

## Reproducibility2020 Action Plan

Stakeholder	Actions to Improve Reproducibility in Preclinical Research
Funders	<ul style="list-style-type: none"> <li>• Enact policies requiring study design pre-registration, cell line authentication and reagent validation, laboratory protocol transparency, and open access to publications. Provide relevant funding commitments where necessary</li> <li>• Include specific line items in grant review to score reproducibility factors</li> <li>• Provide resources for study design training and statistics consultation for grantees and grant applicants</li> <li>• Fund the development of open access and transparency tools, and additional research to better characterize reproducibility</li> <li>• Fund the development of new technologies and methods that enhance reproducibility</li> <li>• Encourage grantees to develop communities of practice for protocol sharing and testing, and dedicate resources to facilitate and incentivize these communities</li> <li>• Fund innovative training programs including online modules</li> </ul>
Researchers and Research Institutions	<ul style="list-style-type: none"> <li>• Make online accessible training modules available that address all major components and evolving approaches of the research process</li> <li>• Explore new approaches to mentorship and accountability to ensure that emerging researchers (i.e., graduate students and postdocs) receive necessary training and supervision from experienced PIs</li> <li>• Implement lab policies that improve reproducibility, such as reagent validation and documentation, routine cell line authentication, and independent reproduction of results by another researcher in the lab</li> <li>• Develop institutional policies and an organizational culture that values and rewards reproduction studies, study design pre-registration, protocol sharing, and open access</li> <li>• Organize online communities of practice to facilitate discussion and sharing of information within the field</li> <li>• Participate in multi-stakeholder groups that develop reproducibility policies and guidelines</li> <li>• Explicitly consider reproducibility issues during peer review of grants and manuscripts</li> <li>• Develop new technologies and methods that improve reproducibility and assist in validation and authentication processes</li> <li>• Explore new technologies including lab/bench automation and robotics to ensure greater precision and minimize errors</li> <li>• Perform results reproduction studies and publish the results</li> <li>• Explore new incentive structures for career advancement that move away from the traditional impact factor and funding paradigms to reward greater data and methods transparency, adherence to best practices and standards, and reproducibility of published work</li> </ul>
Journals	<ul style="list-style-type: none"> <li>• Adopt more stringent reporting and transparency guidelines, such as TOP Level 3</li> <li>• Provide cost-effective open access publication options under CC-BY licenses</li> <li>• Require cell line authentication and promote antibody validation guidelines, as they become available.</li> <li>• Allow archiving of submitted manuscripts before publication</li> <li>• Publish reproduction studies and technical commentary</li> <li>• Consider pre-registered review models that enable rigorous peer review of study design</li> <li>• Encourage greater use of pre-print platforms</li> <li>• Work with researchers to establish data and metadata standards for reporting (e.g., next-generation sequencing)</li> <li>• Require authors to link to version-controlled protocols</li> <li>• Conduct surveys of researchers to better understand reproducibility issues and obtain feedback on journal guidelines and policies</li> <li>• Report on reproducibility issues in the editorial and news section of the journal</li> </ul>
Industry	<ul style="list-style-type: none"> <li>• Transparently communicate the results of in-house replication attempts</li> <li>• Enhance protocol transparency, discussion, and version control, especially for reagents and kits</li> <li>• Provide validation data and technical support for reagents and kits</li> <li>• Participate in the establishment of materials standards</li> </ul>
Nonprofits/Scientific Societies	<ul style="list-style-type: none"> <li>• Convene multidisciplinary groups to establish relevant standards, including materials standards for commonly-used reagents, and data standards for commonly-used experimental methods</li> <li>• Provide professional development for researchers to improve research proficiencies, particularly in the areas of study design, data analysis, reagent validation, and reporting transparency</li> <li>• Convene meetings focused on reproducibility to facilitate sharing of best practices and develop new policies and procedures</li> </ul>
Public	<ul style="list-style-type: none"> <li>• Stay aware of reproducibility news to promote a culture of accountability</li> </ul>