Grant Writing 101

Emerging Biomedical Professionals

Georgia Cancer Center

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GEORGIA CANCER CENTER
AUGUSTA UNIVERSITY

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Disclosure

Principal owner:

Scientific Editing

by

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Specializing in the Biomedical Sciences

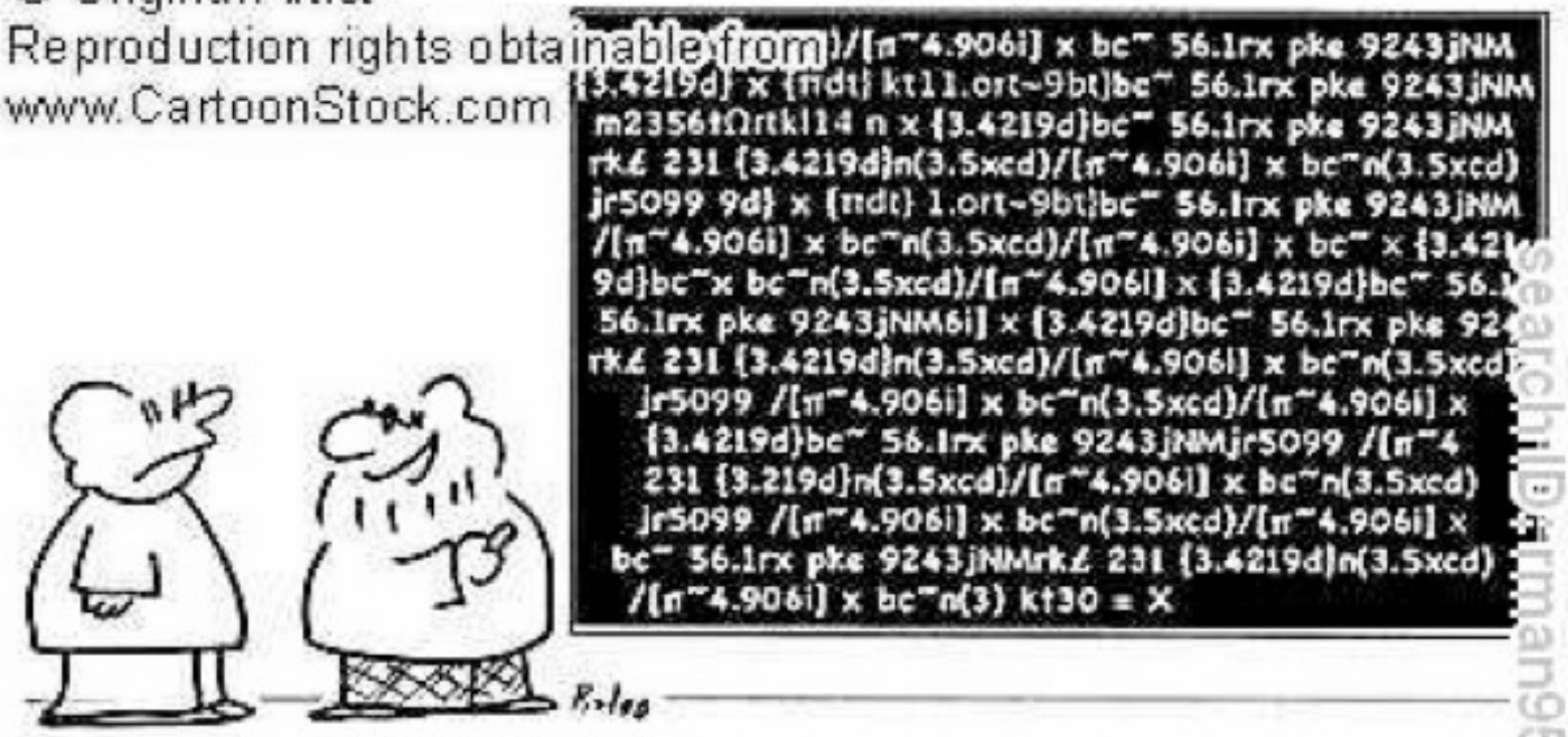
&

Services to Non-Native Speakers of English

Topics

- Before you start to write…..
- Resources, Updates, & Types of NIH Grants
- Critique Criteria
- **Anatomy of the Grant**
- **Biosketch**
- How to Keep the Reviewer Happy
- Tips, Common Mistakes, Finishing Up

From the perspective of the Researcher



"It's a foolproof formula for writing grant applications."

Very handy reference

The Grant Application Writer's Workbook

NIH version, Dec. 2021: includes changes required after Jan. 25, 2022.

John D. Robertson, Stephen W. Russell & David C. Morrison

Grant Writers' Seminars and Workshops, LLC

http://www.grantcentral.com

$90

Web Sites & Tutorials

- How to write your grant
  https://grants.nih.gov/grants/how-to-apply-application-guide/format-and-write/write-your-application.htm
- Sample applications & summary statements
  https://www.niaid.nih.gov/grants-contracts/sample-applications
- NIAID has tutorials on its web site
  https://www.niaid.nih.gov/grants-contracts/prepare-your-application
- Collection of videos about Peer Review:
  https://public.csr.nih.gov/NewsAndPolicy/PeerReviewVideos
- Ohio State University Center for Clinical & Translational Science: https://www.youtube.com/watch?v=pc8NcUsqoUM

Mock Study Sections

- From the 2021 NIH Virtual Regional Seminar Series:

  https://www.youtube.com/watch?v=gEQh49zyv4E
- From the 2020 NIH Virtual Regional Seminar Series:
- https://www.youtube.com/watch?v=Vx6qO8z9swQ

Be Aware of Changes!!

In 2010, NIH began to make major changes in the grant application forms and the process, and the train hasn't stopped yet!

You must stay aware of these changes!!

How to Learn about Changes

- Updates from Geno Clark, our Cancer Center Grants Specialist
- Updates from Division of Sponsored Programs Administration (DSPA)
- E-mail updates from your program officer/NIH (if you are already funded).
- NIH Grants Guide (next slide)
- Other resources

NIH Grants Guide

RESEARCH INSTRUCTIONS FOR NIH AND OTHER PHS AGENCIES

SF424 (R&R) APPLICATION PACKAGES

Forms G version

Latest changes were made as of Jan. 25, 2022

Bookmark it!!!

https://grants.nih.gov/grants/how-to-apply-application-guide/forms-g/general-forms-g.pdf

Weekly NIH Funding Opportunities & Notices

Weekly e-mail that comes out on Friday afternoons

http://grants.nih.gov/grants/guide/WeeklyIndex.cfm

- Grant Notices
- Requests for Applications
- Program Announcements

To subscribe:
https://grants.nih.gov/grants/guide/listserv.htm

Resources: Extramural Nexus

Sign up for Office of Extramural Research (OER) Extramural Nexus:

https://nexus.od.nih.gov/all/

Provides regular updates on NIH grants policies and activities: bulletins, back-issues, and a blog (Open Mike) by the Deputy Director for Extramural Research

Monthly e-mails or RSS feeds

NIH Regional Seminars
on Program Funding & Grants Administration

NIH Regional Seminars

- 2021 was virtual, November 1-4, 2021, and **FREE**
- **You can access all presentations at:** https://grants.nih.gov/virtual-seminar-2021/presentations.html
- **Plans are not yet available for the 2022 seminar, but it appears that it will be virtual again.**
- **Questions:** Send to NIHRegionalSeminars@nih.gov
- Join the listserv at: https://public.govdelivery.com/accounts/USNIHOER/subscriber/new?qsp=USNIHOER_2

Two aspects to the grant:

- The science (writing the text)
- Everything else
  - The administrative pages
  - The actual submission

Forms G: now in use

- Since Jan 25, 2022, all applications are required to use Forms G forms.
- Be sure that you are using the correct Forms and Guide (includes Biosketch).
  - Grant can be rejected outright if incorrect forms are used, including (especially) incorrect Biosketch form.

REMEMBER:

- Write the text as a Word doc
- Submit text to your grants officer as either a Word doc or as a PDF (depending on your institution)
  - Header/footer are put in automatically

The investigator does not submit the grant to NIH. This is done by your Grants Office.

To get ready:

- Get your eRA Commons user name.
  - All PIs and Senior/Key Personnel on grants
  - Post-docs also need eRA Commons user name so NIH can track career outcomes (NIH Reform Act of 2006)
  - Get your eRA Commons user name from DSPA (ask Geno Clark).

ORCID iD:

Open Researcher & Contributor ID

- Register at: https://orcid.org/register
- ORCID is a not-for-profit organization, providing digital unique identifiers (ORCID iD) for individuals world-wide to use with their name as they engage in research, scholarship, and innovation activities
- Distinguishes you from anyone else with a name the same or similar to yours
- You use it for the rest of your life, even if you've changed your name
- Linked to your eRA Commons name
- Mine: **0000-0001-6617-3383**

NIH Staff

Communicate with NIH staff throughout the application, revision, and award process!

It is their job to help you!!!

They are your Advocate!

Application life cycle – who can help you:

NCI Program Officer,
Office of Sponsored Research

NCI Program Officer

NCI Program Officer

Grants Management Officer / Specialist

Institution

Could take 8+ months

Scientific Review Officers

Referral Officer → CSR Study Section, Review Officer
Institute → Program Officer

From: NCI webinar: https://www.cancer.gov/about-nci/organization/dcb/funding/resources#getting-a-grant-from-the-nci-webinar

NIH Abbreviations (selected)

https://grants.nih.gov/grants/glossary.htm

- ESI: Early Stage Investigator
- FOA: Funding Opportunity Announcement
- IC: Institute/Centers
- NoA: Notice of Award
- NOSI: Notice of Special Interest
- PA/PAR: Program Announcement
- PD/PI: Program Director/Principal Investigator
- RFA: Request for Application
- RFP: Request for Proposals
- SRO: Scientific Review Officer

Let's start…. ♫

at the very beginning

♫….a very good place to start…. ♪

Maria, Do Re Mi, Sound of Music

What is your purpose in writing this grant ?

To convince the reviewer that you are:

- doing great science
- that you can solve these important problems and….

They should give you the

$$$$$

to do the work!

Things to Keep in Mind Before You Start Writing

What is the Mission Statement of the funding agency?

- Write “to” that Mission Statement!
- Refer to that mission in Aims or Significance.

Mission Statements

NIH's mission is to seek fundamental knowledge about the **nature and behavior of living systems** and the application of that knowledge to **enhance health, lengthen life, and reduce illness and disability**.

Mission Statements

NCI: The National Cancer Institute coordinates the National Cancer Program, which conducts and supports research, training, health information dissemination, and other programs with respect to the **cause, diagnosis, prevention, and treatment of cancer, rehabilitation** from cancer, and the **continuing care** of cancer patients and the families of cancer patients.

Mission Statements: Specialized

Alex's Lemonade Stand Foundation:

- To raise money and awareness of **childhood cancer** causes, primarily research into new treatments and cures.
- To encourage and empower others, especially children, to get involved and make a difference for children with cancer.

The Leukemia & Lymphoma Society (LLS):

- Cure **leukemia, lymphoma, Hodgkin's disease and myeloma**, and improve the quality of life of patients and their families.

Do NOT:

Submit a grant to an agency without knowing what it wants to fund.

Just because an agency has a specific disease name in the title, and that is "your disease," it does not mean they are automatically interested in your grant. If their mission is to develop new therapeutics for the disease, they may not be interested in your "quality of life" grant.

Things to Keep in Mind Before You Start Writing

Who is reading (and scoring) your grant?

You need to "convince":

- the entire Review Panel AND
- the Funding Panel (but mostly the Review Panel)

What kind of grant are you going to apply for?

- Research Grants (R series)
- Career Development Awards (K series)
- Research Training & Fellowships (T & F series)
- Program Project/Center Grants (P series)

What kind of grant are you going to apply for?

- **Know the instructions for the different types of grants**
  - They require you to write a bit differently!
  - They are scored a bit differently!

Research Grants

R01: Research Project Grant Program

- Supports a discrete, specified research project
- NIH's most commonly used grant program
- Usually for 3 to 5 years

R21: Exploratory/Developmental Research Grant Award

- Encourages new, exploratory, and developmental research projects; sometimes used for pilot studies
- Limited to up to 2 years of funding
- Preliminary data is not required
  - But it is desired!!!!
  - Do not confuse “not required” with “not desired!”
- Shorter grant application (6 page limit, not 12 pages)
- Myth: easier to get than an R01: **NOT TRUE!!**
- Myth: less competitive than an R01: **NOT TRUE!!**

NIH Criteria for Reviewing Grants

- ✓**Significance**
- ✓**Innovation**
- ✓**Investigators**
- ✓**Approach**
- ✓**Environment**

Scoring

- Each criteria is scored on a 9-point scale
  - 1 (best) to 9 (worst)
- Then, Reviewer gives an Overall Impact Score.
  - Overall evaluation
  - Not an average of criteria scores

Overall Impact

The likelihood for your project to exert a powerful influence on the field.

Scoring for Impact

- Application does not need to be strong in all categories to be given a high impact score.
- Reviewers consider the criteria scores plus other factors (e.g., criteria specific to the funding announcement, use of animals or human subjects, etc).

Example

- Overall impact: “Could be high, given that this is a fundamental study……. **but** lacks an explanation of……”

Final scores

After the meeting:

- Individual impact scores are averaged
- Multiplied by 10
- Final score: 10 - 90

Final Assessment

Strength	Score	Descriptor
High	1	Exceptional
High	2	Outstanding
High	3	Excellent
Medium	4	Very Good
Medium	5	Good
Medium	6	Satisfactory
Low	7	Fair
Low	8	Marginal
Low	9	Poor

NIH Criteria for Reviewing Grants

- ✓**Significance**
- ✓**Innovation**
- ✓**Investigators**
- ✓**Approach**
- ✓**Environment**

Significance

- You will have a special section of the grant entitled: **Significance**.
- Use statements like: *This research is significant because……*

Significance

- Does study address an important problem?
- Describe the Rigor of the Prior Research
  - We will discuss this further.
- How will scientific knowledge or clinical practice be advanced?
- Effect of studies on concepts, methods, technologies, treatments, services or preventative interventions.

Rigor of the Prior Research

- Describe the strengths and weaknesses in the rigor of the prior research (both published and unpublished) that serves as the key support for the proposed project (NOT-OD-18-228)
- In Approach:
  - Describe plans to address weaknesses in the rigor of the prior research that serves as the key support for the proposed project.

Rigor of the Prior Research

- During scoring:
  - Reviewers will score the Rigor under the Significance and Approach criteria.

Innovation

- Is project original & innovative?
  - Challenge existing paradigms or clinical practice?
  - Address an innovative hypothesis or barrier to progress in the field?
- Does project develop or use novel concepts, approaches, methodologies, tools, or technologies?

Innovation

Use this sentence somewhere in this section (in italics):

The proposed research is innovative, in our opinion, because……

(hit them over the head!!)

What is the difference….

between Significance and Innovation?

Significance vs Innovation

Significance: the effect one thing is likely to have on other things.

Innovation: a new and substantially different way of addressing something that results in positive change.

BOTH of these are very important to explain in your grant!!

Investigators

- Are investigators appropriately trained?
- Is work appropriate to the experience level of all the researchers?
- If the team has Early Stage or New Investigators, do they have appropriate training/expertise?
- Does team bring complementary and integrated expertise to the project?

Early Stage Investigator

- Designed to encourage early transition to independence.
- Are you within 10 years of completing your terminal research degree or medical residency?
- Update your eRA Commons profile before submitting your grant.
- http://grants.nih.gov/grants/new_investigators/index.htm#earlystage

Early Stage Investigator

Why?????

Reviewers are instructed to focus more on the research portion of your application and less on your track record!

Approach

- Are conceptual or clinical framework, design, methods, and analyses adequately developed, well integrated, well reasoned, and appropriate to the aims?
- Does applicant acknowledge potential problem areas and consider alternative tactics?

Approach

- If project is in early stages of development, is it feasible and will risky aspects be managed?
- For clinical research, are human subjects protected from research risks, are minorities/both genders and individuals across the lifespan included, and are the risks justified in terms of scientific goals?

Environment

- Does scientific environment contribute to probability of success?
- Do proposed studies benefit from unique features of the scientific environment, subject populations, or collaborative arrangements?
- Is there evidence of institutional support?

Check your Grant…

- Have you fulfilled all these criteria?
- Be sure you can answer all the previous questions!

Now…..

Let's return to the writing of your grant.

A Successful Application….

Has 2 core elements:

- Important Scientific Topic
  - Significant, novel, innovative science and question being studied
- Good Grantsmanship
  - How the science is communicated

Four Words to Remember

- ✓**Logic**
- ✓**Clarity**
- ✓**Brevity**
- ✓**Reviewer**

But first…..

Have a good idea

What makes an idea a GOOD IDEA?

- Your idea should be novel and compelling.
- It must drive your field vertically.
  - Not just confirm what others have done.
  - Not just extend work (horizontally) that others have done.

Developing your idea

1. Define the niche area you want to develop.
2. Collect & analyze background information that pertains to this area.
3. Generate a preliminary idea that is pertinent to the problem.

Developing your idea

4. Assess the idea's potential for success.
   a) Your ability to pursue the idea.
   b) Your competition.
   c) The funding potential.
5. Seek constructive criticism from colleagues.
6. Refine your idea.

Now:

Grantsmanship…….

the communication!

Writing a grant is different from writing a manuscript!!!

Anatomy of a Grant (1)

- Cover Letter (not a required part)
- Title
- Project Summary/Abstract
- Project Narrative
- ~~Introduction: resubmissions/revisions (1 page)~~
- Specific Aims (1 page)
- Research Strategy (12 or 6 pages)
- Literature Cited
- Biosketches

Anatomy of a Grant (2)

- Facilities & Other Resources
- Equipment
- Budget & Justification
- Human Subjects & Clinical Trials Information
- Vertebrate Animals
- Authentication of Key Biological/Chemical Resources
- Letters of Support
- Multiple PI Plan (if needed)
- Resource Sharing Plan & Data Sharing Plan
- Assignment Request Form
- Appendix

Page Limits for Research Strategy

- Does NOT include Aims page:

  R01, R10, R15, R18, R21/33, R24, R33, R34, DP3, G08, G11, G13, SC1 X01: 12 pages

  R03, R13, R21, R36,SC2, SC3: 6 pages

  Career Development (K) awards: 12 pages

Research Strategy

- 12 pages for an R01
  - Significance
  - Innovation
  - Approach:
    - Preliminary studies (some)/progress report
    - Strategy (experiments)
    - Methodology
    - Analyses
    - Problems/pitfalls

Title

The title is the very

first impression

of your grant that anyone

(the reviewer)

sees!

Title

- 200 characters.
- Emphasize the product of the research ("the payoff").
- Convey novelty of the research.
- You may use standard abbreviations or acronyms, but not ones that require a definition!!!

How to Write Your Title

- Figure out your key words.
  - From Significance section.
  - From words you have bold-faced.
- Make up several titles from your key words.
- Let them sit and think about them.
- Ask others who read your grant (editor, colleagues).
- By the time you finish writing the grant, you will know which title to choose.

Project Summary/Abstract

Will be read by:

- Every reviewer on the panel.
- The people who assign your grant to the review panel and reviewers.
- Administrators who catalog your grant for content.
- And anyone who accesses RePORT!

Project Summary/Abstract

- It is an Executive Summary of your proposal!
- Must fit into space provided (30 lines maximum).
  - Use 11 point, Arial, with 0.5 inch margins.
- Make every word count.
- Should be a brief version of your Specific Aims.
  - Yes, you can use some of the same words and phrases from your Aims. In fact, you should!
- Use plain language.

Project Summary/Abstract

- Should summarize:
  - Overall problem.
  - Where your proposal fits in.
  - Hypotheses & Specific Aims.
  - Conclude with statement of significance.
- For NIH, must include **relevance to public health.**
  - 2-3 sentences.

Project Summary/Abstract

- Do not include any proprietary or confidential information!!!
- Write Abstract last, especially after you have written your Specific Aims
  - But don't do it at the last minute.
  - Or if you write it early, fine-tune it at the end.
- Use **bold** to emphasize key words.

Project Summary/Abstract

- Must be able to stand alone.
  - No abbreviations.
  - No jargon.
  - No references.
- Some grants require a “lay” abstract.
  - How would you explain the work to your mother or father?

Project Narrative

- 2-3 sentences.
  - Our grants office will return it to the PI if it is more than 3 sentences.
- Plain language
- Should reflect
  - **the relevance of the proposed work to public health**
  - **how the research relates to the mission of NIH.**
- This goes into the RePORTER database, along with the Project Summary.

RePORT

Research Portfolio Online Reporting Tool

A database of EVERYTHING NIH funds!

- What is NIH funding in my research area?
- What are the results?
- What institutes/centers have priorities that align with my research ideas?
- How can I find collaborators? Contacts?
- Matchmaker & RePORTER tools
- https://RePORT.nih.gov

Youtube: https://www.youtube.com/watch?v=azTrSIrEYUM

Specific Aims

the

MOST IMPORTANT PAGE

of the grant

Specific Aims

- It is a **Road Map** for the grant.
- Concisely state the goals of the proposed research.
  - Specific objectives.
- Summarize expected outcomes.
- Impact of the results on the research field.
- One page only.

Specific Aims: 1st Paragraph

- Opening sentence:
  - Interest grabbing.
  - Establish relevance to human health.
- First paragraph should identify the gap in knowledge or unmet need that your work is addressing.
  - Identify this gap as a problem.
    - *"What is not known is….."*

Specific Aims: 2nd Paragraph

- State:
  - The objective of this application.
    - "Our *overall objective* in this application is to……"
  - Central hypothesis and rationale.
    - "Our *central hypothesis* is…."
    - "The *rationale* that underlies the proposed research is…"
  - Conclude with why you and your colleagues/environment are the best group to do this research!

Specific Aims Paragraph (3rd):

- Lead-in sentence.
  - "To achieve these goals, we propose:"
    - 1. To determine…..
    - 2. To characterize…..
    - 3. To ……
- Limit: 3 specific aims.
- **Boldface**, *italicize*, or <u>underline</u> important words or phrases.

Specific Aims Paragraph (3rd):

- Show action:
  - To determine….
  - To characterize…..
  - To test the hypothesis that…..
- Use parallel construction.

Specific Aims: Final Payoff Paragraph

- Why the work is innovative.
  - "The proposed research is *innovative* because.."
- What is the expected outcome of the research.
  - "Our *expected outcomes* are…"
- What is the impact of the expected outcome.
  - "These outcomes are expected to have an important *impact* on the field because….."
  - This research addresses a *key research priority* of NCI, namely…..

Specific Aims: Final Payoff Paragraph

- May want to include a diagram (optional).
  - Overall goal and where your aims fit in.
  - Boxes and arrows.
  - OR: this kind of diagram could also be put in the beginning of your Research Strategy.

A. Specific Aims

Diabetic retinopathy (DR) is characterized by vascular and neuronal abnormalities that are associated with oxidative stress and retinal inflammation. Inflammation occurs via Ras/Raf/MEK/MAPK signaling in immune cells, in which anti-inflammation occurs via cyclic AMP (cAMP) signaling induced by locally released adenosine (**Figure 1**). The anti-inflammatory A_{2A} adenosine receptor (A_{2A}AR)-cAMP signaling has been implicated in many chronic diseases; however, the contribution of specific adenosine receptors to key immunoregulatory processes in DR is unclear. Moreover, the anti-inflammatory A_{2A}AR-cAMP signaling is inefficient *in vivo* due to rapid adenosine reuptake and turnover via equilibrative nucleoside transporters (ENTs). Our goal is to understand the mechanisms of DR-associated inflammation and anti-inflammation in an effort to intervening inflammation and enhancing anti-inflammation. Studies show that activation of A_{2A}AR protects against diabetic nephropathy, suggesting that limitations in adenosine availability may contribute to diabetes complications. **Our preliminary studies show that in diabetes, activated MAPK is exclusively localized in retinal microglia, suggesting a crucial role for microglia.** Our studies also show that an isoform of Raf, B-Raf, is not expressed in the retinal microglial cells (RMC). Activation of Ras/C-Raf (Raf-1)/MEK/MAPK signaling leads to pro-inflammatory cytokine release. However, activation of A_{2A}AR-cAMP signaling in RMC leads to C-Raf inactivation and cytokine release inhibition. Moreover, ablation of A_{2A}AR leads to extensive vascular inflammation and inner retinal cell death in diabetic retina. Further, cannabidiol (CBD), a putative adenosine reuptake inhibitor that is neuroprotective in experimental diabetes, enhances adenosine-mediated inhibition of tumor necrosis factor (TNF)-α release, which is blocked by an inhibitor of cAMP-activated protein kinase (PKA). These results suggest that a mechanism of anti-inflammation **involving crosstalk between Ras/C-Raf/MEK/MAPK and A_{2A}AR-cAMP signaling** is operative in diabetic retina, and that adenosine reuptake inhibitors enhance this mechanism.

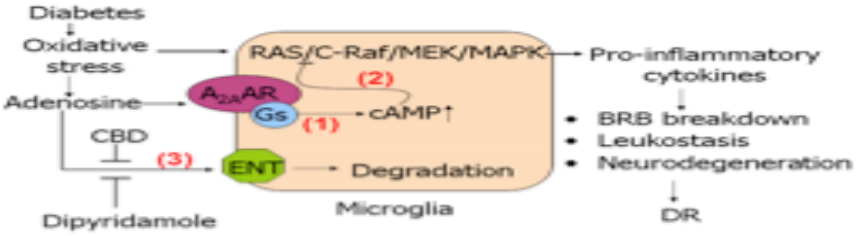


Figure 1. The hypothesized inflammation and anti-inflammation mechanisms in diabetic retina. Diabetes-induced oxidative stress causes release of pro-inflammatory cytokines via activation of Ras/C-Raf/MEK/MAPK, leading to DR. In the microglia, locally released adenosine initiates anti-inflammation via a crosstalk between A_{2A}AR-Gs-cAMP and MAPK signaling. This crosstalk is terminated due to adenosine reuptake by ENT and subsequent metabolism. CBD or Dipyridamole inhibits adenosine reuptake via inhibiting ENT, thereby activating A_{2A}AR-Gs-cAMP signaling. **(1):** Aim 1; **(2):** Aim 2; **(3):** Aim 3.

We hypothesize that the A_{2A}AR-cAMP signaling is anti-inflammatory through crosstalk with the Ras/C-Raf/MEK/MAPK signaling evoked by oxidative stress in diabetic retina. We further hypothesize that compounds that enhance the A_{2A}AR-cAMP-mediated anti-inflammation by preserving adenosine will be of therapeutic utility in DR. We propose to test these hypotheses by the following Specific Aims:

1. To test the hypothesis that anti-inflammation occurs via A_{2A}AR-cAMP signaling.

A) RMC will be co-treated with 8-pCPT-cAMP or CGS21680, an A_{2A}AR-selective agonist, and Advanced Glycation End-products (AGE) or high glucose in the presence or absence of PKI 14–22, a PKA inhibitor. Treatment effects on the release of inflammatory cytokines will be compared. Our hypothesis predicts that 8-pCPT-cAMP or CGS21680 dose-dependently inhibits AGE- or high glucose-induced cytokine release, and PKI 14-22 dose-dependently reverses the inhibitory effect of CGS21680. **B)** Wild-type or A_{2A}AR-/- mice with or without diabetes will be compared for retinal cytokine release, vascular permeability, leukostasis, and retinal cell death. Our hypothesis predicts that DR-associated retinal complications in the wild-type mice are more severe in the A_{2A}AR-/- mice.

2. To test the hypothesis that a crosstalk between cAMP and MAPK signaling results in the inhibition of inflammation in retinal microglial cells in diabetes.

A) RMC will be co-treated with AGE or high glucose and with 8-pCPT-cAMP or CGS21680. Treatment effects on C-Raf activity and on TNF-α release will be compared. Our hypothesis predicts that AGE or glucose treatment increases MEK phosphorylation and TNF-α release. Co-treatment with 8-pCPT-cAMP or CGS21680 dose-dependently reverses these effects. **B)** RMC transfected with B-Raf, co-treated with AGE or high glucose

Specific Aims
Some Do Nots:

- Do Not: Include detailed methods in your aims!
- Do Not: Include citations (references).
- Do Not: Use abbreviations or jargon.
- Do Not: Have one aim dependent on another.
  - What if the first aim doesn't work???

Specific Aims
More Do Nots:

- Do not use words such as:
  - We hope to……
  - We believe that…..
  - We plan to observe….

Research Strategy

Three subsections

1. Significance (may include ”rigor of prior research”)
2. Innovation
3. Approach
   - Preliminary data, relating to technical aspects
   - Experiments themselves

Significance: the Problem

- Explain importance of the problem or the critical barrier to progress in the field.
- Describe (maybe) the rigor of prior research (strengths & weaknesses) of the project (next slide).
- Explain how the proposed project will improve scientific knowledge, technical capability, or clinical practice.
- Describe how the concepts, methods, technologies, etc. that drive the field will be changed if the proposed aims are achieved.

Rigor of Prior Research

- Describe the strengths and weaknesses in the rigor of the prior research (both published and unpublished) that serves as the key support for the proposed project.
  - NOT-OD-18-228
- Review criteria ask: “is the prior research that serves as the key support for the proposed project rigorous?”
- https://grants.nih.gov/policy/reproducibility/index.htm

Strengths & Weaknesses??

- Cite peer-reviewed articles (not reviews).
- Replicable data, authenticated reagents.
- Appropriate statistics.
- If your proposal refutes work of others, point out the weaknesses of previous work.

Alternative for “Rigor” Section

- Can do a “Rigor” section for **each aim** in the Experimental Design section, rather than in Significance.
  - Helps to support the Rationale.
- Seems to flow better than having it in Significance, **but criteria for ”rigor” is included in Significance.**

Innovation

- Explain how your solution (approach) will shift current research or clinical practice paradigms.
- Describe novel concepts, approaches, methodologies, instrumentation, or interventions and their advantage over what currently exists.
- **What is new and different about your solution?**
- This work is innovative because……

Approach

- Describe overall strategy, methodology, and analyses to be used to accomplish the Aims.
- Discuss potential problems, alternative strategies, and benchmarks for success.
- If project is in early stages of development, describe strategy to establish feasibility & address high-risk aspects of proposed work.
- Point out hazardous procedures/materials.

Approach
(from NOT-OD-16-011)

- Describe the experimental design and methods proposed and how they will achieve robust and unbiased results.
- Explain how relevant biological variables, such as sex and age, are factored into research designs and analyses for studies in vertebrate animals and humans….(e.g., strong justification from literature or data if you propose to use only one sex).

Preliminary Data

- Can go into Significance section, with Rigors of Prior Research.
- Can go into Approach, as Rationale for each Aim. **Makes more sense to have it here!!**
- Preliminary data relating to techniques goes into the Experimental Design, usually at the beginning of each aim.
- Helps to establish the likelihood of success of the proposal. **"I can do it!"**

Preliminary Data

Remember:

Reviewers are instructed to place less emphasis on preliminary data in applications from Early Stage Investigators.

Preliminary Data

- Say why you did the experiment.
  - *"In order to determine the mechanism, we did ….."*
- End with conclusion of the experiment: **boldface**, *italics*, ***both.***
  - *"These data are important because…"*
- Include figures/tables.
  - If from a manuscript, modify the legend.
  - **Have figure near the text that discusses it.**

Preliminary Data

- Can refer to published papers.
  - ……..(for details, see ref 32).
- You can not include manuscripts in the Appendix !
  - If you do, your grant can be rejected outright.

Common Problems with Preliminary Data

- Failure to lead the reviewers through the data.
- Do not explain what it has to do with the proposed experiments.
- Not enough preliminary data to support the proposed work.

Approach: Experimental Section

Organization

of this section is critical.

Hierarchical Formatting

Example:

Section Heading

Subsection heading

Sub-subheadings

Experimental Section

- Restate each Specific Aim exactly as it appears on the Aims page (but without the sub-aims).
- List each experiment by number and give it a title (and underline or *italicize* it).
  - Expt. 1. Does silencing "*XYZ*" in glioblastoma cells limit their proliferation?
- Can subdivide each experiment into:
  - Experimental Design
  - Detailed Methods
    - But indicate that there is a separate Detailed Methods section at the end.
    - Only do this if methods are complicated.

Numbering: Reduce Confusion

- Aim 1
  - Experiment 1
  - Experiment 2
  - Experiment 3
- Aim 2
  - Experiment 4
  - Experiment 5

Not these:

Aim 1

- Experiment 1
- Experiment 2
- Experiment 3

Aim 2

- Experiment 1
- Experiment 2

Aim 1

- Experiment 1.1
- Experiment 1.2
- Experiment 1.3

Aim 2

- Experiment 2.1
- Experiment 2.2

If project is in early stages of development:

- Describe strategy to establish feasibility
- Address high risk aspects (if any) of the work

For every experiment, you need to answer these questions:

1. **What** will you do?
2. **How** will you do it?
3. What **results** do you expect and why are they important?
4. What are your **benchmarks** for success?
5. What can go **wrong**?
6. What are your **alternative strategies** if something does go wrong?

Subdivide each experiment into:

- Rationale.
  - Why you are doing the experiment.
  - Why you are doing it **this way**.
- Hypothesis.
  - "In this experiment we will test the *working hypothesis* that…."
- Preliminary Data
  - Organized and succinct.
  - Present actual data, not a summary.

Subdivide each experiment into:

- Experimental approach. Include:
  - Controls & numbers of subjects.
  - How data will be analyzed (e.g., statistical methods).
- Anticipated results and interpretation.
  - In detail!
- Potential problems, pitfalls, and solutions.
  - If you do not anticipate problems, say so, and say why.
  - Do not leave out this section!

These last two sections may be done for the entire aim, rather than each experiment.

Experimental Section

- Experiments should be ordered from low risk to high risk.
  - Indicate the high-risk ones and give an explanation.
- Your methods should be sufficiently detailed so the reviewer knows what you are doing, but don't include every minor detail. Should not read like a cookbook.
  - Exception: if you are using a novel method or developing new techniques.
- Be succinct.

Future Tense

Write in the

Future Tense!

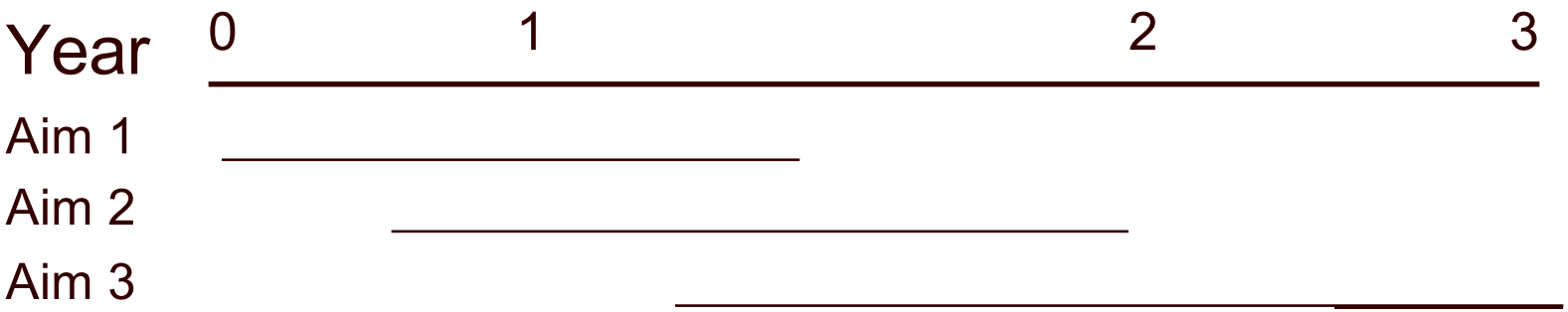
I often see methods written in the past tense because they are "cut and pasted" from a manuscript. Remember you are describing experiments that you WILL do when you get the grant!

Experimental Section

- End with Future Directions paragraph.
  - Summarize where you expect to be at the conclusion of the funding period.
  - What you will do next….
  - What is your VISION?

Experimental Section

- Include a time frame:
  - "We anticipate accomplishing all of Aim 1 during the first year…."
  - Can be done as a diagram/time line.



Figures/Tables

- Put figures/tables into text boxes.
- Wrap text around figures/tables.
- Keep figures/tables close to the text discussing them.
  - Never place a figure/table in the text before it is discussed.
- Keep figures/tables uncomplicated.

Figures/Tables

- Legend can be in smaller font (9 or 8), but be sure the reviewer can read it!
- Separate legend from the text (indent).
- Put a box around the figure.
- Include routine methodology in figure legends, not in the text (saves space).
- If you are short on space, can put all information in the text and not have a legend except for the figure number & title.

Use of Color in Figures

- Your colors will come through with the electronic submission process.
- However, reviewers may print your grant in black-and-white, so…..
- Use colors that have grayscale differences.

Example of a Figure

formed by Id1-knockdown Hepa1-6 and HepG2 cells compared to control cells (Fig 2C-F). These results suggest that the proliferative capacity of HCC cells is impaired in the absence of Id1.

Id1 knockdown suppresses *in vivo* xenograft tumor growth

To investigate if Id1 knockdown suppresses tumor growth *in vivo*, we performed subcutaneous xenograft assays in athymic nude mice which revealed a significant reduction in xenograft tumor growth in Id1 knockdown cells compared to control cells (Fig 3A-D). These results suggest that Id1 is required for tumor growth *in vivo*.

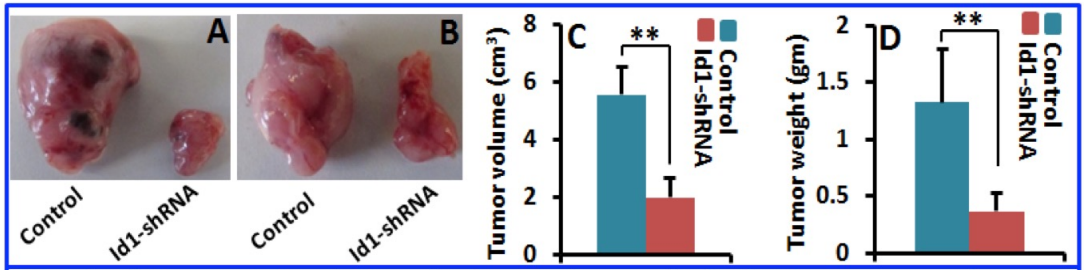


Fig 3: (A-B) Representative photographs showing the growth of subcutaneous xenograft tumors in nude mice isolated on day 15. Control or Id1-shRNA Hepa1-6 cells ($3x10^6$) were injected subcutaneously to 7 week old nude mice. **(C-D)** Bar graph showing tumor volume **(C)** and weight of tumors **(D)** on day 15 (n=5).

Id1 knockdown suppresses aerobic glycolysis

To continuously proliferate, cancer cells reprogram their metabolism and depend on high rates of glycolysis and glutaminolysis to meet the demands of energy production and biomass accumulation (13, 14). We asked if

Literature Cited

- Documentation is important!
- A reviewer will be unhappy if he/she is not cited.
  - Good idea: check who is on your review panel.
- Use a reference program (EndNote).
- Don't leave references until the last minute; add them in as you go along.
- No strict format for reference style but be consistent. AND…….

FORMAT:

Which would you rather read? This????

Considerable information about these genes had been learned prior to their cloning, due in part to the abundance of histone mRNA found in rapidly cleaving sea urchin embryos (Kedes and Gross, 1969a, 1969b; Nemer and Lindsay, 1969). These abundant 9S RNA species were identified as histone mRNAs by *in vitro* translation (Gross et al., 1973, Levy et al., 1975) and by nucleotide sequence analysis (Grunstein, et al., 1976). In addition, the histone mRNAs were shown to lack a 3' poly A tail (Grunstein and Schedl, 1976; Grunstein et al., 1976).

Or This?

Considerable information about these genes had been learned prior to their cloning, due in part to the abundance of histone mRNA found in rapidly cleaving sea urchin embryos[101,102,147]. These abundant 9S RNA species were identified as histone mRNAs by *in vitro* translation[60,116] and by nucleotide sequence analysis[67]. In addition, the histone mRNAs were shown to lack a 3' poly A tail[65,67].

More about Citations

- Be selective about the references you use.
  - Do not cite hundreds of papers!
  - Know who is on your study section, and be sure to cite them, if appropriate.
- Be sure you read each of those papers.
  - You do not want to misquote or incorrectly refer to a paper that one of your reviewers wrote!!!

Environment

- Identify facilities to be used
  - Laboratory, clinical, animal, computer, etc.
  - Include proximity and availability if appropriate
  - Special facilities for biohazards, etc.
- Explain how scientific environment contributes to probability of success.
  - Describe the quality (nutrients) of that “soil” that is nurturing you.
- Unique features of environment or subject population.

Environment

- Collaborative arrangements
  - NIH wants to see collaborators on your team.
  - To push the project beyond the traditional approach of the PI.
  - Need **Letters of Support** and the appropriate **Biosketches** explaining what key personnel will do.

Environment: for Early Stage Investigators

- Institutional investment
  - Travel, training
- Collegial support
  - Career enrichment programs
  - Organized peer groups
- Financial support
  - Protected research time

Authentication of Key Biological and/or Chemical Resources

- Is a separate pdf attachment (not part of page limit)
- Describe methods to ensure the identity and validity of key biological/chemical resources
  - Cell lines
  - Antibodies
  - Not common reagents

Authentication: Sample Wording

- Retroviral vectors used in the proposal are obtained from trusted sources routinely used by other laboratories or are purchased from XXX.
- Plasmid DNA will be sequenced in our institutional core facility before use.
- Chemicals will be purchased from reputable vendors and will be of the highest grade available.

Authentication: Sample Wording

- Cell lines will be obtained from and authenticated by commercial sources. They will be periodically tested for pathogens.
- Mouse lines will be generated in our laboratory or purchased from reliable commercial sources. We will verify the genotype of mouse lines by Southern blot and PCR on an annual basis.
- Antibodies will be obtained from at least two sources and will recognize two different epitopes to identify the antigen of interest.

Appendix

Effective January 25, 2017, most Appendix materials have been eliminated from NIH grants.

NOT-OD-16-129

The Only Allowable Appendix Materials are:

- For clinical trials:
  - Trial protocol
  - Investigator's brochure for IND (investigational new drug)
- All other applications:
  - Blank informed consent documents
  - Blank surveys, questionnaires, & data collection instruments
  - FOA-specified items

Beware:

Proposals

that contain any non-allowable Appendix Materials

will be withdrawn and not reviewed.

Ask any reviewer!

Post-Submission Materials

The only post-submission materials that are allowed are those resulting from an **unforeseen** event.

Not for correcting oversights or errors discovered after submission.

Post-Submission Materials

- Examples of allowable materials:
  - Revised budget pages (e.g., due to new funding or acquisition of equipment).
  - Biosketches and letters of support due to hiring, replacement, or loss of an investigator.
  - Adjustments resulting from natural disaster or change of institution.
  - **News of acceptance of a paper for publication.**

Cover Letter

- Optional, but is a good idea.
- Write so it is understood by a qualified layperson.
- Is seen only by NIH staff, not reviewers or review panel.
- Cover letter is NOT for requesting assignment to an institute or study section or requesting particular reviewers.
  - Use the Assignment Request Form.

Cover Letter

Things to include:

- Title of Application: Youth Enjoy Science at the Georgia Cancer Center
- Title of Funding Opportunity: NCI Youth Enjoy Science Research Education Program
- FOA Number: RFA-CA-21-020
- Explain unusual issues
  - Budgetary
  - Late submission (only specific reasons allowed)
  - If submitting a video

All the other stuff…

- Human Subjects & Clinical Trials Information
  - Inclusion of individuals across the lifespan (children & elderly)
  - Minority inclusion
  - Other at-risk populations
- Use of vertebrate animals
- Letters from collaborators & consultants

More other stuff…☹

- Budget
- Contractual agreements
- Forms

There are templates in the Robertson, Russell & Morrison book.

The other stuff…

- Do not leave these to the last minute.
  - Start 6-8 weeks before due date.
- It is time-consuming to get approvals and signatures.
- But the grant is worthless without them.

Biosketch

Fulfills the **Investigator** review criteria.

- Required for:
  - **Senior/key personnel**
  - **Other significant contributors**
- A number of changes have been made over the past couple years!

Make sure you use the new Forms G!

(approved through 09/30/2024)

OMB No. 0925-0001 and 0925-0002 (Rev. 10/2021 Approved Through 09/30/2024)

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME:

eRA COMMONS USER NAME (credential, e.g., agency login):

POSITION TITLE:

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY

Instructions and Templates for Biosketches

- Go directly to:

  https://grants.nih.gov/grants/forms/biosketch.htm

- Or search for Biosketch within the General Instructions: https://grants.nih.gov/grants/how-to-apply-application-guide/forms-g/general-forms-g.pdf

Assignment

- For the next session, I would like you all to start to work on your Biosketch. I've told you where to find the template.
- In particular, write your Personal Statement and Contributions to Science.
- Get them to me by Friday, May 20, by 5 pm, and I will look at them and we can discuss them on Tuesday, May 24.

Education Block

Includes (in this order):

- Bachelors degree
- Graduate degrees
- Post-graduate training
- Internship, residencies

Education Block

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: Hunt, Morgan Casey

eRA COMMONS USER NAME (credential, e.g., agency login): huntmc1

POSITION TITLE: Associate Professor of Psychology

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
University of California, Berkeley	BS	05/2003	Psychology
University of Vermont	PHD	05/2009	Experimental Psychology
University of California, Berkeley	Postdoctoral	08/2013	Public Health and Epidemiology

Section A: Personal Statement

- Why your experience and qualifications make you particularly well-suited for your role (e.g., PI, sub-investigator) in the project.
  - Aspects of your training
  - Previous experimental work
  - Technical expertise
  - Collaborators or scientific environment
  - Past performance in this or related fields

Section A: Personal Statement

- Can explain impediments to past productivity
  - Family care responsibilities
  - Illness
  - Disability
  - Active duty military service.
- Can identify up to 4 peer-reviewed publications that specifically highlight your experience and qualifications (for this project)

Focus on Personal

- Think carefully about how and why you got where you are
  - What excites you?
  - Did your passions bring you here?
  - Why are you in this field?
- What sets you apart from other scientists?
- Target your words to your audience

Research Support:

Research Support is now included in the Personal Statement.

- Ongoing and completed research projects relevant to this proposal from the past 3 years that you want to highlight.
- Include goals of project & your responsibilities on the project. Do not include person months or direct costs.

Note: This used to be in Section D, which has been removed except for Fellowship Biosketch and that consists only of Scholastic Performance, not Research Support.

Biosketch:

- Your Biosketch must be tailored to the specific grant you are submitting
  - Even if you are “just” a sub-investigator on someone else’s grant, you must personalize your biosketch to that grant.

Do Not Forget This!!!!!

Section B: Positions, Scientific Appointments, & Honors

- List previous employment positions.
  - In chronological order, concluding with your present position.
- Other experience & professional memberships.
  - Membership on Federal advisory committees.

Scientific Appointments is new!

- List all positions and scientific appointments both domestic and foreign. This includes titled academic, professional, or institutional appointments, whether or not remuneration is received, and whether full-time, part-time, or voluntary (including adjunct, visiting, or honorary).
- Includes affiliations with foreign entities or governments.

…..and Honors

- List in chronological order:
  - All non-degree training
  - All employment after college
  - Any military service
- Clinicians include:
  - Internship
  - Residency
  - Board certifications

Section C. Contributions to Science

- Considering your level of experience, briefly describe your most significant contributions to science.
- You may describe up to 5 contributions. It is understood that if you are junior faculty, you may have less than 5.
  - Give history behind the scientific problem
  - Central findings and influence on the field
  - Your role in the work
  - May include research papers, abstracts, book chapters, reviews, non-publication research products, such as materials, methods, models, or protocols.

Section C. Contributions to Science

- Each contribution should be no more than ½ page and can cite no more than 4 publications/materials.
- At the end, provide URL to a full list of your publications (although not required)
  - Must be a Federal Government URL, (a .gov suffix)
  - Cannot be a Google citation list
- MyBibliography: a reference tool from NCBI (National Center for Biotechnology Information)
    - Pulls in your publications directly from PubMed
    - Also allows you to enter publications manually

Section D ???

Previously, Section D was Research Support

- Ongoing Research Support
- Research Support Completed During Past Three Years

NIH changed that with Forms G!

Now, Section D is Scholastic Performance and is only to be used for applicants for pre-doctoral and post-doctoral grant applications!!!

Section D. Scholastic Performance

For Pre-doctoral applicants:

- **List by institution and year all undergrad and graduate courses, with grades.**

For Post-doctoral applicants:

- **List by institution and year all graduate scientific courses or professional courses, with grades.**

MyBibliography

- Access NCBI by going to PubMed and click on NCBI in upper left corner.
- Sign in to NCBI (upper right corner) using 3rd party log-in credentials: e.g., Google, ORCiD, eRA Commons, Login.gov, Microsoft, Facebook, and others
- Detailed instructions and videos at http://www.ncbi.nlm.nih.gov/books/NBK53595

Assignment

- For the next session, I would like you all to start to work on your Biosketch. I've told you where to find the template.
- In particular, write your Personal Statement and Contributions to Science.
- Get them to me by Friday, May 20, by 5 pm, and I will look at them and we can discuss them on Tuesday, May 24.

Fellowship & Training Grants

Session at NIH Regional Seminar, 2021:

https://www.youtube.com/watch?v=TV8AfsRgBFE

Understanding NRSA Fellowship (F) and Training (T) Grants

(NRSA: National Research Service Award)

Fellowship (F) & Training (T) Grants

Graduate & Medical Students:

- T32 Institutional Training Award
- F30 Predoctoral Fellowship, MD/PhD or other dual degree programs
- F31 Predoctoral Fellowship (Parent F31)
- F31 Diversity Fellowship Award

Postdoctoral Fellows:

- T32 Institutional Training Award
- F32 Individual Postdoctoral Fellowship

Fellowship & Training Grants

Later years of your Postdoctoral training:

- K22 Career Transition Award (some ICs)
- K99/R00 Pathway to Independence
- K12 Institutional Career Development Award

Early Research Faculty:

- K01 Mentored Research Scientist Development Award
- K08 Mentored Clinical Scientist Development Award
- K23 Mentored Patient-Oriented K Award
- K25 Mentored Quantitative K Award

F30, F31, F32 Applications

- Written in partnership with your Mentor!
- You must be one of the following:
  - US citizen
  - Non-citizen national
  - Lawfully admitted for permanent residency
- F30 Predocs are for 5 years of funding
- F32 Postdoc is for 3 years of funding

Additional Information

- F31 (Predoctoral) FOA: PA-20-246
- F32 (Postdoctoral) FOA: PA-20-242
- 9 months from grant deadline to earliest award date
- Go to FOA to see Review Criteria
- Remember that you cannot apply for T grants; the institution applies for these, and they fund a number of slots

Additional Information

- Fellowships are awarded for:
  - Training at a specific institution
  - Under guidance of a specific mentor
  - A specific area of research

Need NIH approval to change any of the above.

NCI F99/K00 Award
RFA-CA-21-059

NCI Predoctoral to Postdoctoral Fellow Transition Award

- To facilitate the transition of talented graduate students into successful cancer postdoctoral positions
- For the last 2 predoctoral years and 3-4 postdoctoral years
- Must be nominated by your institution (2-step process)
- No citizenship requirement!
- One submission date per year (November 18)
  - 2022 RFA not issued yet, probably in September
  - Preapplication due in October

The Reviewer

Who is he or she?

Someone like you, who comes home from a day at the lab, tired, maybe frustrated, would like to sit down with a nice cup of tea/coffee/glass of wine…..

Reality

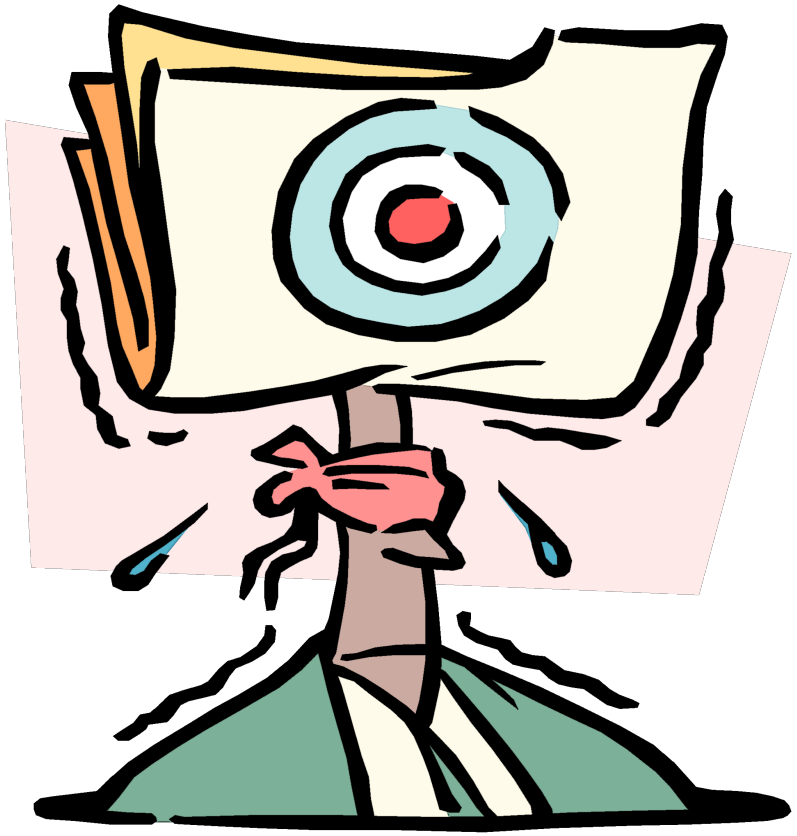
Study Section is next week.

12 grants to review

Get to work!

So…
what is your job, as the grant writer ?

Prevent Reviewer Irritation



Turn this….

Dr. Reviewer

Into this….

Dr. Reviewer

What the Reviewer does not want to see:

- Text so small you need a magnifying glass to read it.
- A page full of black text, no white space.
- Paragraphs that never end.
- Sentences that never end.
- Alphabet soup

Alphabet Soup

A page full of abbreviations, acronyms, and jargon:

DCs	CFU	GC	ER
BMDCs	ROS	WAT	MIP
KO	NAFLD	AA	ADA
Tg	GTT	ITT	PG
DAPI	NASH	TPA	MTT

Don't Randomly Make Up Abbreviations!!!

- Use standard abbreviations
- Not the shorthand abbreviations that you might use in taking your own notes
- Not abbreviations that you use on social media!!

More Ways to Annoy the Reviewer

- Figures that don't match up with the text.
- Search mission:
  - Where is that figure?
  - What does that abbreviation stand for?
- Sloppiness
  - Missspelings, inconsistent terminology.

Slopppy presentation
may mean
slopppy science.

Important Tip

As you write, always think of the **Reviewer**, the person who is reading the grant.

More Tips

- Walk the reviewers through the grant.
- Don’t assume they know the **jargon**.
- Don’t assume they know the **importance** of your work.
- Don’t assume they know the **controls** that you will use.
- Don’t assume they know that you how **smart** you are.
- Don’t make them **search** for definitions.

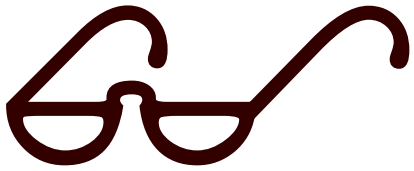
Don't assume anything!

Tell them everything!

But don't overburden them with minutia (or boring details).

Appearance

Think of the kind of page you would like to read.



NIH Rules

- Type density no more than 15 characters per inch in the final pdf file (not Word doc).
  - Character = letter, space, punctuation.
- No more than 6 lines of type per vertical inch in the final pdf file (not Word doc).
- Margins in all directions must be at least 0.5 inch.
  - Try to use slightly larger margins if you can.
- Title: 200 character limit.

NIH Rules

- Recommended fonts:

  Arial Helvetica

  Palatino Georgia

  "Others are acceptable if they meet the requirements."

  But don't do it!!!

- 11 point size is acceptable. Use 12 if you can.
- Have lots of white space.

Make the page easy to read!

Step back and look at it yourself.

When you convert to pdf:

Can change the size of the font during the conversion process.

(Especially when sending a Mac document to a PC)

NIH can (and will) reject your grant from review if you do not adhere to the font/character size.

It happened a few years ago to someone here in the Cancer Center.

Tips

- Start at least 3 months (6 months?) before the deadline.
- **Boldface** or <u>underline</u> topic sentences.
- Don’t imply. Use statements like

  “This is important because….”

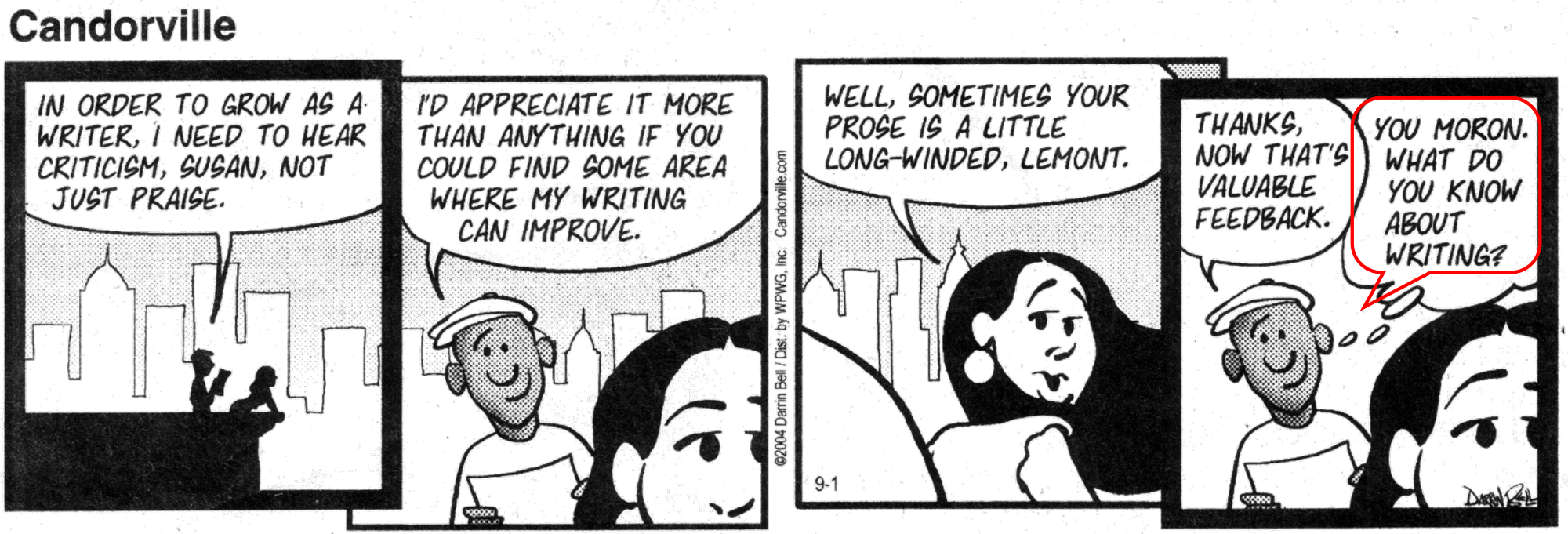
Tips

- Have colleagues critique your work.
  - Make use of your lab's group meetings.
  - Be receptive to their suggestions.

"Honest criticism is hard to take, particularly from a relative, a friend, an acquaintance, or a stranger."

Franklin P. Jones

Don’t React Like Lemont



More Extra Tips

- Keep a running list of the things you refer to and need to get.
  - Letters from collaborators.
  - Manuscripts you need to cite.
  - Data for a figure.

- Put everything into a single folder.

More Extras

- Describe intellectual atmosphere that inspires your creativity (Environment criteria).
  - Seminars.
  - Journal clubs.
  - Group meetings.
  - Departmental retreats.

Finishing Touches

- Read your grant from start to finish, in a short period of time.
- Look for inconsistencies.
  - Spelling.
  - Terminology.
  - Abbreviations.
- Are there smooth transitions?

Finishing Touches

- Check figures, figure legends, and text.
  - Be sure numbering is correct.
  - Be sure you have referred to all figures in the text.
- Are section and subsection headings correct?
- Justify text, right and left (looks nicer).
- If using **abbreviations**, be sure they are used more than 4-5 times. Otherwise, write them out.

Finishing Touches

- Reread your grant directions a week before due date.
- Know your due date!
  - RFAs have different submission dates from R01s.
  - **Some institutes have different due dates.**
- Don’t wait until the last minute to submit!!!
- Other agencies have different requirements.
- And NIH changes its rules sometimes!

How to Shorten Your Grant

Page limits cannot be violated.

- Use smaller font for figure legends, charts, tables, lists--but make sure they are still readable.
- Use 6 pt rather than 12 pt between paragraphs.
- Remove space between headings and text.
- Decrease margins if necessary (can go to 0.5 inch).

How to Shorten…

- Rearrange figures and wrap text.
- Make sure that everything you write is pertinent to this proposal.
- If you delete anything, check for new inconsistencies.
  - Did you delete an abbreviation?
  - Check figure numbers/references to figures in text.
- Check for repeated information in text and figure legends.

Any Questions

?