

20.109 Communication Workshop 5: Grant Proposal

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Helping you communicate effectively.

be.mit.edu/communicationlab

A successful grant must convince its readers that the proposed work is **significant** and **achievable**.

- Readers are busy and easily distracted
- Opportunities are limited
 - Time limits on applying again
 - (whereas there's always some journal that could accept your paper)

NIH Tips for Applicants:
“What makes an application
exciting?”

<https://youtu.be/IAOGtr0pM6Q>

2:02

Review assignment rubric

Category	Elements of a strong presentation
Knowledge and explanation of subject matter:	<ul style="list-style-type: none"> relates proposal to topics covered in 20.109 when appropriate sufficiently explains concepts/ methods/etc. <i>not</i> covered in 20.109
Idea	<ul style="list-style-type: none"> the what, why, and how (<i>are you going to do it</i>) of the idea are each clear and compelling the project scope is reasonable exhibits novelty/creativity
Overview	<ul style="list-style-type: none"> clear and concise description of the social and scientific context (and/or central question and significance)
Background	<ul style="list-style-type: none"> sufficient for intelligent non-experts to understand the proposal describes/credits relevant prior art
Problem and Goals	<ul style="list-style-type: none"> well-defined hypothesis and goals (specific research aims)
Details/Methods	<ul style="list-style-type: none"> staged roadmap for investigation and/or helpful schematics as you go the experiments address the central question and include good controls methods needed to understand the predicted outcomes are explained, without unnecessary detail
Outcomes	<ul style="list-style-type: none"> show sample data if experiment works (summarize in tabular form, make mock graphs, show published images from similar work, etc.) describe alternate assays, questions, and/or information still gained if experiment does not work
Resources	<ul style="list-style-type: none"> consider specialized resources needed (e.g., plasmids, cell lines, access to large/costly equipment) detail is good, but not needed for every resource; nor is detailed budget info. required

Impact and Summary	<ul style="list-style-type: none"> reiterate central question and its significance to science and society
Q&A	<ul style="list-style-type: none"> answers that convey understanding when you lack knowledge, tell how you would approach the question based on what you know
Overall organization of talk	<ul style="list-style-type: none"> content introduced in logical, easy-to-follow sequence main points emphasized, repeated transition statements between ideas
Overall effectiveness of slide text/visuals	<ul style="list-style-type: none"> slide titles convey key message good balance of text and figures text/figures large enough to be seen (including axis labels!) considered use of color not too many or too few slides
Overall effectiveness of delivery	<ul style="list-style-type: none"> all elements of a good individual presentation (effective use of voice, body, and language), plus: collaborative effort: partners speak for equal times, don't interrupt each other, take turns being "on stage" overall appears rehearsed, with smooth transitions between speakers; talk is cohesive review/preview structure of talk 12' length (+/- 0.5 min)
Talking points	<ul style="list-style-type: none"> main points to be made during talk (can be incomplete sentences) well thought-out transitions best work will include supporting detail, in case needed for Q&A

Examples & resources

- NIH Small Grant Program (R03): appropriate scale
<http://grants.nih.gov/grants/funding/r03.htm>
- NIAID: includes alternate approaches if first approach doesn't work
<http://www.niaid.nih.gov/researchfunding/grant/pages/appsamples.aspx>
- BE Research Guide:
<http://libguides.mit.edu/bioleng>
(email Howard Silver hsilver@mit.edu with suggestions!)

You must include...

1. **Overview:** brief statement of knowledge gap, research question, and significance
2. **Background**
3. **Research Question + Specific Aims**
 - a) well-defined, testable hypothesis
 - b) 3-4 tests of that hypothesis
4. **Methods**
5. **Outcomes** predicted if everything goes according to plan, and if nothing does
6. **Resources** needed to complete the work
7. **Impact** on science, society

SIGNIFICANT

ACHIEVABLE

SIGNIFICANT

We'll also briefly address group presentation skills today.

1. Overview: brief statement of knowledge gap, research question, significance

Like the first half of an Abstract:

For many established and newly developed prostate cancer drugs the therapeutic dose is limited by off-target and general toxicities. This leads to subtherapeutic treatment of the tumor, suboptimal treatment response, and increased opportunity for drug resistance. Targeted drug delivery systems to prostate cancer could resolve this problem but have not been developed because of the need for function-driven design of a nano-scale carrier that is sufficiently dynamic in its chemical architecture to accommodate the modifications needed for therapeutic application. This application proposes to develop such a nanoparticle through synergistic collaboration between three unique expertise represented by the three investigators...

Dr. Andries Zijlstra, Vanderbilt University

2. Background

Like an Introduction

3. Research Question + Specific Aims

Objective/Hypothesis: Our objective is to obtain nanoparticles optimized for targeted drug delivery and imaging of prostate cancer.

We hypothesize that polymer-based nanosponges developed using a step-wise, function-driven design format are an effective modality for simultaneous targeted drug delivery and imaging of prostate tumors.

3. Research Question + Specific Aims

Aim #1. Generating a panel of prostate cancer-targeting nanosponges optimized for tumor targeting, drug cargo loading, and drug release kinetics

Aim #2. Identifying the most effective combination of tumor targeting nanosponges considering a combination of different targeting peptides, drug cargo, and release kinetics

Aim #3. Evaluating the use of nanosponge therapy against human prostate cancer using human tissue xenografted in SCID mice

Activity: Evaluate the example proposal

- Handout

Activity: Frame a Research Question + Specific Aims

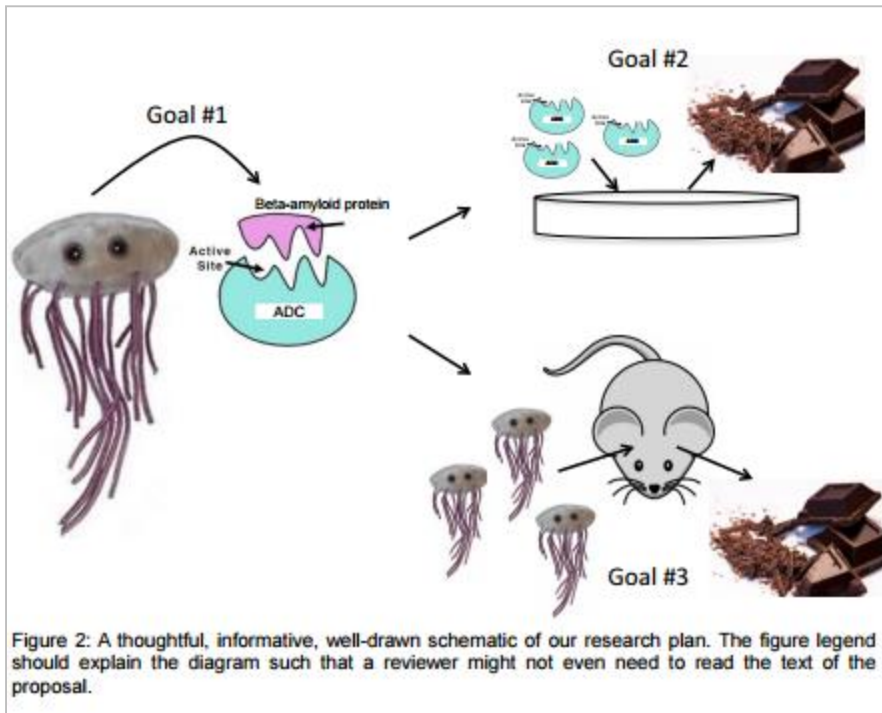
1. Pick one of the fields that you and your partner are interested in. (This is just an exercise, not a commitment!)
2. Identify a testable hypothesis or research question in that field.
3. Brainstorm 3-4 ways of testing that hypothesis.

4. Methods: lay out an experimental roadmap

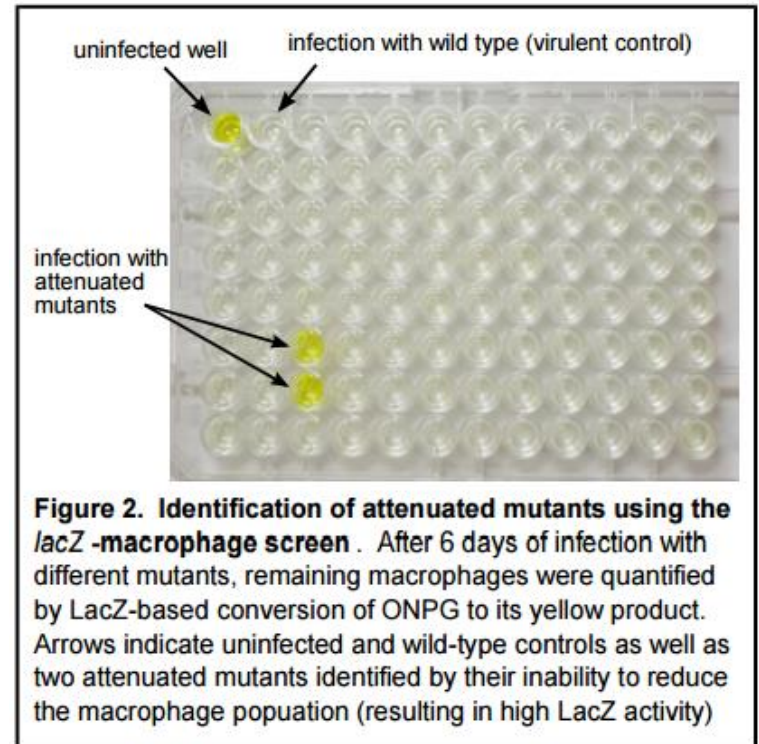
- Include brief statement of overall approach: don't just dump details
- Don't just say "data analysis"
 - Metrics, cutoffs, tests?
 - What would tell you your hypothesis was true?
- You don't have to develop this all on your own: talk to faculty, grad students
 - *How do people usually measure X?*
 - *Is there an animal model for Y?*

4. Methods: use schematics & visuals

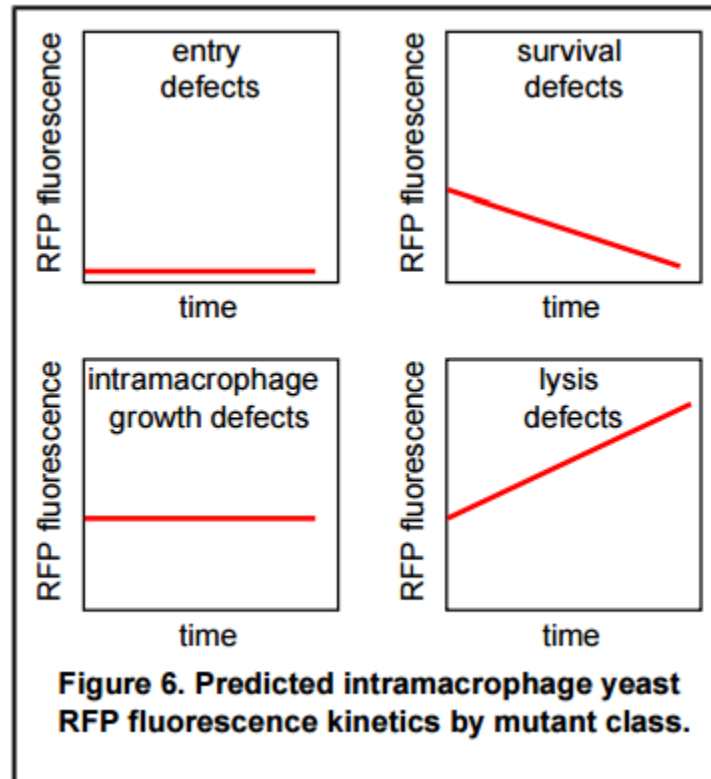
Outline your specific aims:



Demonstrate a method:



5. Predicted Outcomes: create representative visuals



5. Predicted Outcomes: what could go wrong?

- What are other ways you could test the same question?
- Demonstrates robustness
- Demonstrates that you're the right team: you can think through potential pitfalls and prepare for them

5. Predicted Outcomes: what could go wrong?

3.2.2.5. Potential problems and alternative approaches.

It is possible that since reovirus T1L antagonizes innate immune responses via multiple mechanisms, as indicated by our preliminary data (Section 1.4.2) and reassortant experiments statistically linking the S2 and L2 genes to IFN antagonism (24), **substitution of the T1L M1 gene into the T3D backbone may be insufficient to fully decouple the IFN response** from the apoptotic response following infection.

In this case, we will use information derived from Specific Aim 1, to **identify other genes associated with IFN antagonism, to generate an “IFN-dead” virus** in the proapoptotic T3D backbone. The transcriptional networks induced by this virus would then be profiled, as above.

If these approaches fail to segregate apoptosis induction from IFN signaling, we will **profile changes in gene expression** induced by T1L and T3D in IFNAR-deficient MEFs.

It is also possible that microarray slides or software provided through the GCAT consortium **may not be sufficiently robust** to accommodate the level of depth of the proposed experiments. In this case, we would then use commercially available microarrays, such as the GeneChip® Human Gene 1.0 ST Array (Affymetrix), similar to those used previously (45).

6. Resources: mention unique elements in Methods

Resources	<ul style="list-style-type: none">• consider specialized resources needed (e.g., plasmids, cell lines, access to large/costly equipment)• detail is good, but not needed for every resource; nor is detailed budget info. required
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You don't need a dedicated Resources slide.

7. Impact: reiterate central question & significance

Innovation and Impact: The proposed work is highly innovative at two levels: 1) The use of unique polymer chemistry in the design of a polymer-based nanoparticle, and 2) the synergistic function-driven design approach implemented by integrating the expertise of three investigators.

The proposed particle would greatly impact prostate cancer therapy as it would enable tumor specific delivery of established and newly design therapeutics.

Group presentation skills

- Don't switch off too frequently – it's distracting.
 - Divide into larger sections
 - Share big- and small-picture content
- Announce organization & transitions between partners
 - "X will introduce the Question and the Aims, and then I'll talk about the Methods..."
- Show your excitement! Modulate your voice

Feedback from the journal club presentations

- Do interact with your slides
- Excessive animations are distracting & inconvenient
 - Use simple styles
 - Group content – not everything has to appear one-by-one

Additional help

be.mit.edu/communicationlab

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- BE Research Guide:
<http://libguides.mit.edu/bioleng>
(email Howard Silver hsilver@mit.edu with suggestions!)