Introduction to NIH Grants

SAINT LOUIS UNIVERSITY

Grants Development Office

www.slu.edu/grantsdevelopment

These slides explore the trinity of forces at play in an NIH grant application:

Your idea

(4 slides) - Click here to skip to idea slides

Your audience

(8 slides) - Click here to skip to audience slides

Your presentation

(17 Slides) – Click here to skip to presentation slides

Part 1: Your idea

The impact your research can make is the most powerful force
In the proposal process. Sadly, this is also the area least likely helped here.
The following pages do not offer a foolproof method for generating revolutionary insights. However, there are suggestions for jumpstarting critical thought and testing your hypotheses once they emerge.

Idea: The foundation of your proposal

Top 10 reasons proposals fail

(From an NIH-sponsored grantsmanship meeting:)

10. Uncritical approach
9. Lack of sufficient experimental detail
8. Unrealistically large amount of work
7. Absence of acceptable scientific rationale
6. Questionable reasoning in experimental approach
5. Uncertainty concerning future directions
4. Lack of experience in essential methodology
3. Lack of knowledge of relevant published work
2. Diffuse, unfocused or superficial Research Plan
1. **LACK OF ORIGINAL IDEAS**

Idea: Generating / refining

Understand NIH interests - but don't fear being different

Whether you are without a research idea or wonder how to frame one, it can be helpful to know which ideas have a record of NIH support. Fortunately, insights into NIH's research interests are available through a variety of online postings and databases.

- Search for the **'cleared concepts'** of the various NIH institutes, outlining general areas where they would like to see progress.
- Cleared concepts often evolve into **notices of intent** to fund research. Notices of intent – as well as active funding opportunities – can be searched at grants.nih.gov/grants/guide/search_guide.htm
- Searches at report.nih.gov can reveal what NIH has backed in the past.
- Ideas that aren't reflected on these sites can be important, too. Remember, the top reason proposals fail is a lack of **original** ideas.

Idea: Generating / refining

Don’t rush it – refine it

Good science tests hypotheses, so turn a critical eye
to refine your raw idea before you begin to write.

- **First,** read as much relevant literature as possible.
- **Then** revisit your ideas and hypotheses.
- **Then** formulate initial Specific Aims. Extended tips on specific aims appear later in this presentation. If you can’t wait, click here.
- Consult colleagues or SLU’s Grants Development Office for critiques.

The importance of the specific aims section is explained in the next group of slides, which outline the NIH proposal review process.

If you are already familiar with that process, you can focus on preparing your proposal for the journey by skipping to presentation tips.

Part 2: Your audience

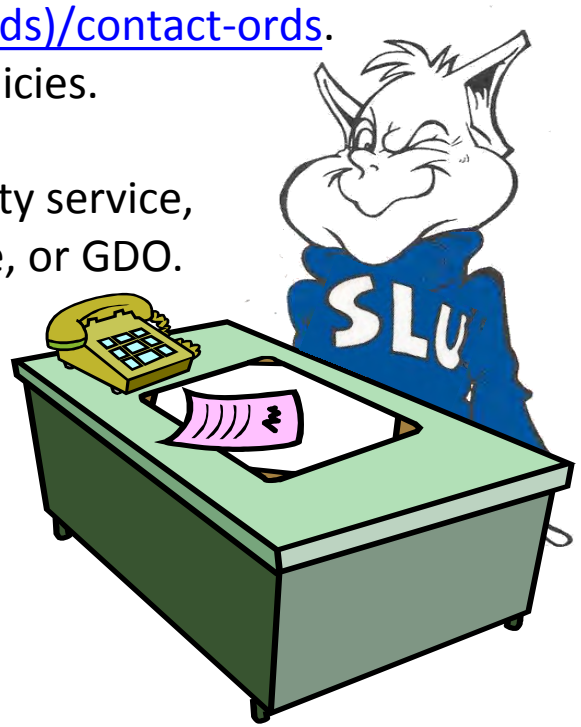
'Know your audience' is a fundamental rule of communication, and in developing your proposal strategy, it would be nice to understand the perspective of the reviewers you want to impress. While you can't know individual reviewing *persons*, knowing the NIH reviewing *process* can help you make educated decisions about proposal style and direction.

Audience: Saint Louis University

Before NIH, don't forget SLU reviews

- Pursuit of research funding should always include a conversation with your Office of Research Development Services representative, listed at www.slu.edu/division-of-research-administration-home/office-of-research-development-and-services-(ords)/contact-ords. They ensure compliance with a variety of SLU policies.

- To enable more research, teaching and community service, SLU has launched the Grants Development Office, or GDO. GDO consultations aren't required, but we like to think we can make your proposal more appealing to the NIH and other funders. For more information, visit the GDO website: www.slu.edu/grantsdevelopment



Audience: Center for Scientific Review

The **CENTER FOR SCIENTIFIC REVIEW** is your proposal's first stop at NIH.

Center for Scientific Review - CSR

The CSR makes 3 major decisions about your proposal:

- Which Institute or Center is best suited to fund your project? (NIH includes 27 agencies, listed at nih.gov/icd. CSR may pick more than one.)
- Which Integrated Review Group and study section best suit your proposal? (These will be discussed more later.)
- Who will serve as preliminary reviewers? **Those chosen will in all probability decide if your proposal gets a full review.**

Exploring agencies' award history at report.nih.gov may help you select a target. NIH also encourages discussing your target agency with a program officer before submission. Your cover letter may suggest an institute or review group. You cannot suggest individuals who *should* review your proposal, but you may mention people or groups who *shouldn't* due to conflicts of interest.

Institute / Review Group assignments are typically posted to NIH Commons within two weeks of application deadline and may be appealed.

Audience: IRG Preliminary Reviewers

IRG PRELIMINARY REVIEWERS

receive your proposal from CSR.

ROUGHLY HALF of NIH proposals won't pass this stage!

Center for Scientific Review - CSR

↓

IRG Preliminary Reviewers

- Typically, three members of the larger Integrated Review Group do preliminary reviews.
  - A primary reviewer summarizes, notes strengths and weaknesses, and assigns a priority score.
  - The secondary reviewer and reader concur or disagree.
  - **Most reviewers read only abstract and specific aims! These sections of your proposal are vital!**
- After discussion, all preliminary reviewers vote a score. (Criteria on next slide.)
- Scores go back to CSR for tabulation. Proposals scoring in the bottom half for a given IRG aren't considered by full IRG unless an IRG member requests it.
- You can't know who'll be picked to review your proposal, but you can see IRG rosters at: public.csr.nih.gov/StudySections/Standing

Audience: Reviewers' Core Criteria

Below applies to <u>MOST</u> NIH programs. More detail at grants.nih.gov/grants/peer/reviewer_guidelines.htm

Significance. Does the project address an important problem or a critical barrier to progress in the field? If the aims of the project are achieved, how will scientific knowledge, technical capability, and/or clinical practice be improved? How will successful completion of the aims change the concepts, methods, technologies, treatments, services, or preventative interventions that drive this field?

Investigator(s). Are the PD/PIs, collaborators, and other researchers well suited to the project? If Early Stage Investigators or New Investigators, do they have appropriate experience and training? If established, have they demonstrated an ongoing record of accomplishments that have advanced their field(s)? If the project is collaborative or multi-PD/PI, do the investigators have complementary and integrated expertise; are their leadership approach, governance and organizational structure appropriate for the project?

Innovation. Does the application challenge and seek to shift current research or clinical practice paradigms by utilizing novel theoretical concepts, approaches or methodologies, instrumentation, or interventions? Are the concepts, approaches or methodologies, instrumentation, or interventions novel to one field of research or novel in a broad sense? Is a refinement, improvement, or new application of theoretical concepts, approaches or methodologies, instrumentation, or interventions proposed?

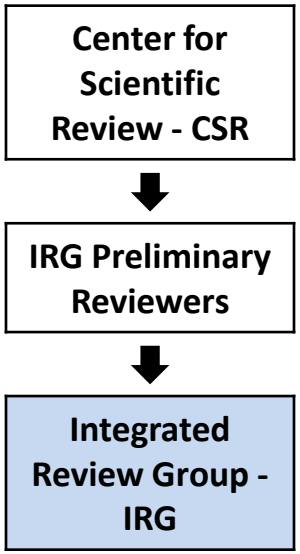
Approach. Are the overall strategy, methodology, and analyses well-reasoned and appropriate to accomplish the specific aims of the project? Are potential problems, alternative strategies, and benchmarks for success presented? If the project is in the early stages of development, will the strategy establish feasibility and will particularly risky aspects be managed? If the project involves clinical research, are the plans for 1) protection of human subjects from research risks, and 2) inclusion of minorities and members of both sexes/genders, as well as the inclusion of children, justified in terms of the scientific goals and research strategy proposed?

Environment. Will the scientific environment in which the work will be done contribute to the probability of success? Are the institutional support, equipment and other physical resources available to the investigators adequate for the project proposed? Will the project benefit from unique features of the scientific environment, subject populations, or collaborative arrangements?

Audience: Integrated Review Groups

INTEGRATED REVIEW GROUPS

consider proposals surviving preliminary review.



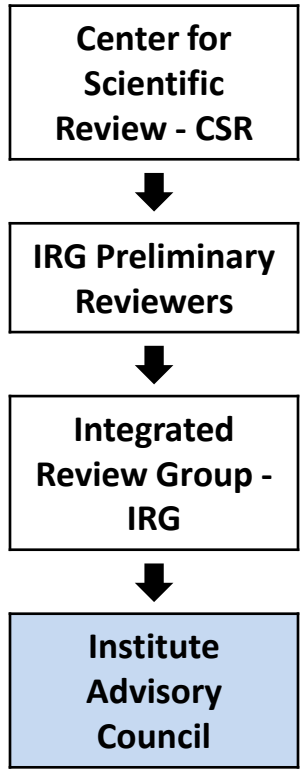
- Also called Study Sections, they consist of 12 to 25 reviewers:
  - 'Permanent' members – active researchers on 4-year terms
  - 'Ad hoc' members – added for expertise
  - IRG rosters: public.csr.nih.gov/StudySections/Standing
  - It is still important that your idea can be grasped quickly. The group reviews 50 to 100 proposals over 1 or 2 days.
- Each proposal's preliminary reviewers offer their evaluation. After discussion, all members privately submit priority scores. See mock review at youtube.com/watch?v=fBDxI6l4dOA
- CSR figures a proposal's percentile rank among all other proposals scored by the institute in question during the past 12 months.
- Scores and percentile posted to NIH Commons a few days after IRG meeting. Summary sheet or 'pink sheet' with full critiques posted within a month.
- More on IRGs: public.csr.nih.gov\StudySections\IntegratedReviewGroups

Audience: Institute Advisory Council

INSTITUTE ADVISORY COUNCILS

use IRG scores to recommend funding – or not.

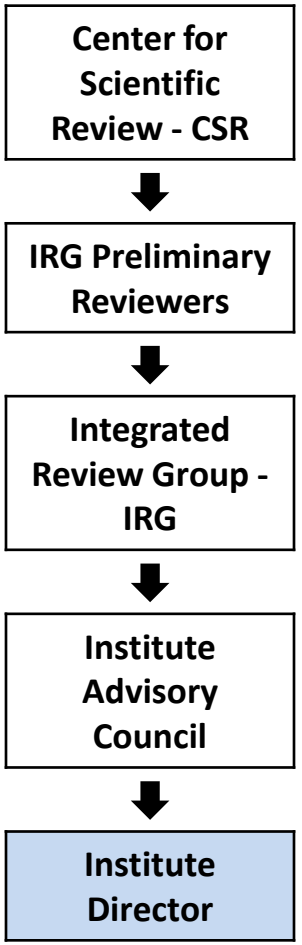
- Advisory councils start a 'second level' review that is more internal to a given center or institute.
- They include both scientific and public members, appointed either by the president or the secretary of Health & Human Services. Rosters at ofacp.od.nih.gov/committees/rosters.asp
- Recommendations are based largely on IRG percentile scores and the institute 'payline.' (For example, a 10th percentile payline means proposals scoring in the top 10% will likely be funded.) Einstein College of Medicine lists many paylines at einstein.yu.edu/administration/grant-support/nih-paylines.aspx
- Institute priorities sometimes trump IRG scores and paylines.
- Advisory councils also consider appeals from investigators who can persuade their Scientific Review Officer that the initial review of their proposal was flawed.



Audience: Institute Directors

The 27 **NIH INSTITUTE DIRECTORS** ultimately decide funding (at least technically).

- Directors usually have the last word on funding, but this is largely a formality.
- Directors rarely contradict the payline-based suggestions of their advisory council, though they may choose between similarly scored proposals or delegate such a decision back to program managers.
- Agency directors listed at nih.gov/icd/icdirectors.htm



Part 3: Presentation

After having a transformative idea, you must craft a proposal that re-creates it in a stranger's mind – accurately and easily. At a minimum, the essence of your project must be quickly understood. Ideally, reviewers will be just as excited about testing your concept as you. Here are strategies to maximize curiosity and minimize confusion in the key sections of an NIH proposal.

Presentation: Major Components

There is much more to a full NIH proposal*,
but these narratives are at the heart of the review process.

- Details of your idea should expand consistently from Abstract (1 page) to Specific Aims (1 page) to the full Research Strategy (lengths vary**).
- Begin by creating a clear set of Specific Aims.
  Reviewers trying to grasp ideas quickly look to them as a 'sweet spot' – a single page with enough specifics to create a reliable impression.

* All the paperwork for a typical NIH proposal (PHS Form 398) can be viewed at grants.nih.gov/grants/funding/phs398/phs398.html. Your SLU research representative can assist with completing these documents. The National Institute of Allergy and Infectious Diseases has full proposal examples at www.niaid.nih.gov/researchfunding/grant/pages/appsamples.aspx

** Depending on type of application, Research Strategy may be limited to 5, 6, 10 or 12 pages. For more information, visit grants.nih.gov/grants/forms_page_limits.htm

Presentation: Specific Aims

SPECIFIC AIMS PAGE

If the reader doesn't understand your specific aims, your proposal is toast.

If the Specific Aims section is good, the rest of the proposal flows from it.

SUGGESTION:

1. Conceptualize Specific Aims & describe in one page. (More tips follow.)
2. Expand it to make the Research Strategy.
3. Contract it to make the Project Summary (abstract).
4. Repeat steps 1 through 3 as needed.

This approach should help maintain a consistent message.

Presentation: Specific Aims

When conceptualizing the logic of your Specific Aims, remember:

- Don't blur aims and experiments. Aims are the concepts you'll prove, disprove or at least illuminate. Experiments are the means to this end.
- Achieving most Specific Aims requires more than one type of experiment.
- You can consult experts on research methods and statistical analysis through SLU's Grants Development Office. (Contact info on last slide.)
- Avoid Specific Aims that can test only one hypothesis.
- Avoid 'Incredible Disappearing Specific Aims,' in which one aim might become irrelevant depending on results of another. (More on next slide.)
- Though not dependent, aims should be closely connected to synergistically test your hypothesis.
- Aim to 'determine' something, rather than 'explore' or 'study' it. Without an endpoint, your Specific Aim is not specific.

Presentation: Specific Aims

'Incredible Disappearing Specific Aims'

WRONG - Aim 2 may 'disappear' depending on result of Aim 1

- Aim 1: Determine if chicken or egg came first.
- Aim 2: If egg came first, determine how first egg was formed.

BETTER – Aims are preserved by considering alternative hypotheses

Hypothesis: Chicken came before egg.
Alternative hypothesis: Egg came before chicken.

- Aim 1. Determine how first chicken arose.
- Aim 2: Determine how first egg arose.

Together, information gained in these two aims distinguishes between alternative ideas. Don't over-rely on a favorite hypothesis; test competing ideas.

CONNECT YOUR AIMS: Strive to explain the role of each aim and how they combine to inform the hypotheses. For example:

- Aim 1 might distinguish possibilities A & B from possibilities C & D.
- Aim 2 might distinguish possibilities B & C from possibilities A & D.

Together, the two aims distinguish between all four possibilities.

Presentation: Specific Aims

After setting sound logic, strive to cover the following in one page:

- **Background & Significance –** Overview of field, key knowledge gaps.
- **Preliminary Studies** – Explain previous work in the field and the resulting ideas and hypotheses.
- **Specific Aims** – Keep them independent but connected. The experiments you will conduct to achieve your aims should be discussed only generally, leaving the details for the Research Strategy section.
- **Summary** – Share your vision of the unique impact you expect to have on future work in the field, with specific objectives, such as:
  - testing a hypothesis;
  - creating a novel design;
  - solving a specific problem;
  - challenging a paradigm or clinical practice;
  - addressing a critical barrier;
  - developing a technology.

Presentation: Specific Aims Example

From Institute of Allergy & Infectious Diseases-funded proposal:

Background & Significance
- ✓ Field overview
- ✓ Importance to health
- ✓ Knowledge gap (biology of apicoplast)

Summary
- ✓ Project goal
- ✓ Hypothesis being tested
- ✓ Impact on future work

Preliminary Studies
- ✓ Discusses ideas resulting from previous work

Apicomplexa are responsible for a number of important human diseases including malaria, toxoplasmosis, cryptosporidiosis and cyclosporidiosis. Management of these diseases rests heavily on chemotherapy but anti-parasitic drug treatment faces multiple challenges. These include poor overall potency, restriction to certain lifecycle stages, unwanted side effects, and rapidly emerging multiple drug resistance. A constant stream of new drugs and potential drug targets is required to stay abreast of the threat posed by these pathogens. One of the most promising sources of such parasite specific targets is the apicomplexan plastid or apicoplast. The apicoplast is unique to the parasite and its function is essential to parasite survival. This organelle is a holdover from a free-living photosynthetic past. The structure and biology of the apicoplast is remarkably complex as it is derived from the endosymbiotic marriage of two eukaryotes: a red alga and an auxotrophic protist. The goal of this application is to unravel the complexity of this biology in mechanistic detail. We hypothesize that the photosynthetic past of Apicomplexa and the continued presence of a plastid has profound and lasting implications for their current metabolism and cell biology. Further we believe that discovering and characterizing this biology in its molecular detail will lead us to important insights into the biology of Apicomplexa, the evolution of the eukaryotic cell, and ultimately to novel targets for anti-parasitic interference. In our current funding period we have conducted genetic studies on proteins involved in apicoplast replication, protein import, and metabolism that were identifiable as plastid proteins in part based on their similarity to plant chloroplast proteins. We did so in a gene-by-gene fashion characterizing a limited number of proteins in considerable depth using a genetic approach. This has been an excellent strategy that served us well, we will continue to use this approach to dig deeper into mechanism in the current application. However, we also feel that we might have harvested the lower hanging fruit of candidates with a lot of function left unassigned.

Continued on next slide >>

Presentation: Specific Aims Example

Specific Aims
- ✓ Can be accomplished independently but are connected in being achieved through 'hypothesis-driven mechanistic experiments'
- ✓ Methods discussed briefly.

Preliminary Studies
- ✓ More ideas from past work.

We therefore will complement this approach with a broader effort to define a comprehensive set of plastid proteins to continue to feed our pipeline of hypothesis-driven mechanistic experiments with strong candidate genes.

Specific Aim1: Dissect the mechanism of apicoplast protein import. The bulk of the ~500 apicoplast proteins is nuclear encoded and post-translationally imported across four membranes. We (and others) have described three mechanistically distinct candidate protein translocons that reside in the three inner membranes of complex plastids. In the current funding period we will focus on a newly discovered mechanism that was derived from the ER-associated degradation system (ERAD) of the algal endosymbiont. We will use conditional gene disruptions and complementation assays to establish the importance of individual components and to define the energy source of the translocation process.

Specific Aim2: Understand the function of the apicoplast ubiquitination pathway. The ER-localized ERAD pathway goes hand in hand with the ubiquitination and subsequent proteasomal degradation of translocated proteins. Our preliminary data indicates that aspects of this protein modification pathway are still present in the apicoplast. What is the enzymatic machinery involved in this process? What are its substrates? And most importantly, what is the molecular function of apicoplast ubiquitination? A combination of genetic and biochemical approaches will be used to answer these important questions.

Specific Aim 3: Discover a comprehensive set of apicoplast proteins and characterize their function. Mining comparative and functional genomic information we have assembled an extensive list of proteins for which we hypothesize a role in apicoplast biology. We will establish the localization of their protein products for a comprehensive set of these candidate genes by epitope tagging. In the previous funding period we have found conditional null mutants to be highly informative to study apicoplast protein function and we have developed phenotypic assays to detect defects in apicoplast protein import, apicoplast division, and apicoplast metabolism. We will apply this genetic approach to a prioritized list of validated candidates. To increase the throughput of our analyses we will develop and test a new mutagenesis approach based on promoter replacement.

Editor's Note: Though shown over 2 slides, these aims do fit on one typed page!

Presentation: Project Summary

THE PROJECT SUMMARY (ABSTRACT)

This is ideally a crystal-clear micro-version of whole proposal. Though not as crucial as the Specific Aims page, it is the first part of a proposal most reviewers will read, and one of few parts read by ALL study section members should your proposal get that far. In short, it is the first place you can capture – or lose – reviewers' interest.

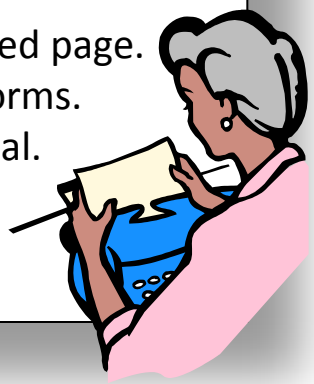
<u>It should clearly state:</u>

- Your project's importance and relevance to human biology.
- Your project's primary goal.
- The key ideas and hypotheses being tested.
- A micro form of the specific aims and methodology.

Clearly explaining all in small space is difficult but extremely important.

<u>Other notes:</u>

- Usually a text-only form allowing about 2,000 characters or half of a typed page.
- 'Relevance' has a separate 2 or 3 sentence form, but discuss it in both forms.
- May be wise to wait until Specific Aims page & Research Strategy are final.
- May become a public document ; omit confidential/proprietary data.
- Verbatim instructions from PHS 398 appear on next slide.



Presentation: Project Summary

Project Summary form verbatim instructions:

"The first and major section of the Description is a **Project Summary**. It is meant to serve as a succinct and accurate description of the proposed work when separated from the application. State the application's broad, long-term objectives and specific aims, making reference to the health relatedness of the project (i.e., relevance to the mission of the agency). Describe concisely the research design and methods for achieving the stated goals. This section should be informative to other persons working in the same or related fields and insofar as possible understandable to a scientifically or technically literate reader. Avoid describing past accomplishments and the use of the first person.

The second section of the Description is **Relevance**. Using no more than two or three sentences, describe the relevance of this research to public health. In this section, be succinct and use plain language that can be understood by a general, lay audience. **DO NOT EXCEED THE SPACE PROVIDED.**

Use text only (no figures or other information not in standard text.) Do not include proprietary, confidential information or trade secrets in the description section. If the application is funded, the project description will be entered into an NIH database and will become public information."

Presentation: Abstract - Example 1

Importance of problem and relevance to human biology and disease

Key goal of proposal

Key ideas and hypotheses being tested

Succinct summary of specific aims and methodology

Enhancers that transcriptionally activate promoters from several kilobases away are vital for expression of many genes during metazoan development. The Chip protein was discovered in a genetic screen for factors that support activation of the Drosophila *cut* gene by a distant enhancer. Chip, also found in humans, facilitates activation of many Drosophila genes, including *eve,* by remote enhancers. The primary goal of this proposal is to determine how Chip facilitates activation of *eve*.

Chip interacts with homeoproteins such as Bicoid and increases Bicoid activity *in vivo*. The principal hypothesis is that Chip increases cooperative binding of Bicoid and other homeoproteins to *eve* enhancers. Another important idea is that Chip also helps homeoproteins bind between the *eve* enhancers and promoter and thereby facilitates enhancer-promoter communication. Gypsy transposon insertions can block communication between enhancers and their target promoters in many genes, including *eve* and *cut*. Chip is a genetic target of the gypsy insulator at the *cut* locus, and interacts with proteins that bind gypsy, Su(Hw) and Mod(mdg4)-67.2, implying that Chip is also a molecular target of the insulator.

The proposed work has four aims: (1) to determine how Chip promotes Bicoid activity using *in vitro* DNA-binding assays and *in vivo* gene expression experiments; (2) to test if Chip interacts directly with *eve in vivo*, and where in *eve* it binds using chromatin immunoprecipitation assays; (3) to determine if a remote *eve* enhancer that is Chip-dependent comes physically close to the *eve* promoter during activation using an *in vivo* site-specific recombination assay; and (4) to define how the Su(Hw) and Mod(mdg4)-67.2 insulator proteins interact with each other and Chip using *in vitro* protein interaction assays, and *in vivo* genetic experiments. These studies will increase understanding of long-range gene activation and illuminate fundamental mechanisms underlying some human genetic diseases.

Presentation: Abstract - Example 2

Importance of problem and relevance to human biology and disease

Key goal of proposal

Key ideas and hypotheses being tested

Succinct summary of specific aims and methodology

Cornelia de Lange syndrome (CdLS) is caused by mutations in genes that control sister chromatid cohesion. CdLS patients show slow pre- and postnatal growth, mental retardation, autistic features and structural abnormalities in limbs and organs. Unexpectedly, model organism studies indicate that the diverse CdLS deficits are caused by effects on expression of genes that control development, rather than defects in chromatid cohesion. The long-term goal of this proposal is to learn how cohesion factors regulate gene expression and development to increase understanding of the etiology of CdLS and related birth defects.

The cohesin complex has a ring-like structure and the leading idea is that cohesin mediates cohesion by encircling the sister chromatids. The NIPBL (Nipped-B-Like) protein loads cohesin onto chromosomes, and most CdLS patients have heterozygous loss-of-function NIPBL mutations. These mutations reduce NIPBL by less than 30%, and do not cause cohesion defects. A small fraction of milder CdLS cases are caused by missense mutations in cohesin subunits. These mutations also do not affect cohesion.

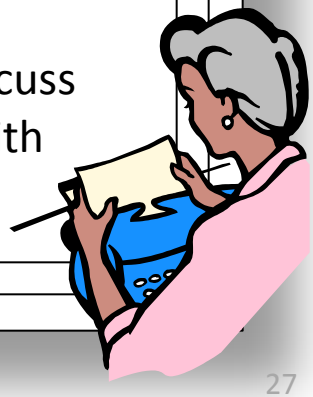
The most puzzling aspect of CdLS is how such small changes in cohesion factors have such dramatic effects on development. In model organisms, similar small changes alter gene expression and development without altering cohesion. In Drosophila, cohesin binds preferentially to active genes, and differences in binding between cell lines correlate with differences in gene transcription. These data suggest a model in which cohesin encircles active genes where transcription unwinds the chromosome. It is further proposed that cohesin affects transcription by multiple mechanisms. Because cohesin binds so tightly, its association with genes must be controlled dynamically by NIPBL to facilitate transcription. Thus it is proposed that CdLS is caused by changes in cohesin dynamics that alter gene expression.

There are strong structural and functional parallels between human and Drosophila cohesion factors. The proposed work will take advantage of the highly amenable Drosophila animal model to elucidate how cohesion factors regulate gene expression. There are three aims: (1) determine how cohesion factors affect transcriptional elongation, gene activation, and insulator function in cells and in vivo, (2) determine how gene expression regulates cohesin binding using chromatin immunoprecipitation, and (3) determine how changes in cohesion factors affect cohesin chromosome-binding dynamics in vivo using fluorescence recovery after photobleaching. It is hoped that insights from these studies will shed light on the mechanisms by which small changes in cohesion factors cause CdLS, and impact the development of diagnostic and therapeutic methods.

Presentation: Research Strategy

In the **RESEARCH STRATEGY** section:

- You finally get more than one page to express your idea!
  Five to 12 pages are typically allowed, depending on your program.
- This is where you expand on the Specific Aims page in three subsections:
  Significance *Innovation* *Approach*
- Each situation is different, but the Approach subsection, detailing the steps you will take to achieve your specific aims, is usually critical. Significance and Innovation should have been largely communicated in the abstract and specific aims pages. None of the sample proposals posted at www.niaid.nih.gov/researchfunding/grant/pages/appsamples.aspx devotes more than 3 pages to Significance and Innovation.
- For new applications (not renewal or revisions), you must also discuss your *Preliminary Studies* relevant to your proposal. This can go with the Significance, Innovation or Approach section – as it best fits.



Presentation: Research Strategy

Structure options

If the significance and innovation of your project are substantially covered in your Project Summary and Specific Aims pages, it may be a poor use of Research Strategy space to address them again for each individual aim.

Consider first

(Typically leaves more space to detail each experiment.)

SIGNIFICANCE
- Collective

INNOVATION
- Collective

APPROACH
- Aim 1
- Aim 2
- Aim 3

Alternatives

(Use if significance & innovation for each aim merit more discussion.)

SIGNIFICANCE
- Aim 1
- Aim 2
- Aim 3

INNOVATION
- Aim 1
- Aim 2
- Aim 3

APPROACH
- Aim 1
- Aim 2
- Aim 3

AIM 1
- Significance
- Innovation
- Approach

AIM 2
- Significance
- Innovation
- Approach

AIM 3
- Significance
- Innovation
- Approach

Verbatim application guidance for Research Strategy can be found at:
grants.nih.gov/grants/funding/phs398/phs398.pdf. (Page I-46)

Presentation: Research Strategy

'Approach': Recommended structure

Your 'Approach' for each aim may benefit from the following subheadings:

- **Rationale** - How the aim relates to your hypotheses and overall goal.
- **Methods –** Detailed plan to achieve each aim, and an explanation why these methods are the best available to achieve your aim. SLU has experts on research methods and statistics ready to help. See last slide.
- **Anticipated Results** - Explain how you'll interpret each potential result and how it relates to your hypotheses and future directions.
- **Potential Problems** - Anticipate experiment pitfalls and discuss alternatives that will be pursued if initial results are unclear.
- **Hazards –** Explain any dangers and precautions you'll take to avoid them.

- Try to walk reader through a sample experiment.
- Break aims into sub-aims if necessary, sub-aims to individual experiments.
- The more alternative models considered and tested, the better.

Presentation: Finer points

Help reviewer embrace your idea at every turn

- Relevant ideas based in sound logic will help your proposal be considered – against other proposals with relevant ideas and sound logic.
- In 2013, only 1 in 6 NIH applications won awards. Crisp communication of your idea builds confidence in your ability to execute it, helping separate you from competitors.
- Have someone (we recommend SLU's Grants Development Office) critique your proposal before submitting.
- The next slide contains basic tips for making your idea more accessible to reviewers. Some may seem like small matters, but small matters are often the difference in success and failure.

Presentation: Finer points

Ideas and hypotheses drive proposals. Present them early, clearly and often to help the reviewer understand why you are doing the experiments you propose, and how you will interpret the results.

Do not assume reader knows as much as you about your field. Explain everything!

- Do not fear reminders or repetition about key facts at critical points.
- Avoid field-specific jargon or abbreviations, or at least redefine them often.
- Summarize key points of cited work. It is dangerous to assume your reviewer will be familiar with them or will eagerly spend time researching them.

Reviewers are busy. They'll favor proposals that go easy on their eyes and mind.

- Using short words and active sentences frees space to present ideas cleanly.
- A little white space makes your text more approachable and helps the reader follow your train of thought. Try to separate major sections with a blank line. Paragraphs, too, or at least indent them. Bold type helps if not overdone.
- Numbering sections helps the reader find them.
- A picture really can be worth 1,000 words, and you need not be artistically inclined. (The Grants Development Office can help!) Simple diagrams and figures often save space. Number and title each, and refer to them in the text. If the figure is on a different page than your reference, tell the reader which page.

Grants Development Office

Questions? Contact us!

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