How to Write a Competitive Grant Proposal

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The Hypothesis

- Begin by focussing on the “big picture”
- where is the field (the background)
  - directions
  - gaps in knowledge
  - what has already been done
Your Idea

- Is it novel
- How great is the intellectual merit
- What is the potential impact
- Is the hypothesis valid and can you present evidence to support it
- Are the aims logical
The Hypothesis - 2

- You need a strong hypothesis to drive your proposal
- solid, important, means to test it
- rationale based upon current literature
The Hypothesis - 3

- increase understanding of biology, disease or treatment
- provide alternative hypotheses
- state your hypothesis in the **summary**, **specific aims** and **research plan**
- you can’t state it too many times
Basic principles - understand the field

- Assess competition in the field
- Understand resources needed
- Understand opportunities
  - Mentor
  - Collaborators
  - Carve out niche
Basics principles - Don’t underestimate the task

- Major undertaking
- Allocate lot’s of time!!!!
- Not overly complex
- Read, write, read more and revise, revise, revise
- This is an iterative process
The basics -continued-

- Closely examine proposals from successful applicants
- read the instructions and then read them again
- ask several experienced grantees to read and critique your proposal, ALLOW LEAD TIME (≥ weeks)
The basics - The investigator and the resources

- are the investigators qualified, competence, credentials and experience
- facilities, adequate and conducive
- are the procedures appropriate, adequate and feasible
- realistic expectations
Developing your Research Proposal

- Based upon a strong hypothesis
- relate specific aims directly to hypothesis
- emphasize mechanisms
- coherent direction, focussed
- don’t be overly ambitious
Abstract or summary

- State hypothesis
- State specific aims
- Why objectives are innovative and important
- Methods and approaches to accomplish objectives
- Significance
Structure - 1

- A. Specific aims, \(<1/2\) page or as directed
- B. Background and significance, 2-3 pages
- C. Prelim. studies/progress report, 1-3 pages
- D. Research design and methods (11-25 pp)
- E. Overall significance, max. 1/2 page
- F. Timeline, 1 paragraph
- G. Resources, equipment, space, staff, general facilities, 1 paragraph
The Research Plan - Specific Aims

• Begin by articulating the broad or general objectives of the project
• your **specific aims** are the specific objectives of the proposal and relate these to your hypothesis
• state alternative hypotheses and the basis for your choice
The Research Plan - “background and significance” - justification

• Summarize
  – information from the field that led to the research you are proposing
  – point out gaps in knowledge
  – how your research will increase knowledge, and long-term big picture scientific objectives and better health
  – how your research is innovative
The Research Plan - “Preliminary studies/progress report”

- Showcase what you have already done
- Builds the reviewer’s confidence that you can do the work
- Supports the hypothesis
- Explain how results are valid and will be expanded upon
- Include manuscripts submitted
The Research Plan - “research design and methods”

- Each section, one specific aim, one set of experiments
- logical sequence of experiments with a starting point and finishing point
- give rationale for methods and their appropriateness
D. Research design and methods
  - Specific aim 1. xxx....
  - Hypothesis. xxx...
  - Rationale. xxx...
  - Experimental design. xxx....
  - Significance. xxx....
The Research Plan - research design and methods

- Discuss potential pitfalls or obstacles
- Suggest alternative approaches
- Consider limitations of each approach, direct vs. indirect evidence
- Discuss anticipated results, describe and how you will analyze the data, statistics
- Discuss how you will interpret the results you anticipate in relation to your hypothesis
Commonly cited problems and concerns - 1

- Lack of significance of scientific issue
- Lack of original or new ideas
- Unrealistic, overambitious
- Scientific rationale not valid
- Diffuse, superficial, lacks focus
- Fishing expedition, no basic scientific question being addressed
Commonly cited problems and concerns -2

- Shaky hypothesis, data, no alternative hypothesis
- Descriptive experiments, indirect vs. direct evidence, will not test hypothesis
- Technology vs. hypothesis driven
- Rationale for experiments not provided
- Flow, direction of exp., starting and finishing points not defined
Commonly cited problems and concerns -3

- Lack of alternative methodological approaches
- insufficient methodological detail (do you know what is involved and limitations)
- linearity, experiments or aims are interdependent
- the model is not appropriate
Commonly cited problems and concerns - 4

- Experiments do not include positive and negative controls
- innovative, but lacking preliminary data
- prelim data do not support hypothesis or feasibility
- inadequate experience, collaborators
- inadequate critical review of the field
- ambiguous source of supporting data
Budget

- Estimate number of personnel required
- PDF’s vs. grad students
- research assistant
- briefly describe responsibilities in relation to research plan
• $15,000 per researcher for expendables
• provide listing of major categories of expendables
• provide clear description and justification for items requested, item by item
• e.g., personnel, services, travel, animals, equipment
A Rose is a Rose is a ....

- Clarity, clarity, clarity
- hypothesis, hypothesis, hypothesis
- mechanisms, mechanisms, mechanisms
- experimental design, design, design....
- Alternative hypotheses ....
- Alternative approaches.....
- Data interpretation and what it will tell you...