Published in final edited form as:
*J Invest Dermatol*. 2010 June ; 130(6): 1478–1480. doi:10.1038/jid.2010.65.

# Bridging the Translational Research Gap: A Successful Partnership Involving a Physician and a Basic Scientist

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"Translational research" bridges clinical and basic research to formulate research studies based on clinical observations and to implement the clinical applications of basic research. Although basic and clinical scientists have long collaborated, translational research challenges investigators to move beyond the traditional training of both laboratory scientists and clinicians. In 2007, we—a clinical researcher (Kong) and a basic scientist (Segre)—initiated an interdisciplinary project to characterize the human skin microbiota associated with both common and rare skin disorders (Grice *et al.*, 2008, 2009). We set out to better understand the cutaneous microbial landscape in healthy individuals and patients with atopic dermatitis through the use of genomic techniques. The project demanded an understanding of a combination of high-throughput sequencing technology and logistics of clinical research, with knowledge of the subtleties of dermatologic disorders. The requirements of rigorous translational research moved us both beyond the boundaries of our individual disciplines.

The paradigm for a translational investigator has been the MD–PhD scientist with training in both patient care and laboratory research. This model results in over 300 MD–PhD graduates per year in the United States, 5.9% of whom enter residencies in dermatology. Of the recent MD–PhD scientists who completed dermatology residencies, 56% (39 of 70) remain in academia and provide a rich source of researchers in the field of dermatology (Brass *et al.*, 2010). In the current state of research, there is an increasing need to build bridges between clinical and basic researchers to translate findings from bench to bedside and back again. Are we adequately preparing clinical researchers and basic scientists to bridge the translational research gap? If not, what skills do we need to learn and teach?

Seven years ago, former National Institutes of Health (NIH) director Elias Zerhouni highlighted the complexities and roadblocks inherent to modern translational research. He implemented the NIH Roadmap with the goal of bringing individuals from critical disparate disciplines into translational research teams (Zerhouni, 2003). His model foreshadowed our path toward collaboration. We participated in the NIH Roadmap's Human Microbiome Project with our study of patients with atopic dermatitis.



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CONFLICT OF INTEREST

The authors state no conflict of interest.

MDs interested in laboratory-based research face competing demands imposed by patient-care responsibilities. PhDs interested in clinical research face competing demands for projects with shorter turnaround times to publish manuscripts and to compete for grants. MD–PhDs face both sets of competing demands. In addition, it is difficult for PhD scientists to identify ways to work with clinicians and for physicians without a laboratory to find a basic researcher to coinvestigate a clinical question.

When we met, one of us (Segre) had training in genetics and basic cell biology, using only animal models and cell culture. The other (Kong) had training in dermatology and patient-oriented research. Although neither of us had prior experience with a translational research team jointly led by a clinical researcher and a basic scientist, our common enthusiasm propelled us into a high-risk research project that proved to be rewarding and fruitful. A critical issue was learning how to foster a collaboration that promoted translational research.

We discuss here what enabled our collaboration and highlight features specific to our interactions as MD and PhD. Although we believe that much of our experience is relevant to all collaborations, certain features were specific to the changing landscape of translational research and the inherent differences in our training.

## Maintain strong, open communication

Open, transparent communication is vital, including frank discussions about manuscript authorship, abstract and journal submissions, potential disagreements, meeting presentations, and a mechanism by which to make decisions on bringing in additional collaborators. Clearly outline the goals for each collaborator in the project, particularly for junior colleagues. Define timelines and how the combined efforts of the group will allow these goals to be achieved. We intermittently had disagreements and encountered misunderstandings, but issues were resolved with frank discussion. Each of the points delineated below is predicated on effective communication.

## Team building

*A priori*, we assumed that one large group meeting with all personnel would provide the best opportunity for communication. However, we quickly realized that many team members were engaged primarily in either patient care or molecular sequence analysis. Although it seems antithetical to building one team, we began to hold two separate weekly meetings with only the two of us attending both meetings. Vital information was lost if only one of us attended either meeting, because each of us had a different perspective on the many exchanges of information and data. Our clinical meetings focused on clinical protocol development, effective patient recruitment, accurate clinical phenotyping, and careful, timely specimen collection and storage. Our laboratory meetings reviewed molecular protocol development, technical challenges, sequence data analysis, and statistical methodologies. On an as-needed basis, individuals from one meeting attended the other to present data or to participate in troubleshooting. Quarterly, we held larger meetings involving all team members to assess progress and set the agenda for the next quarter.

How then does each individual on the team comprehend the responsibilities of other team members and how each person’s role affects the entire project? This requires each individual to develop a greater understanding of the role of team members with whom they directly interact and then use this knowledge to strengthen overall communication and operations. For example, after observing the DNA preparation method, the clinical team saved the laboratory staff frustrating hours at the bench by making simple, but important, changes to the sample-collection process. Similarly, tailoring the data entry and specimen tracking forms to mirror the medical-record forms minimized data errors.

In addition to these separate weekly meetings, the two of us devoted at least one hour per week to discussing milestones and roadblocks. We developed this particular arrangement over time, after realizing that we needed a deeper understanding of each discipline's strengths and major questions. Willingness to learn more about each other's area of expertise fosters an efficient transition from bench to bedside and back. Rather than the clinical medicine or the laboratory components remaining terra incognita to the basic scientist or the clinical researcher, respectively, we both work hard to comprehend all parts of the project. This approach enables each of us to understand more clearly the strengths, challenges, and realities of each discipline and of the project as a whole.

## Start with a small project

Before embarking on a complicated project with a new collaborator, begin with a more manageable project. This lays the groundwork for future endeavors by establishing a collaborative relationship. We began with a pilot study examining the feasibility of skin sampling for microbiome investigation (Grice *et al.*, 2008). The pilot study provided vital knowledge, not only about how to expand our skin microbiome investigation but also about how each individual functioned as part of the research team. Most importantly, the pilot project tested the question "who owns this project?" We crossed a major hurdle when the first microbial diversity sequencing data were brought to the clinic meeting for analysis. Prior to this, there had been unspoken concern that the basic researchers would retain isolated control over the intellectually rewarding component of the data analysis.

## Trust and respect each other

This element seems obvious, but trust only develops over time and is constantly being challenged. Former colleagues and mentors played an important role leading up to the initial meetings. For example, Maria Turner became more familiar with the work of the Segre lab through two long-time colleagues, and she also supervised and mentored Kong's fellowship. Turner brought us together to pursue what she visualized as a new way to investigate skin microbiota. We shared several other colleagues, and hearing from reliable colleagues that a potential coinvestigator is trustworthy carries significant weight. This emphasizes the importance of having a wide range of colleagues and keeping them informed about long-term goals. The field of dermatologic research is broad and highly interconnected, and it includes many whose expertise spans numerous arenas, such as immunology, pathology, and intriguing clinical observations.

## Negotiate missteps

On one occasion, Segre submitted a meeting abstract for the team, thinking that she was saving the others time. However, Kong potentially missed an opportunity to write and present the abstract at a shared meeting. Don't be afraid to admit that, however good your intentions, your actions were wrong—and correct your mistake. Obviously, it is important to avoid repeating mistakes. When the team was asked to present at NIH Clinical Center Grand Rounds, the task was better suited for Kong, as the clinician, to communicate the goals and findings of the study. This also brought Kong appropriate recognition for her role as the lead clinical investigator in the project. In turn, Segre presented at the Cold Spring Harbor meeting "The Biology of Genomes," which recognized her role as the head of a large-scale sequencing project. Understanding and respecting that each person brings a unique strength to the project form the foundation of an effective team approach to science. As our working relationship matured, we learned to build on each other's strengths and compensate for each other's weaknesses.

## Conclusion

To collaborate effectively requires one to be both a bit selfish and a bit selfless. Small individual sacrifices can achieve a higher satisfaction quotient for everyone. Conversely, stating what you need for professional recognition is an important part of participating in a collaborative effort, and it does not conflict with the goals of the rest of the group. There is often a mechanism in place for producing a win–win outcome if the team takes the time to evaluate the most important criteria for each individual's personal and professional success. Examples may include providing reasonable technical expertise and assistance to further a team member's research, which may be outside the scope of the main project, or alternating first authorship on submitted manuscripts.

Although the above approach to research may not apply well in all settings, we have established that an MD and a PhD can collaborate to perform translational investigation. We have moved from operating in separate spheres to building a coordinated research team that shares clinical samples, research trainees, and, most importantly, ideas. Each individual's involvement in this project was more than a preplanned career transition; it was a chance to achieve a personal goal. Although we have not addressed in this Editorial the process of securing institutional commitment and support, this is also a crucial element for the success of translational research projects.

The complexity of modern biomedical research continues to increase. What types of novel state-of-the-art technologies can be used in patient-oriented research? How can we foster relationships among researchers with different areas of expertise? Science has traditionally recognized single individuals as principal investigators of projects. By contrast, complex transdisciplinary projects often demand team approaches. Thus, team science creates challenges for traditional institutional mechanisms for recognizing scientific achievement. This issue is now being addressed with respect to funding mechanisms, authors'-contribution statements for publications, institutional promotion/tenure committees, and national and international organizations, such as the Society for Investigative Dermatology.

## Acknowledgments

We acknowledge Maria L. Turner for her vital contributions to this scientific endeavor and her career-long commitment to clinical medicine and intellectual curiosity.

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