National Science Foundation
4201 Wilson Boulevard
Arlington, Virginia 22230

NSF 15-065

Dear Colleague Letter - EAGERs for Cellular Biomanufacturing

April 1, 2015

Dear Colleagues:

Advanced biomanufacturing is a field that builds upon groundbreaking discoveries in engineering and biology to produce the next generation of therapeutics, diagnostics, and manufacturing processes for biochemicals. These include, but are not limited to, cell-based therapies, microdevices with cells organized to provide appropriate biological complexity, also referred to as organs-on-a-chip, as well as design methods of cellular catalysts. Advanced biomanufacturing capitalizes on recent discoveries in bioreactor technology, 3D additive manufacturing, micro and nanofabrication, novel biomaterials, stem cell technologies, cell reprogramming and transdifferentiation processes, systems and synthetic biology, genome editing, and mathematical modeling at the molecular, cellular, cell population, and tissue levels, to spur research and development, education, and industry growth and innovation.

Cellular biomanufacturing is a critical component of advanced biomanufacturing. Cell-based therapies and diagnostics have the potential to revolutionize human healthcare in different contexts, including personalized medicine. Additionally, cells are used for the biomanufacturing of protein therapeutics. Processes with cells as products present major engineering challenges, and indeed new therapies and cell-based products may depend critically on robust and reliable manufacturing approaches at the cellular level.

The National Science Foundation (NSF) has placed a high priority on advanced manufacturing, including advanced biomanufacturing. The Chemical, Bioengineering, Environmental and Transport Systems (CBET) Division in the Engineering Directorate (ENG) at NSF seeks EArly-Concept Grants for Exploratory Research (EAGER) proposals that address key challenges in cellular biomanufacturing science and engineering, whether the intended use of the final cell product is in cell therapies, engineered tissues, or drug discovery and testing platforms that incorporate living cells, or whether the cells are used in novel protein production processes.

This Dear Colleague Letter (DCL) is aimed at identifying opportunities to leverage and synthesize conceptual, scientific and technological innovation across disciplines in order to promote developments in cellular biomanufacturing towards accelerating solutions to critical challenges in the field. Although some of the challenges are specific to a particular type of cells, such as autologous cells, others are more generic and encompassing, applicable to both autologous and allogeneic cells. Projects are not limited to particular cell type(s), however, the project description should indicate the range of cell types for which the scientific questions or technological developments addressed in the proposal are relevant. Topics may include, but are not limited to:

- Novel approaches to increase the efficiency and rate of stem cell differentiation towards the desirable phenotype.
- Methods for rapid, non-destructive characterization of cellular phenotype and potency.
- Culture configurations and bioreactor technologies for reproducible cell expansion/ differentiation towards the targeted population size/phenotype.

- Novel cell separation technologies either for the starting biopsied material or for the final biomanufactured product.
- Development of robust correlations between easily measurable biomarkers and cellular functionality and potency.
- Innovative platforms addressing cell source variability in developing robust biomanufacturing processes based on autologous cells from various subjects.
- Design of stable mammalian cell lines that are less prone to evolutionary changes and that are suited for a more efficient manufacture of protein therapeutics.
- Computational models accounting for the stochastic variability of cells, which could be used for process tracking towards a final product within defined specifications.

These high-risk, high-impact, short-term projects must transcend approaches typically supported by the core research programs at NSF. Projects should have strong engineering and biological components, integrating and advancing both disciplines. Academic-Industry collaborations are encouraged. Although proposed studies should be potentially transformative and may be considered especially "high-risk, high-payoff," they should also be compatible with the time and budget limits of the EAGER funding mechanism. Specifically, requests may be for up to $300K and of up to two years duration. For more information on EAGERs, please consult the NSF Grant Proposal Guide.

EAGER SUBMISSION PROCESS

EAGER proposal inquiries will be accepted from a Principal Investigator (PI) or a consortium of Investigators led by a PI at an eligible U.S. institution. Interested PIs must email a summary of their research ideas to cell-biomanuf-eagers@nsf.gov by April 24, 2015, 5:00 PM PI's time. Each PI may be involved in only one proposal summary. The one-page summary must contain a project title, the names and affiliations of all PIs, and a project description, highlighting the overall hypothesis and goal, as appropriate, specific aims, methods, intellectual merit, and broader impacts of the proposed research.

Summaries will be reviewed internally and those ideas that best meet the goals of this DCL will be encouraged to submit full EAGER proposals. Full EAGER proposals must be submitted by June 5, 2015, 5:00 PM PI's time, via Fastlane or Grants.gov following the NSF's Grant Proposal Guide instructions and should clearly indicate the reason that the proposed work would be appropriate for EAGER support. **Please be sure that the title of your proposal starts with "EAGER: Biomanufacturing:"** It is anticipated that all EAGER awards will be made in FY 2015.

For more information or questions, please contact Chemical, Bioengineering, Environmental, and Transport Systems (CBET) Division Program Director for Biomedical Engineering, Athanassios Sambanis, at asambani@nsf.gov or (703) 292-2161.

Sincerely,

JoAnn Slama Lighty
Division Director
Division of Chemical, Bioengineering, Environmental, and Transport Systems
Directorate for Engineering