Grant Preparation

1. Overview of grant preparation and review

2. Developing and presenting the plan

Why is this important?

- Scientific communication
  - Papers and grants are our major product
  - Teaching and oral communication also essential
- What is a clear and convincing proposal?

Essential Elements of a Good Grant Proposal

- You have identified an important question
- You have shown that you can answer that question
- Answering the question matches the funding agencies goals

- Learn by doing:
  - Writing your own grants
  - Reading other grants
  - Discussing each other's grants in candid manner
    - Don't be defensive or offended

What are the goals of this session?

- Identifying the components of a good grant
  - Focus on NIH grants here; NSF grants later
  - Principles the same for other federal and private agencies
    - DOE, USDA, ACS, AHA, CFF, etc.
  - Format varies

Goal of Effective Grant Writing:

- A critique that says:

"This well-written proposal presents clever approaches to a timely and important topic and is likely to yield new insights and have a significant impact on the field"

  - Well-written:
  - Clever approaches:
  - Topic:
  - Likely to be successful:

NIH Extramural Grants

- Many types of NIH grants
  - Career development
  - Training grants
  - Program project and collaborative grants
  - Transition awards (K99, K22)
  - Research grants
    - Investigator-initiated (R01, R21, R15)
    - Response to targeted requests (RFP, RFA)

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

NIH RO1 Grant Review Criteria

- Know the criteria
- Make it easy for the reviewer to recognize and reward your fulfillment of each criterion

NIH RO1 Grant Review Criteria

Five criteria

- Significance
- Investigator(s)
- Innovation
- Approach
- Environment:

➢ Overall/Impact Score

- Evaluation: reviewers will score each review criterion separately (as they feel is appropriate)
- Emphasize substance and impact, de-emphasize methods

NIH Scoring: 1-9 scale

Impact	Score	Descriptor	Additional Guidance on Strengths/Weaknesses
High	1	Exceptional	Exceptionally strong with essentially no weaknesses
	2	Outstanding	Extremely strong with negligible weaknesses
	3	Excellent	Very strong with only some minor weaknesses
Medium	4	Very Good	Strong but with numerous minor weaknesses
	5	Good	Strong but with at least one moderate weakness
	6	Satisfactory	Some strengths but also some moderate weaknesses
Low	7	Fair	Some strengths but with at least one major weakness
	8	Marginal	A few strengths and a few major weaknesses
	9	Poor	Very few strengths and numerous major weaknesses

Additional Information for Scoring Guidance Table
Non-numeric score options: NR = Not Recommended for Further Consideration, DF = Deferred, AB = Abstention, CF = Conflict, NP = Not Present, ND = Not Discussed
Minor Weakness: An easily addressable weakness that does not substantially lessen impact **Moderate Weakness:** A weakness that lessens impact **Major Weakness:** A weakness that severely limits impact

Parts of the Proposal: **Specific Aims**

- Enough to be substantial and significant; not so many to be overly ambitious or unfocused.
  - Not the long-range goals, but clearly a part of them.
  - What can be accomplished in the time requested
  - Not every experiment, but the general approaches
- Connected but independent.
  - Danger in having all aims dependent on a result in the first aim
- Some aims should be "almost done"; some should be clever and novel.

Parts of the Proposal: **Research Strategy**

Sub-divided into three parts:

- Significance
- Innovation
- Approach

➡ Get the reviewer excited about the topic.

Research Strategy

For multiple specific aims:

- Address Significance, Innovation and Approach for each Specific Aim *individually* or
- Address Significance, Innovation and Approach for *all* of the Specific Aims collectively.

Research Strategy: **Significance**

- Explain the importance of the problem or critical barrier to progress in the field that you will address
- Describe how the proposed project will improve scientific knowledge, technical capability or clinical practice in one or more broad fields.
- Describe how the concepts, methods, treatments etc. that drive this field will be changed if the proposed aims are achieved.

Research Strategy: **Innovation**

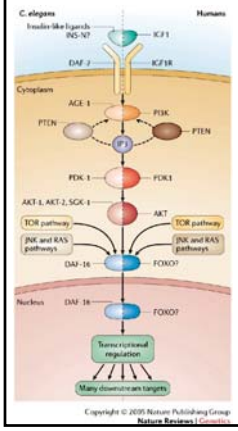
- Challenges and seeks to shift current paradigms
- Novel theoretical concepts, approaches or methodologies, instrumentation or interventions to be developed or used, and their advantages
- Refinements, improvements, or new applications of theoretical concepts, approaches or methodologies, instrumentation, or interventions.

Research Strategy: **Research design and methods**

- Describe the
  - Goal or hypothesis
  - Overall strategy
  - Methodology
  - Analyses to be used to accomplish the specific aims of the project.

Additional Tips

Use a summary figure



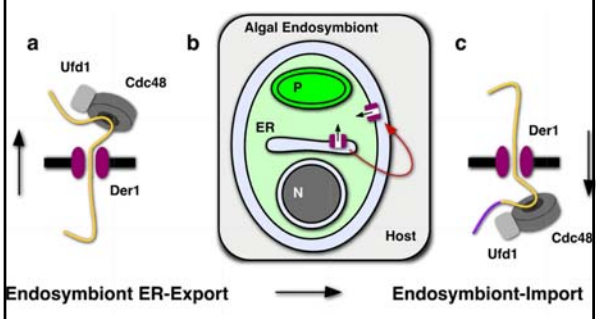
This

Not this

Research design and methods

- Same order as Aims
- General introduction of standard methods
- Rationale
- Methods: some old, some new

Use graphics to identify components of system or hypothesis



Research Strategy:
Research design and methods

- How will the data will be collected, analyzed, and interpreted
- Discuss potential problems, alternative strategies, and benchmarks for success anticipated to achieve the aims.

Research design and methods

- Expected and unexpected results
- Data analysis
- Interpretation relative to Aims
- Why are you doing it that way
- Pitfalls, problems, alternatives

Restate and summarize at the end of the aim:

Overall we expect that Aim1 will …

Preliminary Data

- Include pertinent preliminary studies, data, or experience
- For early stage projects, describe any strategy to establish feasibility
- Address the management of any high risk aspects of the proposed work

Show critical preliminary data:

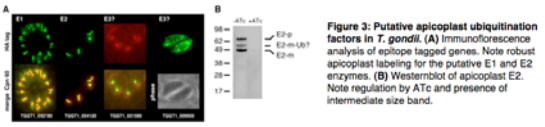


Figure 3: Putative apicoplast ubiquitination factors in *T. gondii*. **(A)** Immunofloresecence analysis of epitope tagged genes. Note robust apicoplast labeling for the putative E1 and E2 enzymes. **(B)** Westernblot of apicoplast E2. Note regulation by ATc and presence of intermediate size band.

Progress Report / Preliminary Data

- Convince reviewer
  - Feasibility
  - Expertise with key methodologies
  - Excellent data
  - Productivity
    - Have some manuscripts in the review pipeline
    - Show timely publication record
  - Rigorous and multiple approaches
  - Critical interpretation

Parts of the Proposal

- **Abstract**
  - Summary of the state of the field and the questions to be asked.
  - Specific aims, rationale and basic methods.
  - Significance and impact

Write this last; make it match the proposal.

Determines the review panel and Institute

Informs the study section

Other Parts of the Proposal

- **Budget**
  - Modular budget (modules of $25K, up to $250K)
    - Personnel
    - Equipment
    - Supplies
    - Travel
    - Collaborations
    - Other
  - Justify fully

Be realistic and in range

Comfort zone for each panel based on type of work and level of experience and productivity

Biosketch
Each Key Investigator

- **Personal Statement** – why are you the person to do this project
- **Positions and Honors**
- **Peer-reviewed publications**
  - 15 most relevant
  - Only published or accepted
- **Research Support**
  - highlights your accomplishments, and those of your colleagues, as scientists.

Show how your training and productivity is needed for this project.

Resources & Environment

"Show how the scientific environment will contribute to the probability of success of the project"

For Early Stage Investigators, show institutional investment in the success of the investigator

- Independent space
- Adequate institutional support
- Equipment, facilities, unique features of the environment
- Collaborators

Show you have or can get all needed resources

Parts of the Proposal:
Other stuff

- Human subjects; vertebrate animals
  - Follow all current procedures
- Letters of collaboration
- Literature cited (know reviewers)
- Appendix - only include allowed items

Additional Tips

- Write a review article before application
- Know your audience
  - Aim for a knowledgeable scientist, not an expert.
  - One reviewer may know the field better than you do; don't write for her
- Be realistic about significance
  - You will not cure cancer or design a new antibiotic but you might identify a critical next step in the process

Writing the grant

- Start early, ask for advice
- Write, re-write, re-write again
- Wait a week, re-read and re-write
- Read critically; proofread carefully

Updates (if allowed)

- Status of manuscripts

Technical details

- Electronic submission for most grants.
- Check for latest rules and requirements
- FAQ presents the allowed fonts, sizes, etc.
- Have figures, but make them readable and self-explanatory, and tied to the text.
  - Color is good.
  - Don't wait until the last minute to upload.

Common errors

Too much

- Repetition
- Detail in methods
- Methods and aims
- Attention to narrow questions, minutia
- Reliance on collaborators

Common errors

Too little

- Repetition
- Proofreading
- Chance of broad insight
- Explanation of rationale, problems, and alternatives
- Expansion of technology

Rewriting the A1

- Happens to everybody
  - Pay lines as low as 10%
- The reviewer is always right
- It was your fault for not making it clear
- Interview SRA and Program Officer
- Rewrite extensively
- Comment on all previous criticisms
- Be nice

New Investigators

- Typical grant issues
  - Over-ambitious
  - Incomplete knowledge of the field
  - Independence
- The good news: Higher payline