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Donning hip waders, students in the University of Texas School of Medicine–San Antonio STEER Program collect water samples from the Rio Grande to test for biological contaminants.

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Border Medicine 101: Mosquitoes Don't Carry Green Cards

BY AMY ROTHMAN SCHONFELD, PhD

In recent months, as the H1N1 "swine flu" pandemic swept through Mexico and engendered fear of spread into the United States, a spotlight was cast on those working at the United States–Mexico border whose job it is to control possible international transmission of disease. For almost 15 years, the South Texas Environmental Education and Research (STEER) Program of the University of Texas School of Medicine–San Antonio has been training medical students, residents, and other health professionals in "border medicine," so that they are ready to meet challenges such as H1N1 influenza. "What attracts students to STEER are the memorable learning experiences the border offers—experiences that engage all of the senses and cannot be found in any textbook or duplicated in the classroom," said Kelsey Vaughan, MPP, the environmental medicine training coordinator for STEER.

"Medical schools typically include little information on public health, and almost no information on environmental health," said Claudia S. Miller, MD, MS, the founder of the program and its current Director. STEER's vision is to reunite medicine and public and environmental health in a way that educates, engages, and empowers students. By taking advantage of its unusual and informative border setting, it aims to provide students with hands-on, in vivo educational experiences.

More than 500 full-time students and thousands of part-time students and health professionals from more than half the US states have traveled down to south Texas for the STEER experience. In fact, two STEER faculty members—Beatriz Tapia, MD, MPH, and Ms. Vaughan—are former STEER students who became so interested in the border that they returned to work for STEER, according to Roger B. Perales, MPH, RS, who has been with STEER since its inception and is the Assistant Director of the program.

The Border Is the First Line of Defense

Border medicine deals with diseases uncommon in the interior United States, including ancient diseases such as leprosy and rabies, and re-emerging diseases such as tuberculosis and dengue fever, said Dr. Miller. It also includes modern diseases and conditions, such as diabetes, obesity, and exposure to chemicals such as pesticides and endocrine disruptors.

For example, STEER students learn hands-on about rabies control. In south Texas, rabies vaccines are dropped from an airplane onto areas known to be populated by coyotes, which can transmit rabies. To tell whether a coyote has ever ingested the vaccine, the vaccine is laced with tetracycline. The tetracycline stains the coyote's teeth, and examination of the teeth can show whether the coyote received the vaccine.

Another aspect of border medicine is sensitizing students to the unique physical and cultural environment of the border

region. "Doctors used to make house calls, and they were aware of their patients' environments. Now patients are seen in clinics. Physicians rarely take exposure histories, and consequently don't know what the patient's life is like. We assume they live like we do. Without context, it is difficult to treat a patient meaningfully," said Dr. Miller.

That is why STEER students are taken into the *colonias*, which are neighborhoods that often lack one or more basic services, such as water, electricity, or sewage disposal. Before visiting the *colonias*, students engage in a discussion about poverty. A local *colonia* expert narrates a driving tour of the *colonias*, explaining why *colonias* have developed and why they continue to persist. Students meet with some local families, and are given an opportunity to ask questions about health care access and the challenges

A botanical expert works with STEER students to identify local plants used for medicinal purposes.





STEER faculty teach high school students to test for lead in paint samples, children's toys, and cooking pottery. If the tip of the swab turns red, lead is likely present.

of everyday living. They inspect food provisions in the kitchen and talk about diet, herbal medicines, and supplements. STEER students learn how important an environmental house call can be in identifying the etiology of an ailment.

Dr. Miller, an expert in indoor air pollution, encourages students to investigate why a patient has asthma, and not just provide treatment. She said that many homes in the region flood periodically, making carpets moldy and triggering asthma. Over the past 10 years, STEER has taught families of asthmatic children how to reduce indoor air allergens and pollutants by removing carpeting and stuffed animals from a child's room, eliminating burning candles, and adopting safer cleaning practices. In follow-up visits, parents have been proud to show that they are able to continue these practices, which have made a positive impact on their children's health.

Recurrent diarrhea may be caused by contaminated drinking water. "We may find the family stores their water in 55-gallon drums that are open to the air, including contamination from bird droppings or insects. We show them how to make their water safe, such as by boiling or adding a tiny measure of chlorine bleach," said Dr. Miller.

"We want to help students make connections, so when they are in practice, they are

aware of possible environmental causes. They should think about the questions physicians sometimes forget to ask—about pesticides, pets, or the use of indoor candles," said Ms. Vaughan.

The STEER Program

Concern about the lack of well-trained public health physicians led Congress to direct the Institute of Medicine (IOM) to find ways to address this shortage. In the publication "Training Physicians for Public Health Careers," the IOM recommended that physicians receive environmental health and public health education, as well as training in cultural competency.

To accomplish these goals, the STEER program, which originally began as a four-week fourth-year medical student elective, has expanded to include other health professions students and professionals. This is the only

such course in the nation. It is offered by the University of Texas Health Science Center at San Antonio at two sites along the US-Mexico border, Laredo and Harlingen, eight to 10 times a year. Now it is not uncommon to have medical students, residents, physician assistants in training, and dental students all in the same class. STEER also provides instruction for community groups, high school students, lay health workers (known as *promotoras*), and university faculty members.

These are dozens of half- to full-day segments that make up the four-week program. The faculty consists of nearly 100 instructors, including health department leaders, community health care workers, and professors. Federal officials from the US Department of Agriculture, the US Fish and Wildlife Service, and the US Department of Homeland Security also teach in the program. Dr. Miller, who is also Professor of Environmental and Occupational Medicine in the Department of Family and Community Medicine at the University of Texas Health Science Center at San Antonio, lectures about indoor air quality and chemical susceptibility, and a veterinarian travels from San Antonio to teach about animals and disease transmission.

Faculty members are encouraged to use unique teaching methods. One of the highlights of the course is a day spent taking water quality samples in the Rio Grande. After an introductory lecture, students don hip waders to collect water samples upstream

STEER students interact with elementary school children to promote physical activity, healthy food choices, and tobacco use prevention.





STEER participants visit an outdoor market in the Lower Rio Grande Valley.

and downstream of Laredo. The data go to the Texas Commission on Environmental Quality, and the results vividly demonstrate the impact of a large metropolitan area on its water supply.

Another highlight is a visit to an elementary school in Brownsville, where Environmental Medicine Training Coordinator Pat Bortoni, Faculty Associate Beatriz Tapia, MD, MPH, and STEER students participate with school children in the Coordinated Approach To Child Health (CATCH) program. The CATCH program is designed to promote physical activity and healthy food choices and to prevent tobacco use in elementary school-aged children. "We teach students how to prevent illness in cost-effective ways. Only a tiny fraction of the health care dollar goes toward prevention. This must change, nationally and globally, but first we must change the way we train our doctors to think. STEER does that," noted Dr. Tapia.

The STEER program encourages its graduates to return to engage in community research projects. "We try to design projects so that just doing the project benefits the community," said Ms. Vaughan. For instance, one project focused on teaching *promotoras* to help *colonia* families make their water safe to drink and thereby reduce diarrheal disease. In another project, *promotoras* were

taught to perform environmental house calls in order to improve indoor air quality and reduce asthma.

STEER aims to teach students broad lessons that they can take back to their home communities. To understand the causes of dengue fever, for example, a classroom lecture is followed by a hunt for mosquito breeding grounds, such as standing water in discarded tires. To learn the importance of proper sanitary waste disposal, students tour a local landfill. "We know everyone will not return to the border to practice medicine, but we want students to learn the importance of public health programs in every community. Every community has discarded tires, people drinking unsafe water or breathing unsafe air," said Ms. Vaughan.

Four-Year Combined MD/MPH Program

A longstanding partnership between STEER and the University of Texas School of Public Health laid the framework for the creation in 2007 of Texas' first four-year MD/MPH dual degree program, for which Dr. Miller serves as Assistant Dean. MD/MPH students from the University of Texas School of Medicine—San Antonio who take STEER earn three semester credit hours for their MPH-required practicum experience and four senior year elective didactic credits in the School of Medicine.

There are only a handful of four-year MD/MPH programs in the country, explained

Dr. Miller, but interest is growing. In the first year, 16 medical students enrolled in the dual degree program; now, three years later, 30 students, or 15% of the first-year medical class, are enrolled in the MD/MPH program.

The STEER experience helped first-year MD/MPH student Martin Hechanova clarify his interest in public health. For him, it was illuminating to visit a Superfund site at the Donna Reservoir near Harlingen with a representative from the Environmental Protection Agency, learning about the source of PCB contamination, witnessing the impact on the fish population, and seeing the cleanup efforts.

"The Texas–Mexico border has been the ultimate outdoor classroom. There are things I learned I would never have expected to learn in a classroom. It was definitely a very different and worthwhile experience. I would highly recommend this program to medical, public health, nursing, and allied health students. It is a great program," commented Mr. Hechanova.

STEER is an excellent model not just for environmental public health education, but also for service and research. Leonel Vela, MD, Regional Dean for the Health Science Center's Regional Academic Health Center in Harlingen, summed it up well: "Understanding the interface between environment and human disease adds to the medical education experience. The need for well-informed, culturally sensitive medical practitioners who understand the important role of a safe environment in their patients' health is particularly important in the US–Mexico border region. The STEER program prepares the next generation of physicians to meet tomorrow's public health challenges."

A STEER short course for faculty will be offered in the fall, and Dr. Miller urges anyone interested in starting their own program to contact her (millerccs@uthscsa.edu) for more information.

"We're delighted that we have become a national program for training in border medicine," said Dr. Miller. "The National Institute of Environmental Health Sciences supports research and research training, but it does not support graduate health professional education, and that's a real problem. It is so important that we train people in medical school—that's where you engage the public and launch the environmental health champions of the future." ♦