

Commentary: Meeting the Challenge to Train the Next Generation of Endocrinologists: Filling, Diversifying, and Plugging Leaks in the Career Pipeline

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A talented and well-trained scientific workforce is essential to advancing our understanding of human biology and improving health. This has been a national priority since the formation of the National Institutes of Health (NIH) in the 1930s, ultimately resulting in an unprecedented advance in basic knowledge and improved health both within the United States and worldwide. The NIH has had laudable success in training an effective biomedical workforce, but there is an impending crisis that may compromise the long-term stability and competitiveness of the workforce in which we have invested so much over the past century. This crisis is brought on by a number of converging factors that, left unaddressed, will reduce the attractiveness of biomedical research as a career. These factors include the long training times and lower wages of biomedical scientists relative to other science, technology, engineering, and mathematics fields, the aging of the biomedical workforce, and the difficulty for young scientists to find stable, independent research positions. Ultimately this will compromise our ability to stay at the forefront of scientific and medical research. The impact of this crisis is compounded by the recognition that our global competitiveness is dependent on remaining at the forefront of research, and it is essential that we continue to attract the best and brightest minds to carry on the biomedical research enterprise. The issue of old vs new has raised its profile in the public consciousness to the point that Public Broadcasting System News Hour recently ran a story on “Graying Academia” to highlight the generational conflict (1). Further, the changing face of the US population cannot be ignored. By 2050 the US population will be

much more diverse than it is now, with nonwhites making up well over 50% of the population (2). Although this sounds far off, considering that the average age at first independent award is 42, those children born today will not yet celebrate the award of their first R01 by 2050. A freshman entering college this fall will not be celebrating their first award until about 2040, around the time when the 50% mark will be passed. Our workforce is already committed for that date, and we are at risk of neglecting to plan wisely for the future or else falling irretrievably behind in our diversity. As a society, both national and professional, we must ask ourselves “How do we assure that our children today will be the leaders of tomorrow?” And we must recognize that the decisions we make today will have an impact on that generation. If current trends continue, those in academia will look nothing like those they are teaching or who make up their research teams. In the strict objective thinking of a scientist, this may not seem to matter, but in the sociological context of the interaction of role models and mentors, the pale gray temples of those in the ivory tower or hallowed ward will have little in common with those they are educating; under these conditions, the effectiveness and ability to train and inspire the next generation will potentially be reduced. This problem is not restricted to the United States. Similar challenges face young researchers across the developed world as populations age and national resources are stretched to meet ambitious social obligations while maintaining the level of investment in the scientific and medical enterprise to foster the growth and competitiveness necessary to keep up with the global economy.

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Abbreviations: FLARE, Future Leaders Advancing Research in Endocrinology; MAC, Minority Affairs Committee; NIDDK, National Institute of Diabetes and Digestive and Kidney Diseases; TCDCC, Training and Career Development Core Committee.

The recent NIH report on the Biomedical Workforce (3) has detailed a number of problems with our current training model and has called for redefining our approach to training new scientists. A particularly alarming trend is the increasing age of our academic faculty and the inability of current policy to reduce the average age of first award, a situation that compels many of our youngest and brightest to spend their most creative years in a holding pattern for over a decade before establishing an independent research program. A strong argument can be made that we are currently not selecting our best for academic positions, but rather those that have not yet found more gainful employment in the private sector. The Biomedical Research Workforce Working Group has even suggested that an overall reduction in numbers of trainees be implemented, much like the reorganization of medical education in the early 20th century that was implemented following recommendations in the report of Alexander Flexner to the Carnegie Foundation (4). The Flexner report was the result of an extensive examination of medical education in North America by the American Medical Association and resulted in a number of recommendations intended to harmonize and set minimum standards for medical training as well as control the number of practitioners. Although our current model of training young scientists was originally proposed by Vannevar Bush (5) in the closing years of World War II, not all the recommendations of this complementary report were followed, especially in the realm of removing barriers to higher education, balancing the numbers of scientists trained with other national priorities, and providing stable levels of funding. Thus we have ended up with widely differing professions in which the Ph.D. workforce has exceeded the capacity of the academic job market (6). Although realigning graduate research education along the model of medical education is tempting, we must keep in mind the consequences of that restructuring. Implementation of the Flexner report led to the loss of institutions willing to train those with limited means to support extended medical education, especially minorities and women. Another unintended consequence was increased cost and reduced access to medical care. Thus, well-intended reform institutionalized many of the disparities that persist to this day in the medical profession and healthcare delivery. It is imperative that we rethink our goals in training highly skilled research scientists and redefine what a successful training outcome is while taking steps to avoid repeating the mistakes of the past. Therefore we are faced with 3 general challenges: How do we assure that we are training sufficient numbers of the best scientists and physicians of tomorrow? How do we ensure that they reflect society at large so that our investment in science and medicine is

relevant and meaningful to the nation as a whole? And finally, how do we support the development of young scientists and physicians through the exceptionally long years of training that culminate, well into their middle age, in independence as a researcher?

Although this is a general concern of the entire research enterprise, these questions are also particularly important to The Endocrine Society. As a long established scientific society, the membership has experienced all of the shifts in the prominence and focus on science of the past century and has kept pace with science in this century, all the while continuing to be a leading scientific organization. The Endocrine Society has recognized these questions and has begun to address them. The Society's goals as stated in the new strategic plan for the Society, implemented by past president Kelly Mayo, Ph.D. (7), incorporate plans for addressing these needs. Under Direction II, we are charged to deliver a dynamic portfolio of programs and services that enrich the professional lives of Society members across the continuum of their careers. Therefore, it is the charge of the Society to provide career guidance and development to its membership at all significant points of career transition. By providing this service, we assure our youngest members that they will receive the best training and opportunity possible to aid in navigating their careers. In conjunction with the new strategic goals, the Society's committees, particularly the Training and Career Development Core Committee (TCDDCC), and the Minority Affairs Committee (MAC) have also turned their attention to these issues. The committee membership should be credited with bringing these issues and concerns to the forefront of The Endocrine Society's activities. Although much of the Society's membership is familiar with our educational programming and board review offerings, our activities are much broader. Many of us may not be aware of all the activities we are engaged in or realize how they are connected. Also, the Society's efforts are evolving and there is certainly room for improvement and innovation. By outlining our activities here as summarized in Table 1, we hope to raise awareness of our activities and inspire our membership to contribute to our efforts and bring their creativity to bear on the issues facing us.

The Society has two major programs that seek to increase and diversify the trainee and membership pipeline. These programs reflect our need to raise awareness of the field and engage young students actively in the research enterprise in order to encourage their interests in careers allied to the membership of The Society. All of these programs can be found on The Endocrine Society's web site (www.endocrine.org) with details of eligibility, program structure, and application dates.

Table 1. Summary of Endocrine Society Programs Supporting Training and Career Development

Constituency	Program
Undergraduate	Summer Research Fellowship, Minority Access Program
Graduate/medical student	Early Career Forum, Summer Research Fellowship, FLARE
Postdoctoral/medical fellow	Early Career Forum, Early Investigators Workshop, FLARE, International Endocrine Scholars Program
Early-/mid-career faculty	Promotion and Tenure Workshop

These programs support both research experience and mentorship of trainees. FLARE and Minority Access Programs are NIH-funded programs that support advancement of underrepresented minorities in research. Web sites for Endocrine Programs are listed below.

Summer Research Fellowship: http://www.endo-society.org/awards/research_fellowship/summer.cfm.

Minority Access Program: http://www.endo-society.org/awards/research_fellowship/summer.cfm.

Early Career Forum: http://www.endo-society.org/awards/ENDO AwardsGrants/trainee_day.cfm.

FLARE: <http://www.endo-society.org/minorityactivities/future-leaders-advancing-research-in-endocrinology.cfm>.

Early Investigators Workshop: http://www.endo-society.org/awards/ConfTravelGrants/clinical_investigators_workshop/.

International Endocrine Scholars: http://www.endo-society.org/awards/SocietyAwards/international_endo/.

Promotion and Tenure Workshop: <http://www.endo-society.org/trainees/tenuretrackworkshop.cfm>.

Summer Research Fellowship Program

For many years the Summer Research Fellowship Program was the primary mechanism by which The Society could foster research experience from its youngest trainees. In its current form, this program supports up to 20 trainees every summer, supporting both their attendance to the Annual Meeting and 8-10 weeks in a mentor's research laboratory. We hope, in the near future, to debut a more enriching program in order to increase the contribution to our training pipeline and strengthen the mentorship and career development of participants.

Minority Access Program

The Minority Access Program is the successor to the original Short Courses in Endocrinology Program that brought endocrinology to minority-serving institutions through guest lectures and campus visits. This program changed under the leadership of past president Margaret Shupnik, Ph.D., to more actively engage young scientists. This program is unique in that it spans 2 summers of an undergraduate career. The first summer includes mentored attendance to The Annual Meeting followed by a paid summer of research at one of 4 campuses across the United States. In the second year, participants share their research at The Minority Mentoring and Poster Reception held at each meeting and serve as peer mentors to the new incoming students. Headed by Steven Anderson, Ph.D., and Mark Lawson, Ph.D., with participation of the Training and Career Development Core Committee and the MAC, this is a unique program that is jointly funded by The Endocrine Society and a grant from the National Institute of General Medical Sciences that addresses The Society's desire to diversify the training pipeline by tapping

the pool of students that are not attending major research universities but who are interested in research careers.

The Society has 3 distinct programs targeting the career development of both basic and clinical trainees. These aim to support the development of graduate, postdoctoral, resident, and clinical fellows. These trainee members are at a crucial point in their training and need The Society's support in navigating the early stages of an independent career.

Early Career Forum

Previously known as Endocrine Trainee Day, the Early Career Forum takes place the day before the opening of the annual meeting of The Endocrine Society. Based on participant feedback and input from the TCDCC, the program has evolved over the years to address the needs of both basic science and clinical trainee members of The Endocrine Society by providing a selection of sessions addressing everything from choosing a career direction, polishing up interview skills and resumes, to getting started in a laboratory or practice. This program has grown over the years and serves as a baseline experience for our trainees from which they can pursue other forms of career enrichment. Highlights of this program include joint sessions emphasizing the connection between basic and clinical research and practice and individual tracks for basic and clinical trainees that provide in-depth instruction.

Early Investigators Workshop

The Early Investigators Workshop, also led by the TCDCC, is held each fall and is open to both basic and clinical researchers. This is a weekend-long program of

intensive and interactive sessions that provide the opportunity to connect with senior Society members in a small group setting that facilitates individual mentoring and guidance. This workshop addresses career transition issues with a focus on developing a competitive, hypothesis-driven research program. Experts in career development and research attend as workshop leaders, and participants have the opportunity for a more open and personal interaction.

Future Leaders Advancing Research in Endocrinology (FLARE)

This recently launched program addresses the challenge of maintaining diversity in our transition career pipeline by supporting the careers of underrepresented graduate students, postdoctoral fellows, and clinical trainees. This unique program headed by Dale Abel, M.D., Ph.D., and run jointly with the MAC and the TCDC, was developed in response to a call for applications by the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) requesting professional societies to implement programs supporting the early careers of underrepresented researchers in areas under the mission of NIDDK. This program was awarded one of the first grants in this initiative and is funded jointly with The Endocrine Society and a grant from NIDDK. This program includes a week-end-long leadership training course that focuses on individual development plans, mentoring in funding opportunities and laboratory management, as well as marketing, networking, and management. This program also supports the development of a strong networking system for fellows by providing them with the opportunity to connect with new mentors through The Society's Mentor Exchange and travel funding to visit their mentor's institution. Fellows selected for the FLARE network can also receive travel support to the annual meeting, which fosters the continuation of the mentoring relationship and provides an opportunity for fellows to serve as peer mentors to undergraduate students attending the meeting. Another strong component of the Future Leaders Advancing Research in Endocrinology program includes a 1-year internship that allows fellows the opportunity to participate in committee work with a Society leadership committee, to participate in outreach to undergraduates with The Minority Access Program directors, or receive support to participate in The Keystone Fellows Program.

International Endocrine Scholars Program

The international reach of The Society has outpaced the development of programs supporting our international

members. This is an active area of effort as we continue to explore ways in which we can foster the career growth of international trainees and support the activities of sister societies across the globe. The International Scholars Program implemented under the leadership of incoming president Richard Santen, M.D., is simple in concept and has met with considerable success. Through this program, The Endocrine Society facilitates matching postdoctoral endocrinologists with mentors willing to support their training and development. Scholars attend the annual meeting where they are also able to network with current and past fellows as well as share their research. Since 2003 this program has supported more than 100 international fellows.

Promotion and Tenure Workshop

Finally, at the next stage of career development is the transition from fellow or postdoc to an early career investigator. Inspired by the new strategic plan to address the needs of members at all stages of their careers, The Promotion and Tenure Workshop was inaugurated at last year's annual meeting in Houston. The program was developed under the leadership of Simon Rhodes, Ph.D., with the support of the TCDC. The purpose of this workshop is to provide junior and midcareer professionals with timely mentoring and advice on the process of tenure and promotion. The course is led by senior members of The Endocrine Society that are engaged in tenure review or have extensive experience in the area. Common success strategies and awareness of pitfalls and concerns are discussed with the goal of providing participants with the understanding necessary to navigate the process successfully.

Final Thoughts

As you can see The Endocrine Society has begun to develop a portfolio of programs that address all 3 of the issues above, development and diversification of the pipeline and support through the crucial career transitions of the early scientist. By providing the historical context and current challenges facing research training, we hope to underscore the importance of our training activities. These efforts are complemented by The Society's advocacy and outreach efforts to promote our agenda with our government leaders. Importantly, our efforts have been successful in terms of garnering NIH support for key programs that will provide us with the experience and expertise to broaden our reach and to be more effective in mentoring all members

of The Society. Our current portfolio is not complete or exhaustive, and we rely on the ideas and enthusiasm of our membership to refine our current programming and develop new novel approaches of highlighting and supporting our talented young membership, both domestic and international. The Society membership at large can support these activities by actively participating in our mentorship efforts, reaching out to those at the earliest stage of their careers and answering the call for participation in our many activities. All Endocrine Society members are asked to support these efforts through active committee service or by participating as mentors, panelists, or speakers at our courses and conferences.

As outgoing co-Chair of TCDCC, I have been humbled by the energy and creativity of those working on committees and supporting our activities. Everything that The Society does depends on the generous gifts of time and energy of the membership. Our activities and our focus depend on their input, their willingness to bring new ideas to the table, and especially their willingness to participate in their implementation. It is important for us to be clear that The Endocrine Society is aware of the issues facing young scientists today and will stand with and support them by providing the access to mentorship and training necessary to achieve success and excellence.

Acknowledgements

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