Malaria Motivates Travel to Ethiopia

by Christina Mills

This past March, I made the daylong journey across the globe to Addis Ababa, Ethiopia. There, I joined a team of researchers at a capacity building meeting for malaria control, part of an ongoing collaboration between the Ethiopian government, the Harvard School of Public Health (HSPH), and the Kennedy School of Government (KSG). The trip was an amazing opportunity for me, a first year doctoral student in the HSPH Infectious Disease Epidemiology Program, to observe and participate in the development of national health policy. The six-day meeting brought together Ethiopian experts in a range of areas that reflect the diverse issues important for effective malaria control. Regional malaria program managers, physicians, epidemiologists, entomologists, parasitologists, ecologists, and meteorologists were all represented. The “farengi” (the Amharic word for foreigners) included HSPH Professor Andy Spielman, HSPH Professor Marc Lipsitch, KSG CID Malaria Program Manager Awash Teklehaimanot, Roll Back Malaria Team Coordinator Dr. Charles Delacollette, RA Anthony Kiszewski, Odessa Deffenbaugh and myself.

In Ethiopia, over two-thirds of the population are at risk of malaria. Since transmission is largely seasonal and as a result protective immunity is often low, many regions are subject to severe outbreaks. Recently, epidemics have become more frequent and resistance to treatments and insecticides more...
prevalent. Thus, prediction, early detection, and management of epidemics were major concerns of the workshop. For example, we discussed the predictive value of specific weather variables for level of transmission, the effect of corn pollen on mosquito fitness, and the sensitivity-specificity and cost-convenience trade-offs in using different malaria diagnostics. We also debated which anti-malarial regimens should be implemented on a national level. On the one hand, distributing the least expensive drug would allow the greatest coverage for a fixed budget. On the other hand, using the more expensive combination therapies may cure infections resistant to the single drug regimen and may slow the development of resistance, saving more lives in the long-run.

Over the course of the meeting and the ensuing week of field visits, research, economics and culture repeatedly emerged as important factors in malaria control. Although most Americans will never experience the pain of Plasmodium, malaria remains a significant health and economic burden for the world. There are over 300 million clinical cases of malaria each year and over one million malaria-related deaths each year. Whether it is in understanding mechanisms by which Plasmodium cause disease, or in developing drugs to replace those lost to resistance, or in assessing the long-term impact of interventions, there is a huge need for creative minds and top-notch researchers. For any new health technology to be sustainable in Ethiopia, it must be affordable. The cost of lunch at the Courtyard Cafe is about as much as the per capita yearly health expenditures for Ethiopia. Again, research is needed into how to make technologies like dipsticks for rapid diagnosis or insecticide impregnated bed nets as inexpensive as possible.

Finally, culture is a major factor in determining whether a scientifically sound intervention will become a practical solution to the malaria problem. Only 50% of Ethiopians have access to health facilities, but only 35% of Ethiopians actually use these facilities. In some regions, eating bitter things during pregnancy (like some anti-malarials) is taboo, making it difficult to prevent malaria-associated premature delivery, low birth weight and maternal death. In response to this problem of what is termed poor treatment-seeking behavior, Ethiopia is training village health care workers and mother coordinators to treat malaria in a village setting. Involving traditional healers in the treatment process will also be an important means to address the conflict between traditional and modern medicine. Seeing malaria from the perspective of a developing country was an invaluable educational experience for me as an HSPH student and as an M.D.-Ph.D. candidate. The experience was a real world reminder of the importance of bringing together medicine and research to solve public health problems. More importantly, I gained some insight into behind-the-scenes events that allow ‘bench-to-bedside’ to become a reality.

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A forum focused on new career pathways for scientists interested in human diseases met during the Days of Molecular Medicine conference in San Diego, which was hosted by UCSD, Salk Institute and Nature Medicine. Leon Rosenberg, past Dean of Yale Medical School, gave a compelling keynote address about a pressing issue concerning the research and medical communities; he and others have observed an alarming trend in the decrease of physician-scientists. Dr. Rosenberg began by explaining two different pathways of physician scientists. The first involves entering a traditional M.D.-Ph.D. program; the second involves deciding to pursue research during medical school or residency or beyond (also called the “late-bloomer” track). Although the numbers of physician-scientists who take the traditional M.D.-Ph.D. track are increasing, they only make up a small fraction of physician-scientists. The majority of physician-scientists are late-bloomers, and, it is this population that is rapidly decreasing in size. He speculated that the number of late-bloomers are dwindling due to several factors: 1) not all medical schools expose or encourage students to pursue research; 2) the large debt incurred during school is difficult to repay (on average, medical graduates leave with $99,000 in debt; and only 17% of medical students graduate without any debt); 3) older students frequently have additional family responsibilities. Organizations such as the American Medical Association, Association of Medical Colleges, American Society for Clinical Investigation, and the NIH Director’s Panel on Clinical Research have all voiced their concerns over the decrease in the pool of physician-scientists.

A panel of speakers posed new initiatives to address the physician-scientist shortage. One such initiative is the loan repayment programs of the Clinical Research Enhancement Act. Additionally, the NIH sponsors career development programs aimed at supporting physician-scientists. Other organizations, such as the Howard Hughes Medical Institute have pledged to appoint 5-10 new investigators performing patient-oriented research. Moreover, not-for-profit organizations (such as the Kirsch Foundation) provide support of physician-scientist training and career development. These were just a few examples of current approaches helping to alleviate the shortage.

Next, directors of various M.D.-Ph.D. programs discussed issues relevant to training physician-scientists. Nancy Andrews (Harvard) discussed the need for more role models. Ajit Varki (UCSD) discussed two concerns of M.D.-Ph.D. students—the time it takes to complete the program (time to graduate) and the time it takes to become established as a physician scientist (time to career). He cited the age of 39 as the current average age for getting the first R01 grant. To decrease residency training time, and thus alleviate “time to career,” Gerry Boss (UCSD) introduced a new “generalist physician-scientist pathway,” which, in addition to internal medicine training, would include three years of research without clinical responsibility. The discussion became particularly intense when one of the students asked if residency was necessary. Some strongly believed specialized training was essential to perform biomedical research; others thought residency was not required for basic research.

Another concern was the lack of underrepresented minorities graduating from M.D.-Ph.D. programs (only 6% among MSTP graduates from 1996-2000). Olaf Anderson (Cornell) presented an initiative called “Gateways to the Laboratory,” a ten week summer research and enrichment program for underrepresented minority students in freshman or sophomore year of college. This program, which includes components of research, clinical medicine, mentoring/career advice, and journal club, has been designed to encourage more underrepresented minority students to apply for M.D.-Ph.D. programs.

This forum was an outstanding opportunity to discuss pressing issues for M.D.s and Ph.D.s with interest in human disease. Moreover, this forum provided a unique opportunity to understand that no single training pathway can provide all the physician-scientists needed in the future. We will need researchers to link molecular sciences and disease through avenues such as the M.D.-Ph.D. program, M.D.s with post-residency research fellowships, and M.D.s in biotechnology, pharmaceutical, and academia doing patient-oriented translational medical research. Students from the various M.D.-Ph.D. programs, in particular, found the conference an excellent opportunity to share research and, as a community, support each other in the varied career paths to becoming physician-scientists.

Carolyn Rodriguez is a 6th year M.D.-Ph.D. Program student (HST, DMS-Neuroscience).
when I started. In the hopes that it might be helpful to those that may want to go this route, my answers to questions that people have asked me about the combined program follow:

Why do a combined program?
If you know you want to do either science or medicine just do it -- the time it takes to complete another degree can be better spent reaching a higher level of accomplishment in your desired field. The combined degree is useful, however, if you want to work in fields that require knowledge of both. Interdisciplinary experience is currently a highly sought after commodity. Many basic science departments, for example, are creating interdisciplinary research centers where basic scientists and physicians can interact and hopefully together come up with new ways to apply newly found scientific knowledge to medicine. Arguably, M.D.-Ph.D.s are ideal candidates for positions in such centers. Whether you eventually want to focus more on research, on medicine, or on the business side of science and medicine, the combined degree gives you a broad knowledge base from which to grow. Furthermore, by completing a combined degree you have shown that you can master not one but two very technical fields, which will give you the confidence to learn about new fields in the future and will give your sponsors confidence to support such efforts on your part.

What did you learn by doing a Ph.D.?
The Ph.D. is an in-depth investigation into a well-defined subject. Although scientific breadth is mandatory, the work need not have practical implications. There is much self-directed learning, with an emphasis on reading the current literature and determining the limits of the current work and data. In doing a Ph.D. you develop your own project, which teaches you how to frame an answerable question, identify risky experiments, and judge how long things take to come to fruition. Such creative endeavors can be challenging, fun and can lead to long-lasting change in the world, but I would caution people with an interest in completing clinical training against spending too much time getting their Ph.D. Abridging the Ph.D. too much, however, can also limit you to asking questions within projects that are already well developed and rob you of valuable experimental experience.

What did you learn by doing an M.D.?
The M.D. provided broader albeit more superficial training that had a strong emphasis on classic physiology, biochemistry, and molecular biology. Medicine is an applied discipline, so the breadth of knowledge you get is very practical — more friends and family will ask you for medical advice than for scientific advice. Clinical training emphasizes recognizing patterns of disease and on fitting them into already known disease patterns with little room for experimentation. Some effort is made to introduce students to the clinical literature, but the emphasis is not on learning to do research unless you take time off for such endeavors. Furthermore, medicine requires a high level of social interaction for one is constantly communicating with patients or other physicians.

How was the transition back to medical school after doing a Ph.D.?
For a variety of reasons the transition back to medical school can be rough. First, not only are there things you might have forgotten, but the things that you do remember might no longer be correct. Although it is good to try to refresh your memory about medical school before coming back, don’t extend your Ph.D. by more than a month for such efforts. Also, you can expect to feel isolated at times, for most of the people that you started graduate or medical school with are not doing a combined degree and do not
share that experience. To help with feeling less isolated especially during the transitions, I would recommend getting to know other M.D.-Ph.D.s, especially the ones that went back to the wards the year before you: these people give particularly good advice about rotations, the match, and other issues immediately relevant to someone who has been away from medicine for a while.

What advice would you give to help with the clinical years of medical school?

First some practical advice. The first rotation back you will be adjusting to life on the wards, so you may not want to schedule your most important rotations first. Try to come back by October so that you can complete your requirements on time and still have time to do advanced electives. As a Ph.D., there is some clinical forgiveness given to you, for it is understood that you have been away for a while and that you have other things to offer to a program besides your clinical expertise. Nevertheless, for your own peace of mind and pride, I would recommend working hard in the fields in which you hope to match. Work hard in your cores, especially medicine and surgery, for these are almost always included in the final letters for residency. Don’t panic, however, if you do not do well in a core rotation — a good letter from an advanced clerkship can make up for a less than stellar performance in a core rotation. Most importantly, however, get to know the people with whom you are training. Part of what you are evaluated on in the wards is your maturity, diligence, and ability to get along with others. Make sure that you show good team spirit and leave some time to develop professional relationships, especially with your attendings, who will eventually write your letters for residency applications.

Closing comments

My final words of advice would be to try to figure out your strengths and weaknesses, your likes and dislikes, and what makes you happy as early as possible. Then focus your efforts on maximizing your happiness, readjusting those goals as you grow. Education will give you the tools with which to pursue your dreams — your job is to discover what those dreams are and to make them happen. During my training I was lucky enough to be surrounded by people who were bright, motivated, caring, professional, and hungry for new knowledge. They inspired me to push the boundaries of what I thought I was capable of doing and supported me in my efforts to grow professionally and personally. The end of the M.D.-Ph.D. marks the beginning of what will hopefully be a lifetime of learning, so surround yourself with people who inspire you and push you to be the best that you can be the same way as during your training.

Elizabeth Speliotes is a 2002 M.D.-Ph.D. Graduate (Holmes, MIT-Biology).
I have been fortunate over the course of my graduate school studies. Not only have I been able to learn a great deal about how to conduct good science, but I’ve done this with extensive opportunities for travel. While various meetings and conferences covering cancer and the cell cycle have placed me pretty much all over the U.S., I had rarely spent much time in Europe. It was by chance that after hours of laborious PubMed searches, I stumbled upon a site that detailed a review course especially for cancer researchers. This course was to take place in London, England. Wow! London was pretty far away for a review course. After careful contemplation, I came to the conclusions that: One, I could use a global review of the cancer and cell cycle field, two, I’ll only be young once, and three, the mice needed some time alone anyway. So I booked my ticket and began to plan my trip.

I arrived in London a couple of days early in order to adjust to the change in time zones. After all, what good would a review course be if I was still on Eastern Standard Time in the middle of the apoptosis lecture. I immediately dropped off my things and headed out to see the sights. Ahhh! The large red double decker buses were just as I had imagined. I boarded the tour bus and began my trek through the city. I obviously had plans that were not as urgent as my need for rest. I dozed off somewhere after Buckingham Palace and subsequently missed Westminster Abbey, Harrods, and the London Bridge. Oh well, it all looked great in the tour booklet and couldn’t have been as appealing in the London winter rain. Did I mention the rain?

After a day or two of finding my way around the city, it was time for class. The course was entitled the Cellular and Molecular Biology of Cancer and classes were held daily at Hammersmith Hospital of the Imperial College from February 25-March 1, 2002. The lectures were divided into five major categories such that researchers, clinicians, graduate students and other medical professionals could choose which day or days they would attend. Day 1 focused on the ‘Molecular Mechanisms of Cancer Invasion and Metastasis’. Day 2 centered on ‘Hormones, Cytokines and Growth Factors’. On Day 3 the lectures covered the ‘Cell Cycle and Programmed Cell Death Control and Regulation’. Day 4 dealt with ‘Methodologies in Experimental and Clinical Laboratory Research’. The review course closed out on Day 5 with ‘High Throughput Technologies and Therapeutic Advances’. Being the New Pathway trained trooper that I am, I chose to attend all five days of the course — 35 hours of lectures. No big deal!

I immediately surveyed the registry list and soon discovered that I was one of three Americans among the three hundred or so attendees. It was interesting to see where people were from: Sweden, Norway, Austria, Germany, France, and of course the United Kingdom (UK). There was definitely a diverse representation. I ended up speaking with several of the other students and physicians about training in their countries. We discussed in great detail the similarities and differences of science and health care in our respective nations. While there were many curious and unique questions about the M.D.-Ph.D. track in America, questions about the longevity of the dual degree were just as frequent abroad as they are at home. Gee, is eight years really that long???

The lectures were pretty intense. While the overall content was very broad, they were packed full of information and historical data. We reviewed the cell cycle. We reviewed nuclear and growth hormone receptors. We analyzed new treatment options and research techniques. Perhaps the best parts of the conference were the two sections dedicated to new methodologies in research and high throughput strategies. It was truly informative to hear about the newest tools such as immunoglobulin chain libraries used for developing candidate antibodies in weeks or laser capture microdissection for sampling single cells in situ. It was interesting to note that most of the lecturers were from the UK. In addition, the majority of research data discussed was also from the UK or European labs. It was as if a parallel cell cycle world existed across the water. Aside from the mention of a few labs, the abundance of U.S. based cell cycle and cancer research was noticeably absent. This provided a different perspective of the same biology published here in the U.S.

Overall, I was reminded of many things I’d forgotten from my graduate school science courses and first year journal sessions. I also learned a great deal about new technologies and how our colleagues abroad are trained. My first trip to London definitely had to be considered a success. Being there however, really made me miss Boston and my small hometown in Georgia. Maybe it was due to being in a new and different environment. Perhaps it was the week or so in a strange bed. Maybe it was the lack of Chowder, or my craving for a bowl of grits. I think it basically was due to the fact that HMS is a pretty good place to do science. While it was nice to get away for a while, there is still plenty of work to be done. Is eight years really that long???

Bradley Carthon is a 6th year M.D.-Ph.D. Program student (DMS, BBS-Genetics).
Recent Publications


Recent Publications


* Equal contributors.
For the Record

Ph.D.s Completed

Alex R. Carter, Health Sciences and Technology, Neuroscience (DMS) at Harvard University [Rosalind Segal, M.D., Ph.D.] Neurontphin Modulation of Cerebellar Development and Synaptic Plasticity (12/01).

Lisa Catapano, Health Sciences and Technology, Neuroscience (DMS) at Harvard University [Jeffrey Macklis, M.D.] Stage-Specific Control over Neocortical Callosal Projection Neuron Survival and Differentiation (9/01).


Rubén Corral Fragoso, Holmes, Immunology (DMS) at Harvard University [Steven Burakoff, M.D.] Reconstitution of CD8 Single Positive T Cells Using a Chimeric CD8a-Lck Co-receptor Chain (11/01).

Anita Goel, Health Sciences and Technology, Physics at Harvard University [Dudley R. Herschbach, Ph.D.] Single Molecule Dynamics of Motor Enzymes Moving Along DNA (5/02).

Edmund Azeriah Griffin, Jr., Cannon, Neuroscience (DMS) at Harvard University [Charles Weitz, M.D., Ph.D.] Light, Cryptochrome, and Circadian Clocks (3/02).

Mayra Elisa Lorenzo Iglesias, Holmes, Virology (DMS) at Harvard University [Hidde Ploegh, Ph.D.] Downregulation of MHC Class I Molecules by Herpesviruses: Usurpation of Intracellular Trafficking Pathways (5/02).

Wynn Hugh Kao, Health Sciences and Technology, BBS-Pathology (DMS) at Harvard University [Peter Howley, M.D.] Degradation of E6AP in the Absence and Presence of HPV E6 (4/02).

Samuel Goddard Katz, Health Sciences and Technology, BBS-Genetics (DMS) at Harvard University [Stuart Orkin, M.D.] Regulation of Hematopoietic and Cardiac Development Mediated by the GATA Transcription Cofactor FOG-1 (5/02).

William Taylor Kimberly, Peabody, Neuroscience (DMS) at Harvard University [Dennis Selkoe, M.D.] Intermembrane Proteolysis and Signal Transduction: The γ-Secretase Complex and its Connection to Alzheimer’s Disease (5/02).

Mykol Larvie, Health Sciences and Technology, BBS–Biological Chemistry & Molecular Pharmacology (DMS) at Harvard University [Stephen Harrison, Ph.D. and Thilo Stehle, Ph.D.] X-ray Crystallography and Electron Microscopy of Cell Surface Receptors I. CD46 II. Transferrin Receptor (7/01).


Jeffrey Pai-Chin Lin, Castle, Virology (DMS) at Harvard University [Elliott Kieff, M.D., Ph.D.] Epstein-Barr Virus Nuclear Antigen 3C (EBNA3C) Regulates Transcription through Viral and Cellular Factors (9/01).

Kenway Louie, Cannon, Biology at Massachusetts Institute of Technology [Matthew A. Wilson, Ph.D.] Mnemonic information in the rodent hippocampus during wake and sleep states (5/02).

Mireya Nadal-Vicens, Peabody, Neuroscience (DMS) at Harvard University [Michael Greenberg, Ph.D.] Signaling Mechanisms that Govern the Switch from Neuronal to Astrocyte Differentiation in Neocortical Progenitors (9/01).

Carolyn Ines Rodriguez, Health Sciences and Technology, Neuroscience (DMS) at Harvard University [Susan Dymecki, M.D., Ph.D.] Innovating Genetic Technology to Map the Origin of the Precerebellar System (3/02).


Michael Wei-Chih Su, Health Sciences and Technology, Immunology (DMS) at Harvard University [Steven Burakoff, M.D.] Characterization of Signaling Pathways Induced by Agonist and Altered Peptide Ligands in the Fratricide of CD8+ Cytotoxic T Lymphocytes (12/01).

Channing Yu, Health Sciences and Technology, BBS-Genetics (DMS) at Harvard University [Stuart Orkin, M.D.] Genetics and Genomics of GATA-1 Function in Hematopoiesis (11/01).

BBS = Biological and Biomedical Sciences
DMS = Division of Medical Sciences, Harvard Graduate School of Arts and Sciences
For the Record

Class of 2002 Appointments

Vincent Aguirre, Internal Medicine, Brigham and Women’s Hospital, Boston, MA.

Jason I. Koontz, Internal Medicine, Duke University Medical Center, Chapel Hill, NC.

Chienwei Eric Liao, Plastic Surgery, Brigham and Women’s Hospital, Boston, MA.

Jerry W. Lin, Otolaryngology, New York Presbyterian Hospital-Columbia Program, New York, NY.

Jacquin C. Niles, Postdoctoral Research, Massachusetts Institute of Technology, Cambridge, MA.

S. Celeste Posey-Morley, Pediatrics, Duke University Medical Center, Durham, NC.

John Reppas, Postdoctoral Research, Neurobiology, Harvard Medical School, Boston, MA.

Rajat Rohatgi, Internal Medicine, Stanford University Programs, Stanford, CA.

Pasha Sarraf, Internal Medicine, Massachusetts General Hospital, Boston, MA.

Adam J. Shaywitz, Internal Medicine, Massachusetts General Hospital, Boston, MA.

Elizabeth K. Speliotes, Internal Medicine, Massachusetts General Hospital, Boston, MA.

Kimiko Suzue, Pathology, University of Chicago Hospital, Chicago, IL.

Vasanth Vedantham, Internal Medicine, Brigham and Women’s Hospital, Boston, MA.

John C. H. Yoon, Medicine/Research, New York Presbyterian Hospital-Cornell Medical Center, New York, NY.

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