Reviewer Guidance on Rigor and Transparency: Research Project Grant and Mentored Career Development Applications

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The goal of this initiative is enhancing reproducibility of research through rigor and transparency in the four areas below. Assessment of these factors has always been implicit in peer review but now is formalized in the stated review criteria. NIH recently updated instructions and review criteria for research grant (NOT-OD-16-011) and mentored career development award (NOT-OD-16-012) applications submitted for due dates of January 25, 2016 and beyond. Implementation of rigor and transparency has been postponed for individual fellowship, institutional career development, and institutional training grant applications.

- **Scientific Premise:** The key data introduced by the applicant to justify the project.
  - The applicant should supply a sufficient evaluation of the strengths and weaknesses of the data or other justification used to support the application, and should describe how the proposed research will address any weaknesses or gaps. NIH will not prescribe a "formula" for addressing scientific premise, although it may involve assessing the other three elements below.
  - Scientific premise will be addressed in peer review as part of the Significance criterion for research grant applications and as part of the Research Plan criterion for mentored career development award applications. This extends the existing review criteria to include a retrospective assessment of the foundation for the project.
  - You should factor a weak premise or the failure to address scientific premise adequately, into your criterion score and overall impact score. The page limit is not an acceptable excuse for an applicant to not address scientific premise.

- **Scientific Rigor:** The strict application of the scientific method to ensure robust and unbiased experimental design, methodology, analysis, interpretation and reporting of results.
  - Whereas scientific premise pertains to supporting data, scientific rigor pertains to the proposed research (statistical procedures, data analysis, precision, subject inclusions and exclusion criteria, etc.). Different research fields may have different standards or best practices for scientific rigor.
  - Rigor will be assessed in peer review as part of the Approach criterion for research grant applications and as part of the Research Plan criterion for mentored career development award applications.

	Scientific Premise	Scientific Rigor
Pertains to:	Supporting data	Proposed research
Review Criterion – Research Grants	Significance	Approach
Review Criterion – Mentored Career Development Grants	Research Plan	Research Plan

- **Consideration of Relevant Biological Variables:** critical factors affecting health or disease in vertebrate animals or human subjects
  - The NIH Policy applies broadly to all relevant biological variables, for example sex, age, source, weight, and genetic strain.
  - Consideration of sex as a biological variable (SABV) is required for studies involving human subjects or vertebrate animals. Both SABV and inclusion need to be addressed in the respective sections of the application, and can affect the Approach (or Research Plan) criterion score and the overall impact score. Reviewers will assess information according to the section where it is included in the application.
    - Justification should be provided if the application proposes to study one sex, for example in the case of a sex-specific condition of phenomenon (e.g., ovarian or prostate cancer), acutely scare resources (e.g., non-human primates), or sex-specific hypotheses possible due to known differences between males and females.
    - Cost and absence of known sex differences are inadequate justifications for not addressing SABV.
  - Other biological variables deemed to be relevant by the applicant will be considered in the application and reviewers will comment on the adequacy of plans to address them.

- **Plan for Resource Authentication:** key biological and/or chemical resources are those that may differ from lab to lab or over time, could influence the research data, and are integral to the proposed research.
  - Examples include cell lines, specialty chemicals, antibodies, and other biologics, not standard laboratory reagents.
  - The plan should be brief (one page or less for the entire plan), and should not include authentication data. The plan may reflect existing guidelines for some resources or the need for a community to develop a plan for other resources.
  - Review of this attachment will occur after scoring; comments on key resource authentication should not affect scores. Reviewers will comment on the adequacy of the plan for key resource authentication; comments can be addressed by the applicant prior to award for meritorious applications.

Not all activity codes are included in the rigor and transparency initiative. Therefore, reviewers need to follow the correct review criteria and use the appropriate and current critique template for each application. Your Scientific Review Officer (SRO) should provide or direct you to the appropriate templates and guidance.

Page limits have not changed. SROs and reviewers will need to be alert for over-stuffed applications.

You may submit your comments/questions about the NIH policy to reproducibility@nih.gov.

OVERVIEW: RESEARCH PROJECT GRANT (RPG) APPLICATIONS

Element of Rigor and Transparency	Section of Application	Criterion Score	Additional Review Consideration	Contribute to Overall Impact Score?
Scientific Premise	Research Strategy	Significance	NA	Yes
Scientific Rigor	Research Strategy	Approach	NA	Yes
Consideration of Relevant Biological Variables, such as Sex	Research Strategy	Approach	NA	Yes
Authentication of Key Biological and/or Chemical Resources	New Attachment	NA	Yes	No

OVERVIEW: MENTORED CAREER DEVELOPMENT AWARD (K) APPLICATIONS

Element of Rigor and Transparency	Section of Application	Criterion Score	Additional Review Consideration	Contribute to Overall Impact Score?
Scientific Premise	Research Strategy	Research Plan	NA	Yes
Scientific Rigor	Research Strategy	Research Plan	NA	Yes
Consideration of Relevant Biological Variables, such as Sex	Research Strategy	Research Plan	NA	Yes
Authentication of Key Biological and/or Chemical Resources	New Attachment	NA	Yes	No

References

- Nature Perspectives: "A call for transparent reporting to optimize the predictive value of preclinical research" Landis, et al., 10/10/2012
- Nature Commentary: "Policy: NIH plans to enhance reproducibility" Collins & Tabak, 01/27/2014
- Nature Commentary: "Policy: NIH to balance sex in cell and animal studies" Clayton & Collins, 05/14/2014
- Science Editorial: "Journals Unite for Reproducibility" 11/07/2014
- Science Perspectives: "Fixing problems with cell lines" Lorsch, Collins & Lippincott-Schwartz, 12/19/2014
- FASEB Journal Life Sciences Forums: "Studying both sexes: a guiding principle for biomedicine" Clayton 10/29/2015