To perform research and generate scholarship you must have resources

Time
Money
Materials
Expertise
Equipment
Training

You request these resources with a research proposal

Research and Scholarship are a cycle

Research
Your Research Identity
Scholarship

There are key elements to writing a successful proposal

Your proposal must have a high likelihood of producing results that will have an impact:
— Emphasize Significance, Innovation!

Your proposal must be easy to understand:
— Keep it simple, concise & logical!

You must know what is required for the proposal:
— Read the Instructions!

You must know how the proposal will be reviewed:
— Write to the Review Criteria!
Crafting a successful proposal requires good communication skills

*Know your audience:*

“The Reviewer at Work”

Above all, remember . . .

**A funded proposal is a successful act of communication**

It is essential to start with a good question

- What is the mechanism of X?
- Is this drug a better treatment?
- Does this curriculum result in increased learning?
- Does this change in clinical practice improve outcomes?
- Do these concepts apply to this situation?
The best research questions have significance and impact

Does the project address an important problem?  
A gap in knowledge?

If the goals of the project are achieved,  
• how will scientific knowledge or clinical practice be improved?  
• how will the field be changed?

“Now you know that, what do you know?”

Floyd Bloom, MD

Your proposal should be based on a hypothesis

Funded
Good research is hypothesis driven

A hypothesis is a general statement, based on existing information, that describes a process in nature.

Research proposals typically contain standard components

<table>
<thead>
<tr>
<th>Component</th>
<th>Content/Question</th>
<th>NIH R01</th>
</tr>
</thead>
</table>
| Specific Aims   | What are the overall goal & specific objectives?  
What is the hypothesis? | Specific Aims       |
| Background      | How does it fit previous work?  
Why is it important?  
How will it advance the field? | Significance  
Innovation |
| Preliminary Results | What have you done to demonstrate feasibility & your competence? | Preliminary  
Results |
| Research Design | What are you planning to do?  
What are alternative plans?  
What are the expected outcomes? | Approach |
The Specific Aims page is the most important part of your proposal...

Describes concisely the goals, objectives & outcomes of the proposed studies

Is a useful summary for obtaining early feedback on your proposal (reality check!)

Is the hardest part of the proposal to write

You must devote time to draft & polish the Specific Aims!

Elements of a Specific Aims page*

State concisely the goals of the proposed research & summarize the expected outcomes, including impact on the field.

List succinctly the specific objectives of the research:
• test a hypothesis
• create a novel design
• solve a specific problem
• challenge an existing paradigm or clinical practice
• address a critical barrier to progress in the field
• develop new technology.

*Instructions for NIH research project grants (RPGs)

A good format for a Specific Aims Page is a sandwich

First paragraph
• topic, goals, objectives, hypothesis, rationale

Specific Aims
• objectives, description

Last paragraph
• impact, outcomes
Using the Template for a Specific Aims Page . . .

The Template lists the essential elements of a Specific Aims page:
- complete each element as a sentence
- combine the sentences into a narrative
- polish
- review
- polish again
- ask for feedback
- polish again

The first paragraph provides the rationale for the proposed studies

What is the Topic?
What is the Gap in knowledge?
What is the long-term Goal of your research?
What are the specific Objectives for the proposal?
What is the Hypothesis?
What is the Evidence for the hypothesis?
What is the Rationale / Significance?

You have a half page or less (~300 words) to set the stage for the proposal & excite the reviewer!

Start the Specific Aims with a concise, active statement introducing the topic of the proposal

Diabetes is a major health concern in the United States.
Retroviruses are responsible for a number of important human diseases . . .
Microscopy has emerged as one of the most powerful and informative ways to analyze . . .
## Writing Effective Specific Aims

Robert J. Milner, PhD • Joan M. Lakoski, PhD

### Next describe the gap in knowledge or unmet need that your proposal will address

But the incidence of diabetes continues to rise . . .

Management of parasitic diseases depends largely on chemotherapy but anti-parasitic drug treatment has multiple challenges.

However, many diseases and biological pathways can be better studied in whole animals . . .

### Describe the long-term goal of your research

Our **long-term goal** is to understand how behavioral modification can prevent the early onset of diabetes.

The **goal** of our research is to determine the mechanism of . . .

The overall **goal** of our laboratory is to define the role of . . .

### Describe the specific objectives of your project

This **proposal** will focus on testing behavioral interventions in adolescence.

We propose a research plan to elucidate the genetic mechanisms of control of XYZ production . . .

We propose to develop algorithms for the analysis of high-throughput images . . .
**Define the hypothesis underlying your proposal**

On-line approaches, particularly involving social media, are well-accepted by adolescents. Therefore, our hypothesis is that these approaches will be most effective in this population.

Both of these responses are unique to XYZ and its interaction with the ABC receptor, and we hypothesize that they are essential for the pathogenesis of . . .

**Describe the evidence for the hypothesis**

On-line behavioral interventions have been used successfully in adult diabetic populations and our preliminary studies demonstrate that this approach can be successfully translated to adolescents.

In our current funding period we have characterized the interaction between XYZ and the ABC receptor, supporting our hypothesis.

**Describe the rationale for the proposal**

We will conduct a comprehensive assessment of the effectiveness of these approaches . . .

We therefore will complement this approach with a broader effort using both in vitro and in vivo models.
Each specific aim has a short descriptive title & brief description

Aim 1. To determine the pathogenesis of the disease in vivo. Based on our hypothesis, we predict that disruption of the interaction between XYZ and the ABC receptor will increase resistance to the disease.
a). Assess disease pathogenesis in mice with mutations in XYZ or the ABC receptor.
b). Assess disease resistance in mice treated with siRNA directed toward XYZ or the ABC receptor.

The last paragraph focuses on innovation, impact and outcomes

Innovation:
To our knowledge, this proposal is the first attempt to use on-line approaches for behavioral intervention in diabetic adolescents.
This proposal applies two state-of-the-art techniques to understanding the pathogenesis of . . .

The last paragraph focuses on innovation, impact and outcomes

Outcomes & Impact:
The experiments described in this proposal will provide a complete description of the mechanism . . .
Understanding the pathogenesis of this disease will lead to new therapeutic approaches.
## Writing Effective Specific Aims

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### For a career development proposal include a statement about training potential

**Training Potential:**
The research and complementary training plan described in this proposal will enable the candidate to acquire the skills and knowledge to become a productive, independent investigator in . . .

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### Next steps . . .

*Put the elements into a coherent & logical narrative, polish, and get feedback.*

**Checkpoint**

- My Specific Aims can test my hypothesis.
- They are doable within the grant period I am requesting.
- The aims are concrete and well-focused.
- I can define endpoints my peer reviewers will be able to assess.

*NIAID Grants Tutorials:*