Submission to NOT-OD-15-084 RFI on "Optimizing Funding Policies and Other Strategies to Improve the Impact and Sustainability of Biomedical Research"

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Key issues that currently limit the impact of NIH's funding for biomedical research and challenge the sustainability of the biomedical research enterprise. We welcome responses that explain why these issues are of high importance.

1. **Several inefficiencies exist in how federal research dollars are spent. If these inefficiencies were corrected, then more dollars would be available to support the direct costs of research.** Thus, the impact of NIH funding on scientific discovery would be increased and a more sustained future for U.S. biomedical research would be realized. Inefficiencies include:
   a. **Duplicative purchases and inefficient use of existing lab equipment on university campuses. This occurs** because of the following reasons:
      i. A culture of individual lab space and equipment often leads to an "ownership" mentality that reduces sharing. The need for PIs to each have their "own" equipment thereby leads to the purchase of equipment that may already exist and be underutilized at a university.
      ii. Most campuses do not maintain a database to help scientists know what assets and what opportunities for equipment sharing exist on campus. As a result, PIs are likely to incorporate equipment needs into a proposal budget or spend funding even if the same equipment is readily available on their campus. Universities also often do not have a process in place to redistribute unneeded equipment between departments.
   b. **Most universities do not have systematic freezer sample management, leading to high energy use and high risk exposure. A university may have samples of exceptional value, yet freezers storing those samples may lack monitors. This puts samples at risk of undetected freezer failures.** It is also fairly common to find labs with significant portions of their freezers occupied by samples that are no longer needed, expired, or cannot be identified due to lab turnover and poor inventorying. Consequently, as long as floor space and funding is available, labs are inclined to purchase more freezers than otherwise necessary. Some scientists only need a small portion of an

ultralow freezer (single shelf), yet feel the need to purchase their own ultralow because of a lack of a central cold storage facility and/or the "ownership" mentality described above.

c. **Laboratory buildings are currently among the most energy-intensive and expensive to support on campuses. This unabated consumption has likely driven an increase in the ICR rates. Green lab efforts show that the utility requirements can be greatly reduced if the scientists are engaged. More scientists would be engaged if federal funding were tied to this consumption more directly.**
   i. Because university scientists are not directly responsible for the utility costs associated with their research, and because granting agencies do not require scientists to purchase/use energy efficient equipment and processes, scientists rarely consider the impact that their equipment or experiments have on energy and water consumption, and/or waste generation. Furthermore, there are currently no energy efficient ratings for lab equipment and thus, no impetus for manufacturers to design energy efficient lab equipment. An expectation from granting agencies that funds be spent on energy and water efficient equipment would help bring change quickly.
   ii. Duplicating equipment also results in greater need for overhead funding for utility costs and space.
   iii. Water aspirators for vacuum and single pass water cooling lead to extensive water use in labs which could be avoided.

Ideas about adjusting current funding policies to ensure both continued impact and sustainability of the NIH-supported research enterprise. We welcome responses that point to specific strengths or weaknesses in current policies and suggest how we can build on or improve them.

1. **Connect grant funding with policies/requests/encouragement asking for equipment sharing and minimizing equipment duplication to benefit efficient spending of grant funding. The NIH Shared Instrumentation grants fit this need for expensive equipment, but it is also needed for grants funding the day to day operations of labs including less specialized equipment purchases** under $50,000 (the lower limit of the NIH Shared Instrumentation Grants) such as floor centrifuges, biosafety cabinets, microscopes, and incubators, Ultra Low Temperature freezers, gel imaging systems, and many other pieces of equipment related to biomedical research.
   a. This would support compliance with Uniform Guidance CFRs 200.313 c2 & 200.318 d requiring equipment sharing and avoiding duplication.
   b. This would also benefit conservation objectives in EO 13693, and getting the best value from tax payer dollars spent on lab equipment by maximizing equipment use.
   c. University of California-Santa Barbara (UCSB) has implemented a shared instrumentation on-line tool (http://www.sharedinstrumentation.ucsb.edu/), the software for which UCSB is willing to share for free with other institutions.

2. **Connect grant funding with policies/requests/encouragement asking for energy or water efficient lab equipment purchases to help keep the need for overhead funding as low as possible.**
   a. Resources and groups exist that can help with this effort, such as:
      i. International Institute for Sustainable Laboratories (I2SL) and its associated green labs community
      ii. GSA's SFTool.gov (https://sftool.gov/explore/green-workspace/89/laboratory)
      iii. NIH's Guide for the Selection and Purchase of Energy Efficient Equipment for Research Laboratories and Healthcare Facilities, which is in the process for being released

iv. The Biomedical Equipment and Supplies category of the Green Procurement Compilation (https://sftool.gov/greenprocurement) is where energy/water efficient products can be added as they are identified
v. EPA has been working on an Energy Star rating for lab grade refrigerators and freezers (http://www.energystar.gov/products/spec/laboratory_grade_refrigerators_and_freezers_specification_version_1_0_pd)

3. **Incentivize universities to use a percentage of the ICR rate towards green lab projects on campus.**
   a. If a portion of the ICR is put towards energy/water/waste reduction projects or initiatives in the labs, then scientists will be more inclined to change behaviors in the lab to "green" biomedical research. If incentives were provided from the indirect cost structure to purchase energy efficient equipment, scientists would be more likely to purchase the energy efficient model and feel good that their grant dollars are helping to reduce the environmental impact of their research.
   b. In general, universities report that ICR funds are not covering all the indirect costs related to supporting federal funded research on their campuses now. This idea would best be received if there is a way to implement it in a manner that would also be of benefit to the university financially.

4. **Incentivize grant recipients to increase lab sustainability practices in their labs by making lab sustainability part of the award process.** For example, some scientists are required to provide the biosafety practices and aspects of their proposed research. A short summary of lab sustainability practices as part of the grant review process would send a clear message to researchers that the NIH supports sustainability in biomedical research and participation in a green labs program or a sustainability recognition program that could be administered by a campus sustainability office or EH&S department.

Ideas for new policies, strategies, and other approaches that would increase the impact and sustainability of NIH-funded biomedical research.

1. RFPs, communications (such as webinars, etc.), and required training could incorporate policies and requests from the NIH for efficiency, such as equipment sharing and selection of energy efficient equipment as described earlier.
2. Incorporation of efficiency into grant proposals, such as utilizing existing campus equipment and resources to accomplish more research with less funding, could be a part of the grant award selection criteria as described above.
3. Perhaps there could be funding opportunities, requests, or encouragement by NIH for university departments to create shared spaces with shared equipment managed by a facility manager.
4. NIH could encourage universities to hire an individual with lab experience and knowledge of biomedical equipment to act as a resource to help implement efficiency efforts, such as identifying energy efficient equipment and the creation of shared equipment facilities. This could be someone that is hired to run a green labs program within the university sustainability or environmental health & safety offices. NIH could in effect encourage universities to develop and implement a formal Green Labs program to make their lab operations more sustainable.
5. NIH could request that university campuses implement on-line shared instrumentation tools like the one from UCSB (http://www.sharedinstrumentation.ucsb.edu/) which UCSB is willing to share with other campuses (contact 'Amorette Getty' amorette@mrl.ucsb.edu)

6. NIH policy documents could be updated where needed to reflect Executive Order (EO) 13693 and Uniform Guidance requirements such as 200.313 c2 & 200.318 d requiring equipment sharing and avoiding duplication.
7. NIH could encourage universities to create centralized cold storage facilities that have a cost associated with sample storage and/or encourage scientists to implement cold sample storage best practices, such as enterprise-scale databases with value priorities and search potential, monitoring of freezers for temperature and power control, adoption of room temperature dry storage, efficient freezer purchases, regular sample disposal events, freezer maintenance programs, or fee for service centralized freezer storage facilities.
8. Water aspirators for vacuum needs and single pass water cooling could be prohibited/discouraged from federal grant receiving laboratories unless an exemption is applied. Not only do they result in significant water use that can be avoided, but "soft" plumbing that has snap-together or press fit connections often used in single pass water cooling occasionally come apart and have tremendous risk potential in the hundreds of thousands of dollars, as documented on almost every campus.
    a. Air cooling is often an option for small scale cooling, and inexpensive closed loop systems are options as well.
    b. Using chilled water loops is preferred, and needs emergency power to pumps.
    c. Medium sized chilling units are discouraged unless reject heat is vented to exhaust
    d. Single pass cooling should always be on-demand, with economizers if possible, and the site should have a plan for phasing in closed loop cooling.
9. NIH could also encourage applicant universities to develop green purchasing among the lab users. Through this process lab users are directed to procure energy star lab equipment, sustainable materials and green chemicals for their research.

Any other issues that respondents feel are relevant.

1. The suggestions described in the sections above fit within the topic of "greening grants", which is not only about reducing the environmental footprint of research but, importantly, is also about the efficient, effective use of federal dollars to maximize research funded with existing federal research budgets.
    a. While this submission has focused significantly on equipment sharing and energy/water efficient equipment purchases, other green lab efforts could also be included:
        i. Lab ventilation upgrades and implementation of laboratory ventilation management plans which benefit energy efficiency, comfort, and safety
        ii. Efficient and effective utilization of lab space and fume hoods which can be of benefit to research and reducing the need for funding of more buildings. Avoidance of duplicate equipment purchases and increases in sharing existing equipment can free up lab space for new PIs and reduce the need for additional laboratory square footage.
        iii. Chemical inventorying and management promoting the efficient and effective use of chemical resources on university campuses, and promoting the use of less toxic chemicals in the lab. This would benefit health, the environment, and help minimize chemical purchases. University of Michigan has implemented a ChEM Reuse program to redistribute surplus or unneeded Chemicals, Equipment and Materials. Similar programs can be implemented elsewhere.
        iv. Minimizing single use plastics in research would benefit cost savings, minimize manufacturing of plastics, and reduce solid waste. Efforts could also focus on creating lab supplies that can be recycled.
        v. Enterprise sample databases to review, access and cull samples.

vi. Partner with utility rebates for freezer monitoring for performance and predictive failure.

2. Since a healthy environment does benefit human health, reducing the environmental footprint of research is in line with the mission of NIH. For example, http://www.nytimes.com/2015/05/05/health/epa-emissions-plan-will-save-thousands-of-lives-study-finds.html?_r=0
3. NIH could look at what HRSA has already done to integrate sustainability into environmental assessment, grant review/award criteria, technical support and allowable costs. A similar approach could be implemented not just for NIH grants that support construction and renovation but also NIH grants that support day to day operations of lab research.
4. A May 29, 2015 meeting on "greening grants" will take place from 8:30AM-12:30PM at the end of the DOE Summit at the Washington Marriott Wardman Park Hotel, 2660 Woodley Rd NW, Washington, D.C. 20008, Room Delaware B. It would be a real benefit to have NIH OER at the meeting. For more information and an invitation, contact philwirdzek@i2sl.org or kramirez@colorado.edu
5. Importantly, universities and scientists are wary of additional unfunded mandates in connection with federal research funding. Are there ways to move toward suggestions, like those made in this submission, without increasing the administrative or regulatory burden on universities and scientists? Is it possible for NIH to raise awareness about its expectations and as a result those expectations bring about cultural changes that influence what scientists submit (for equipment funding requests, for example) in grant proposals and influence the review/selection process without the need for additional regulations?