alas you cannot be too far out in what you propose but don't let that lock you in when you really get in to the work!!].

PREPARING TO WRITE.

- READ, READ, READ.
- Sketch out the plan on paper.
- Have a balanced portfolio of low-risk, "bread and butter" with some high-risk, high-gain but not central to rest of grant.
- Sketch out the plan on computer.
- Enlist your collaborators (early!).

WRITING – STYLE ISSUES.

- Keep within borders – LESS IS MORE!
- Make spacious! leave spaces between paragraphs - cut if necessary (reviewer's mood is more important than your data)
- Have the grant read by people who know, and, if possible someone who doesn't.
- No waffle words (might, could, should) - only "will". If conditionals are tempting then explain, "will do if...".
- Avoid semi-waffle words (characterize) in goals. Better are "identify", "determine", "define".
- Communicate to the reader.
- Abstract and/or specific aims will make or break you (same for research statements, by the way).
- Spell-check and proofread!!!

WRITING – SUBSTANCE ISSUES.

- BIOLOGY, BIOLOGY, BIOLOGY!
- Why is this INTERESTING?
- Why is this IMPORTANT?
- What is NOVEL about what you hoping to learn?
- What is INNOVATIVE about your approach (careful...)?
- What will we learn?
- Don't be over-ambitious in scope and/or approach.
- Have others read it in 15 minutes or less – do they get it?

TITLE.

- Short, sweet but broad enough to encompass unanticipated areas but not so broad that can't write another grant in related area.

ABSTRACT (NIH)

- Two paragraphs.
- For lay audience.
- First is for the context (e.g., disease-relevance) and emphasize its importance.
- End first paragraph with question you will address.
- Second paragraph is for approach you will use.
- This is PUBLIC information - do not reveal patentable ideas.

BUDGET (NIH) [if not modular]

Personnel:

- PI should have significant percentage effort (20% minimum, depending on how big a program you want but don't use up all your % early on).
- Keep in mind 5+ years out that total percent does not exceed 95% (max allowed). Don't defraud!
- Include people by name, if possible; add their CV's.
- Include people who will not be paid off the grant as "freebies".

Equipment:

- Spread items over multiple years so doesn't inflate first year.
- Match year of purchase to time-plan.
- Ask for 50% cost for some big items - explain where other 50% will come from in just'n.

Supplies:

- Divide into medium categories.
- Total should not exceed 15k/fte (full-time-equivalent) unless unusual.

Other

- VERY useful category - try to get things out of supplies so 15k rule not exceeded.
- Include core facility charges, publication costs (page charges and reprints), equipment maintenance, photocopying lab notebooks, software, etc.

JUSTIFICATION:

- JUSTIFY, JUSTIFY, JUSTIFY!!!
- Personnel - what will each person do exactly - which sub-project.
- why do you need the technical support - what will s/he do
- Equipment - why can't you borrow it? Why aren't the six you have enough already? Why is it needed full-time for THIS project?
- Supplies - explain any special needs - impress that are keeping the amounts as low as possible - mention cost-saving measures.

CV'S

- Provide cv's for everyone who helps make the case for how the project is doable by "you" [NOTE – their other support will need to be provided and there are reporting requirements around key personnel].
- Include cv's for collaborators (and letters of support).

RESOURCES

- List big stuff that makes the project doable by you.
- Be sure jives with equipment being requested!
- List core facility support available.
- Give square feet of space available.

OTHER SUPPORT [for all key personnel]

- Be inclusive.
- Divide overlap into scientific and budgetary.
- Explain VERY well why there is no overlap or what you will do if there is ["If both grants are funded, discussions will be held with the respective agencies and budgets and specific aims?} Reduced as appropriate to ensure there is no overlap". List specific aims if you think it will help. For post-docs, explain that salary may be requested from fellowship applications but supplies will come from this grant. If their salaries are included on the grant and fellowship applications are out, explain that an additional person will be hired if the apps are successful.

TEXT (25 PAGES MAX)

Specific Aims

- Use a full page or close to it.
- Aims should embody the whole grant- the rest is fluff. Make these pure MEAT!!!! Sub-numbering helps keep it terse.
- Have a guaranteed useful and interesting outcome.
- Clear thread through whole grant - ideally ONE medium question and several related sub-questions.
- Set the scene with 2-3 sentences of background.
- State the QUESTION or GOAL (generally, you should not make the hypothesis the "lead" since the answer might be "no" after \$1M of tax money; if appropriate, make the hypothesis clear AFTER the question)
- Specific Aims MUST match [*verbatim*] headings in the grant!
- Give enough detail that can understand what will be done.

- Provide back-up strategies where needed.
- Describe how choices will be made – articulate the criteria for these choices (good for you and good for them).
- Generic example:
 - is an important disease. Currently, we know little about ---. My overall goal is to determine (understand) how --- does ---. My hypothesis is that changes in gene expression regulate this process and I will therefore use a combination of genetic and biochemical approaches to study.... My specific aims are:
 1. Determine [be definite] the genes involved in ----. To do this, I will select mutants in --. That is, I will:
 - 1.a. Chemically mutagenize strain xx
 - 1.b. Select and clone mutants able to ---- by putting them through ---
 2. Analyze mutants identified in Aim 1 with respect to ---.
 - 2.a. Determine complementation groups through mating...
 - 2.b. If complementation proves impossible, I will use molecular genetic means to accomplish this aim. That is, I will ----
 3. Pursue five mutants that represent different extremes of the phenotypes characterized in Aim 2 by:
 - 3.a.

Background

- Give only what is needed to appreciate the context of the work.
- Tell what is known and then **what are the questions that are outstanding (in bold, if you like)?** Tell the reader this is a question you will address in your grant.
- Cite references by name.
- Don't just self-cite (intellectual dishonesty).
- **Be sure you have conveyed:**
 - Why is your question interesting?
 - Why is it important to answer?
 - How is the question novel?
 - How is at least one approach innovative (balanced portfolio)?

Preliminary Results.

- Ideally, by aim but not always possible.
- Proof-of-concept. **My plan is DOABLE. It is doable by ME** - now you just have to give me the money to do it.
- Aesthetics count.
- Don't overwhelm with minutiae.
- Keep fonts in figures big enough to read.
- Avoid color unless needed.

Experimental plan.

- Specific Aims verbatim as headings.
- **Flow between sections.** ["Having identified -- in Aim 3, we next need to"].

- Have a “Rationale” or “Approach” section that is a virtual stand-alone. Explain why your chosen strategy is best among the various alternatives.
- Then have an “Experimental detail” section for each.
- Provide detail on aspects that are not standard. What vector might be important? What strain or cell line surely is (and why you chose it). How to do a southern blot is not. Make clear where YOU have direct experience with a technique.
- Explain choices - how many will you choose and what criteria will you use to choose them. Be careful of mushrooming fishing expeditions (and mixed metaphors).
- Have “Possible Pitfalls and Alternative Approaches” section. Describe any major hurdles that could prove problematic (but be careful they are not fatal and non-circumscribable). List back-up strategies and explain circumstances under which you will switch them. Give enough detail that can stand alone.

Conclusion.

- One sentence to start. [“Through the experiments described above, I expect to determine.”
- Then include future goals. [My long term goal is to use the information/clones/reagents generated in this five year period to next’]. This provides context – everything interesting should have a future!

Time line.

- Good idea to show how the work will flow.
- BE CAREFUL THAT THIS MATCHES EQUIPMENT AND PERSONNEL JUSTIFICATION.

Appendices

- Have letters from people who will provide any reagents not in hand.
- Have letters from collaborators.
- Have letters from advisors if non-standard techniques or equipment.
- Do NOT include extra data – only data that is already included but doesn’t incorporate into text well (should not be an issue these days).

Other:

- If something falls outside the scope of the grant, say so, but be sure it really does and you are not just using this as a fudge for something that is important but too risky.
- Communicate! PEOPLE are reading your grant. But don’t be familiar.

Addenda:

- Possible to send to NIH after submission and before review.
- Two pages max.
- Establishes proof of concept or something that could have killed the grant if questioned.