Strategies for Applied Research

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Discussion Outline

- Designing a project that interests YOU!

- Developing the Hypothesis

- Finding an agency that may be interested

- Writing: Background/Methods/Instruction

- Finalize and Send it off! 😊
Design a project that interests YOU!
Choosing a project

- First and foremost, it is IMPERATIVE that YOU believe (and really like) your research!
- Reviewers pick up on subtle signs that indicate that you have concerns about the project
- Good grant writing requires a bit of salesmanship-if you do not believe in the project it will be hard to “sell it to reviewer”
Choosing a project

- Good grant writing requires a substantial amount of time and effort
  - Reading background material
  - Developing the hypothesis
  - Writing the methodology
- Never develop a grant unless you will be incredibly excited to have the opportunity to perform the research
  - It may get funded and then you will need to do the work!
Choosing a project

- It may not always be possible to specifically define the area that you will be working in
  - We often work in an area defined by our mentor
Choosing a project

- However, you can identify the areas of your specialty that fascinate you the most
  - Work to build your research, experiences and publications in YOUR niche as much as possible

- Reviewers will look at your CV to see if you are beginning to build your career around the area of research you are proposing
Grant Development
Grant Development

1. Finding time to write a grant
2. Identifying the Question/Hypothesis that you would like to answer
3. Identifying a funding agency that might be interested in the area of research
4. Writing - Background/Methodology/Budget
Finding Time to Write a Grant
Time Management

- Good grantsmanship requires a fair amount of time (developing the hypothesis, reading about background and methods, calculating the budget etc)

- Start early!! Because........
Unforeseen issues!

- There are many unforeseen obstacles that may develop as you go forward
- Power calculations indicating you would need to study 5,000 horses in order to obtain statistical power
- Determination that a key reagent needed for an assay has been discontinued

You want to have plenty of time to be able to be flexible!!
Exhaustion!

- Mental fatigue - you want the grant to read well and the reviewer to sense your passion and enthusiasm.

- When you are writing the grant at 3am, 24 hours before the grant is due, it is hard to be enthusiastic.

- Mistakes will be (and have been) made!
Red Tape!

- University Grant and Development agencies require that any extramural grant be signed by department heads, deans and university officials.
- They may need time to approve the budget, ok reductions in overhead %, etc
- The University may require that the COMPLETED grant be in their office 1-7 days **BEFORE** the grant is actually due
No matter how successful procrastination has worked in other areas of your career (cramming for exams etc) .............

**IT WILL NOT WORK WELL WITH GRANT WRITING**
Time Management

- Ideally, plan to set aside a small amount of time (2 hours) 4-5 times/week for at least a month before due (longer if NIH level)
  - This will help prevent the grant fatigue that occurs from being forced to do a lot all at once
  - This time slot should be put on your schedule
CLEARLY, this IS very challenging when balancing a clinic load

Clinician scientists need to start even farther in advance so that they can use their off clinic opportunities
Clinician scientists are EXCEPTIONAL individuals!

- They use their unique clinical skills to identify important clinical research problems.
- They use their unique research skills to solve important clinical issues.
They are members of an ELITE and small group of individuals who can actually move veterinary medicine forward.
However, Clinician scientists have to be just a little better than the average person at time management.
Now that you have scheduled time to work on your grant, you can develop your Plan of Action.
Your Writing Plan of Action

1. Hypothesis
   - Specific Aims

2. Identify a funding agency that fits
   - Carefully review instructions for issues that need to be addressed early!

3. Background/Methods/Budget

4. Compliance Concerns
Identify the Hypothesis that you would like to prove/disprove
Hypothesis

- The Hypothesis is one of the most CRUCIAL parts of the grant
- This should be the FIRST part of the grant that you work on
Hypothesis

- Hypothesis should be a tentative explanation for the scientific problem that you will test with further investigation.

- Always list at least 1 Hypothesis (1-3 is appropriate) even if the grant instructions do not specifically state it.
Developing your Hypothesis

- Begin with a broad subject/idea
  - Example: Evaluation of the etiologies of cardiomyopathy

- Immerse yourself in the topic--- read past literature- make notes to yourself (index cards?) about interesting ideas, approaches to the problem

- Start writing down some more specific ideas about possible ways to investigate this
Developing your Hypothesis

- Leave ideas alone for a few days
- Return to study, read some more

- Note that all of the above took time!

- Develop a list of the possible questions you would like to pursue
  - Is cardiomyopathy inherited?
Developing the Hypothesis

- Focus your list to 1, maybe 2 possible, provable, tentative explanations for your problem that you can test
  - Dilated cardiomyopathy is inherited in the Doberman pinscher
- Most grants should have 1-3 concise, well written Hypotheses
Developing the Hypothesis

- If you have more than one Hypothesis, they should be related in subject as the subject or theme of the grant.
- If the title is “Etiologies of cardiomyopathy in the dog” the following might be considered:
  - H1: Dilated cardiomyopathy is inherited in the Doberman pinscher.
  - H2: Dilated cardiomyopathy is caused by a nutritional selenium deficiency in the Doberman pinscher.
Developing the Hypothesis

- However, multiple hypothesis should NEVER be dependent on each other
  - For example, this would be a BAD pair of hypothesis
    - H1: Dilated cardiomyopathy is inherited in the Doberman pinscher
    - H2: Dilated cardiomyopathy is an autosomal dominant trait in the Doberman pinscher
  - Because if H1 is disproven (if it is not inherited) there is no point in completing H2
Developing the Hypothesis

- Be sure that you will be able to PROVE/DISPROVE the Hypothesis

- As you develop your methodology, return frequently to the Hypothesis to make sure what you are planning will prove/disprove the Hypothesis
Developing the Hypothesis

- Ask someone else to read it (especially if this is not exactly their area) to see if it makes sense to them.

- Good H do not develop overnight—anticipate that it will take some time to write and rewrite many times.
Specific Aims

- Each hypothesis should have at least one (2-3 is fine) specific aim that states the major experiment that will be done to test hypothesis

- H1: Dilated cardiomyopathy is inherited in the Doberman pinscher

- Aim 1: Perform outcross breeding studies with affected Doberman pinschers
Finding a grant agency that fits
Finding a grant agency that fits

- Once you have identified your area of research and Hypothesis
  - Start looking for funding agencies that might be interested in funding your project
- Agencies are funded by very specific resources and have very specific needs. No matter how wonderful your grant is – they will not fund it if it does not suit their needs
Finding a grant agency that fits

For example- an agency wants to fund clinical studies that test new treatments for laminitis
Finding a grant agency that fits

Investigator X submits a grant with a hypothesis:

H1: TNF is elevated in horses with laminitis

The reviewers quickly discard the grant since: studies of cytokines in horses with laminitis may be helpful but are not specifically directed at TREATMENT
Common funding agencies for DVM clinician scientists

- American Kennel Club-Canine Health Foundation
- American Association of Feline Practitioners
- Grayson-Jockey Club Foundation
- Morris Animal Foundation
- National Institutes of Health
- Winn Feline Association
Instructions & Grant Formatting
Formatting the Grant

- Each grant agency has their own, very specific guidelines. These may include page margins, forms, deadlines, letters of support, order in which the grant is put together

- It is IMPERATIVE that you follow the directions EXACTLY

- Agencies receive many more grants than they can fund AND reviewers that assist them are often volunteering their time and are very busy experts in the field
Formatting the Grant

- Failure to follow the exact directions --- even font size or page margins, is almost always a reason for dismissal of the grant without it being reviewed!

- If you are going to take the time to write a grant, BE SURE to set aside time to properly go through the directions and guidelines
Background/Materials & Methods
Grant Development II

- Once you have identified an agency that fits your area of interest, you can use the page limit instructions to write Background/Methods/Budget/Etc.

- Use the notes and references you obtained when you were developing your Hypothesis to write the Background and Methods section.
Background

- You do not need to reference every paper ever written on a topic, HOWEVER, you do want to reference Key authors & papers.
- This tells the reviewers that you really know the subject and the state of the science in this area.
Background

- Be as current as possible. Mention landmark studies but be sure that you have done a recent survey of the literature.

- AVOID using textbooks and book chapters as references.
Materials and Methods

- Be sure to state all important techniques needed to do the research to prove/disprove the Hypothesis.

- Amount of detail provided on a technique can be varied.

- Common techniques or techniques that you have published on may not need to be explained. May be ok to state “method as described” REF #
Materials and Methods

- However, if it is a less common technique or a new area for you:
  - write enough detail to tell reviewer that you are familiar with methodology
Materials and Methods

- Clearly state - a few possible limitations/pitfalls of your approach and how to deal with them

- Tells the reviewer that you know the issues may arise and you are prepared for them
Statistical Design

- **Always** provide the reviewer with an indication of how you determined the needed number of cases, repetitions, assays, etc.

- Perform Power Calculations **if at all possible** even if you have limited pilot data.
Statistical Design

- Always state how the data will be analyzed

- Always define what you will consider to be statistically relevant
Budget

- You can anticipate that in most cases, the reviewer will carefully scrutinize the budget.
- Include all needed costs, but be careful that there is no appearance that you are “padding the budget”.
- Be as specific as possible.
Be very specific with salaries

This is an area often used to expand the budget incorrectly so it is evaluated closely!!!

Avoid vague estimates—“50% tech salary” - - -instead estimate actual time it will take to pay for the work to be done (1200 hours, etc)
Compliance
Compliance

- Most grant agencies and university grant offices require several layers of “compliance”
  - Animal use approval forms
  - Biosafety, radioisotope approval
  - Letters of support from co-investigators
- Most of these take much more time than expected to obtain! So start early!
Compliance

- Carefully review the grant guidelines as well as your own university guidelines to determine the needed paperwork and required timelines
Finally….

Go through one more time:

- Make sure hypothesis are not dependent on each other
- Make sure methods can test hypothesis
- Make sure you have power calcs and assessment stats
- Make sure you are not exceeding page limits, format rules
- Set realistic goals for your success….
Keys to Increase Research Funding

Factors that increase funding success*

- Grantsmanship training
- Attendance at association meetings (networking)
- Number of proposals submitted (PERSEVERENCE)
- Research team size (faculty, post docs, grad students, technical assistants, professional support)

Please Don’t Give Up!