FASEB
Federation of American Societies for Experimental Biology

Representing 125,000 Researchers

301.634.7000
www.faseb.org

9650 Rockville Pike
Bethesda, MD 20814

The Federation of American Societies for Experimental Biology (FASEB) appreciates the opportunity to provide feedback to the Request for Information (RFI) from the National Institute of General Medical Sciences (NIGMS) entitled "Strategies to Enhance Physician-Scientist Training though the NIGMS Medical Scientist (MD-PhD) Training Program (MSTP)." Comprising 31 scientific societies which collectively represent 125,000 biological and biomedical researchers and clinicians, FASEB supports the goal of strengthening training for the next generation of physician scientists. The Federation commends NIGMS for engaging the training community with this RFI, and hopes it will continue to seek input from stakeholders as it moves through the process of writing a new MSTP-specific institutional predoctoral training grant funding opportunity announcement. Below are FASEB's responses on some of the many issues raised by NIGMS for comments, submitted online at https://www.research.net/r/NIGMS_MSTP_RFI.

A1. Impact of the time at which trainees apply to and enroll in MD-PhD programs (e.g., before, during or after the first year of medical school) on identifying the trainees most committed to and promising for a physician scientist career.

The vast majority of individuals who apply to dual degree programs do so prior to entering medical school, and this has historically provided a robust pool from which to choose. However, there is evidence indicating that the recruitment of applicants who have already matriculated to medical school provides opportunities for qualified individuals to enter into MD-PhD programs. Whether these individuals should be recruited during or after their first year of medical school would depend on their level of research experience prior to entering medical school. It is also important to consider whether there should be increased opportunities for current medical students to gain research experience before applying to MD-PhD programs, such as more support for medical student summer research programs and year-out experiences, that will better prepare them for entrance into MD-PhD programs. Additionally, such opportunities may ultimately provide those who did not obtain research experience as an undergraduate with opportunities to be considered by MD-PhD programs, and may increase recruitment of applicants from populations underrepresented in medicine (UIM). These opportunities would supplement, not supplant, the recruitment of students into MD-PhD programs before they start medical school.

A2. Best practices for selecting candidates, including strategies to identify promising candidates who may not have had prior research exposure.

It is not clear at this point what strategies would effectively identify applicants who have had no prior research experience and predict their future success as physician scientists. MD-PhD programs traditionally have focused on recruiting applicants who have significant research experience and who exhibit high levels of scientific acumen based on their ability to clearly articulate their understanding of the significance, methodology, results, and future implications of the research in which they have been engaged. It is generally accepted across the spectrum of MD-PhD programs that the above applicant characteristics, along with evidence of motivation and resilience, provide the best indicators of future

success as physician scientists. It should be noted that the types of research experiences applicants engage in can be diverse in nature as long as they provide applicants with clear appreciation of what research entails.

A3. Strategies of recruitment that could potentially enhance the diversity of trainees enrolled in MD-PhD programs.

Pending acquisition of additional data, there is evidence to support the effectiveness of Postbaccalaureate Research Education Programs (PREP) for enhancing the recruitment of underrepresented minorities into MD-PhD programs. Additionally, a number of MSTP institutions have set up summer programs specifically for UIM individuals to work in MD-PhD labs, funded either by NIH R25 grants or by the institutions themselves. In addition to exposing these individuals to research, the summer programs feature near-peer mentoring by current MD-PhD students, practice presenting their research, and help with the admissions process. These types of programs result in more UIM participants matriculating to MD-PhD programs than those that offer general research experiences. Going forward, continuing and perhaps increasing support for such programs, through additional R25 opportunities or, better, through supplements to MSTP T32 awards, is warranted. Such endeavors should be complemented with efforts to enhance retention of UIM individuals in combined degree programs and, subsequently, in the biomedical workforce.

B1. Possible impact of changes to the current economic incentives during MD-PhD training (e.g., the requirement for trainees to bear some of the training costs) on MSTP applicant pool and the range of institutions that apply for MSTP support.

If students enrolled in MD-PhD programs are faced with increased financial burden, this could negatively impact the number of applicants to combined degree programs, significantly alter the specialties that applicants choose and thereby affect their retention in the physician scientist workforce, and likely would have a disproportionate negative effect on UIM applicants and those who are economically disadvantaged. If some form of payback were required, the lure of lucrative clinical jobs may override trainees' desire and intent to pursue research careers in order to fulfill that financial obligation, contrary to the goals of MD-PhD training programs. Therefore, any initiatives that would increase the financial burden for individuals in MD-PhD programs should be carefully evaluated to assess their potential effects on the physician scientist workforce before being implemented.

C2. The essential knowledge and skills required of physician scientists to be successful researchers and leaders of the biomedical research enterprise in academia, industry, and government.

In order to define the knowledge and skills physician scientists need as successful researchers, it is important to determine how they differ from PhD-trained researchers and non-research clinicians. This excerpt from *The Road to Becoming a Biomedical Physician Scientist in Pathology and Laboratory Medicine* (Gotlieb, A., ASIP Committee for Career Development and Diversity, 2017; see also http://www.asip.org/CareerPath/index.cfm) provides a good description of physician scientists' unique role:

> "On the one hand, the physician scientist brings the rigors of scientific investigation into the patient care arena and on the other hand, the physician scientist's contact with disease brings clinically relevant questions into the research arena to drive investigations into pathogenesis, prevention, diagnosis, prognosis, and treatment of disease…Both clinical care and research benefit enormously from this cross fertilization of knowledge discovery and critical thinking."

Rigorous training in research and a medical discipline/specialty provides the technical and intellectual skills that form the foundation for success for physician scientists. Digging deeper, in order to advance fundamental research with the potential to address significant deficiencies in the clinic, physician scientists must have the ability to:

- Identify open questions in patient care for which there is a lack of strong evidence and that can be addressed by a research endeavor
- Work across scientific disciplines to foster convergent scientific endeavors to address critical needs in patient care through team-based approaches
- Bridge the gap between laboratory findings and clinical realities
- Plan, conduct, and analyze properly designed and sufficiently powered clinical trials
- Manage and lead diverse teams of individuals in research and/or clinical settings, and
- Interpret and communicate the importance and relevance of both basic and clinical research results.

C3. The alignment of currently available MSTP graduate research training areas with the future needs of the biomedical enterprise.

The need for individuals skilled in informatics is dramatically apparent. This is an area of training that needs to be expanded.

C5. Potential approaches to decrease the time-to-degree for MD-PhD training.

Our researchers expressed differing opinions as to whether decreasing the time spent in training would adversely affect trainees' preparedness for the rigors of the research and clinical components of their careers. Many believe that the four-year average for obtaining a PhD in most MD-PhD programs is pushing the lower limits of how quickly students can reasonably complete their dissertation research and do not advocate trying to cut time from the research portion of MD-PhD training. Others, however, think that because many students take graduate courses and pursue research rotations during their first two years of medical school, finishing their research in three years is certainly feasible, even reasonable.

Some also think there could be room for savings in the medical education space, citing the family and internal medicine models of counting fourth year electives towards residency, as well as the growing number of medical schools experimenting with three-year programs. This was countered by those expressing the view that the training received in all four years of medical school is valuable and necessary. Collecting, assessing, and publishing comparative data on student performance on board

examinations, performance during residencies, and career outcomes for graduates of three- and four-year curricula would help inform the discussion on the effectiveness of compressed medical education. However, the appropriateness of three-year medical school for MD-PhD training programs should be decided upon by the individual programs themselves.

Ultimately, FASEB strongly urges NIGMS not to prescribe a certain length of time for MD-PhD training, but to allow flexibility at the institutional level as well as for individual students. If trainees from a certain program consistently take longer than the eight-year average to graduate, this could warrant scrutiny. However, given the unpredictable nature of biomedical research and the myriad life events that may interrupt training, we again stress the importance of flexibility—within reason—by both NIGMS and individual training programs.

C6. Approaches to encourage MSTP participants to pursue research careers in academia, industry, and government.

When considering this topic, the question was raised whether MSTP students today **need** encouragement to pursue research careers. There have been reports and research articles for the past four decades decrying the imperiled status of physician scientists; however, extensive unpublished as well as published data demonstrate that physician scientists with MD-PhD degrees are well represented in the research workforce proportionate to the number trained. An analysis from 2010 of career choices of MD-PhD graduates (Brass et al., Acad. Med.) supports that high percentages of them transition to careers in academic medicine, reporting that 67-68 percent of alumni were employed at academic centers. Additionally, four percent were employed at research institutes, and eight percent in industry. Of those in academia, 64 percent reported devoting at least half their time to research, and 39 percent reported that research activities accounted for at least three-quarters of their time. Furthermore, NIGMS' own study showed that MSTP graduates hold a slight but significant advantage over the total MD-PhD population in establishing productive research careers (1998 report).

Research from FASEB on the training and career trends of physician scientists (Zemlo et al., FASEB J. 2000; Garrison and Deschamps, FASEB J, 2013) suggests that the shortage of physician scientists is due to a decrease over the past three decades in MD-trained investigators with NIH-supported postdoctoral training awards, both T32 traineeships and F32 individual fellowships; who report research as their primary professional activity; who are faculty in basic science departments at medical schools; and who obtain first-time R01 awards. Data for MD-PhD-trained investigators over the same time period show slight increases for the same measures.

These data show that the MD-PhD physician scientist population, and the MSTP-trained subset in particular, is successfully transitioning into research careers. These data do highlight, however, the importance of safeguarding MSTP-supported MD-PhD training programs to guarantee the continued entry of physician scientists into the research workforce.

D2. Approaches to evaluate outcomes and to measure the success of MSTP-funded MD-PhD training programs.

Part of the difficulty in measuring success is determining what count as "acceptable" outcomes for MSTP-supported MD-PhD trainees. The 2014 Physician-Scientist Workforce Working Group Report defined physician scientists as those with professional degrees and training in clinical care who are engaged in and devote a majority of their time to independent biomedical research. If achieving an independent research career is the gold standard for "success," this discounts, or at least minimizes, many other viable and important career paths for physician scientists. Physician scientists employed by pharmaceutical or biotechnology companies probably would not be considered "independent researchers," nor would those engaged in regulatory research at the Food and Drug Administration, nor even those who remain in academia who have found their niche in collaborative, team science endeavors. Yet they all still make significant contributions to biomedical and clinical sciences. FASEB advocates recognizing and embracing both the wide variety of careers available to physician scientists and the value of contributions made outside academic medicine.

That said, because a majority of MD-PhD trainees do achieve independent research careers in academia (Brass et al. Acad.Med. 2010), an assessment of their productivity and impact should be included as a component of MSTP-supported MD-PhD training program evaluation. FASEB suggests using an influence metric that accounts for time in research, such as the m-index (or h_m-index), that will help minimize any longevity advantage more established programs may have.

D3. Geographic distribution of MSTP-supported MD-PhD training programs across the nation.

When evaluating MSTP-supported MD-PhD training programs, the focus should be on the strengths of their research and clinical training as well as the geographic distribution of their student populations, regardless of the location of the training site. That said, in order to better reach rural areas and recruit students that reflect the diversity of our country, MSTP-supported MD-PhD programs could partner with satellite campuses (for programs at state universities) or smaller and/or regional universities (for programs at private universities) to allow students to take, for example, first-year courses close to home before transferring to the MSTP school for the duration of their training. Additionally, programs located in regions of the country that have a high density of UIM applicants should not be penalized for successfully recruiting them but consequently decreasing the total geographic diversity of their trainee population.

D4. The optimal number of MSTP-supported MD-PhD training programs and the optimal number of students each MSTP supports.

The optimal number of MSTP-supported MD-PhD programs nationally should be based on the number of institutions that can provide the necessary infrastructure, resources, and student applicant pool to successfully train future physician scientists. The optimal number of students in any given program should be flexible and based on the infrastructure in place at that institution to support their training, with consideration given to the level of support provided by the institution relative to the support provided by the MSTP mechanism.