The spread of infectious diseases is a devastating threat in some developing areas of the world. Students and faculty are going abroad to help prevent the spread of infectious pathogens with education and training.

BY NICOLE BRANAN

A Quest to

EDITOR'S NOTE: This article is the fifth in an occasional series on international development and international higher education. Each article focuses on one kind of international development work. The first article, "Fledging the Phoenix," on reconstruction efforts after natural disasters was published in the July/August 2009 issue; the second, "Developing K–12 Education," was published in the November/December 2009 issue; the third, "Feeding Mouths and Minds," was published in the March/April 2010 issue; and the fourth, "Water, Water, Anywhere," was published in the July/August 2010 issue.

Cure DISEASE

IT'S EARLY MORNING at Benjamin Bloom National Children's Hospital in San Salvador. Alice Hilgart, a senior biology major at Rhodes College, is systematically walking through the hallways, handing staff members surveys with questions about trash disposal. "Where do you put used needles?" "How do you discard diapers?" In a resource-poor public hospital in El Salvador, hazards like infected needles poking out of a container can become a matter of life and death. In fact, many of the children who receive chemotherapy treatments here die not of their vicious cancers but of infections, according to Laura Luque de Johnson, assistant professor at Rhodes College in Memphis. That's what she and her team of students came here to help change.

Hilgart is one of five students who participated in the International Experience in Health Care, a collaborative program between Rhodes College and St. Jude Children's Research Hospital, which started last year. Luque de Johnson learned of St. Jude's outreach efforts in developing countries when she was a post doctoral student at the hospital. As soon as she became a faculty member at Rhodes, she looked for a way to get students involved.

St. Jude had started to work with Bloom on strategies for infection prevention but was limited by time and personnel. "That's where the students came in as a great resource," Luque de Johnson said. Their job became examining the hospital's sterilization and waste management procedures as well as the techniques for the cleaning of endoscopes. One week of specialized training at St. Jude before their departure to El Salvador prepared them for the job.

During the team's two weeks at Bloom, they interviewed dozens of staffers and examined every single trashcan in all patient areas. The first thing they noticed was that the hospital was in dire need of puncture-proof sharps containers, which explained the large number of accidents with dirty needles among the nurses and waste-management personnel. That's a serious hazard because Bloom is a hotbed of infectious disease—as the only public pediatric hospital capable of treating serious illnesses in the entire country of El Salvador, it sees everything from tuberculosis to HIV/AIDS. And infection transmission is a particularly dangerous problem for the cancer patients at Bloom. "Of course they are receiving treatments that suppress their immune system and make them very susceptible to any kind of infection," Luque de Johnson said.

Above, Inset: University of Miami students and indigenous Kuna Indians are taking a boat ride from the Panama mainland to the island of Ticantiki in the San Blas Archipelago.

PHOTO ILLUSTRATION: SHUTTERSTOCK AND ISTOCKPHOTO. ABOVE: KELLY WITHUM

The team also discovered that the hospital staff didn't properly segregate regular and biohazardous waste. Biohazardous waste is very expensive to dispose of and as a public hospital "they didn't have a lot of money to begin with," Hilgart said. Part of the problem was that the separate trashcans weren't consistent in all sections and on all floors, which led to a lot of confusion among the personnel, Luque de Johnson said. The team immediately took care of that and used its budget to buy proper trashcans and donated them to the hospital. The students also found that a lot of trash ended up unnecessarily in the biohazardous waste containers. An initial estimate suggested that the hospital could save at least half of the $7,000 it spends every month on biohazardous waste pickup, the team calculated. That's a significant amount, Luque de Johnson said. To put this in perspective: "they pay their doctors $800 a month." The money the hospital could save by correcting the problem could be used, for example, to vaccinate all its personnel, she added.

"The exciting part was that when we presented our findings to the hospital they were very receptive to our recommendations," Luque de Johnson said. The team even met with members of El Salvador's Ministry of Health that oversees all the hospitals in the country. The Ministry was so encouraged after seeing the results that they became interested in adapting the students' assessment procedures and may use them in other hospitals in El Salvador, Luque de Johnson said.

The experience was valuable for the students as well. Not only did it give them an opportunity to immerse themselves in a different culture, it also prepared them for potential future work in Latin American countries. "I learned a lot, not just about waste management and sterilization techniques but also about the different kinds of connections and relations that the U.S. has [with developing nations]," said Hilgart, who plans to become a physician. This could be valuable if she decided to join groups such as Doctors Without Borders, for example. Hilgart visited with a friend in Honduras after her trip to San Salvador and ended up spending some time at the local hospital there. She noticed that there were problems with the waste management as well. Her time at Bloom had taught her that "it would take no more than a few training sessions and that would reduce the hazard for a lot of people," she said, so she hopes to return to Honduras at some point in the future and help tackle the problem.

The experience also gave students a unique window into the inner workings of a health care system different from that in the United States, Luque de Johnson said. For example, doctors in El Salvador who want to specialize have to travel abroad to get training and have to do so at their own cost, even though they won't get paid more once they return to El Salvador as specialists. As a result, there is currently only one oncology surgeon in the entire country, Luque de Johnson said. "He can't take vacations, or, if he does, then surgeries have to wait. These are some of the big challenges that are faced by some of these countries," said Luque de Johnson, who witnessed some of these obstacles when living in her native Mexico. "I knew that [doctors] from Central America came to Mexico to get trained," she said. "And Mexico has its troubles so I knew that if they came there they had to be in even larger need with respect to health care."

But despite all the difficulties developing countries face, students also saw that a little can go a long way. "Even though the problems are large, small steps can have huge impacts," Luque de Johnson said. "You don't start changing the government, instead you

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KELLY WITHUM

Professor Sherri Porcelain, Kuna youth, and University of Miami students on the island Ticantiki.

Rhodes College students examining sterilization procedures for surgical equipment at the Benjamin Bloom National Children's Hospital in San Salvador.

make small changes, educating people little by little, and that's how you eventually make big changes."

Just as important was that the hospital was willing to listen to and act on the team's input. "For them to say 'Yes, I understand what you are telling me, let me make arrangements here and there and make immediate changes,' that component is extremely important for a program like this to be successful," Luque de Johnson said. Without such genuine interest, "it really doesn't matter what you say and what you don't say."

University of Miami professor Sherri Porcelain is meeting with Kuna Indians.

Developing Trust

Gaining the trust of the locals is not always easy and often involves a deep understanding of their culture that may take years or even decades to establish. That's especially true for societies that stay secluded and isolated, such as the entirely indigenous population of the San Blas Islands, a tropical archipelago off the coast of Panama. Approximately 60,000 Kuna Indians inhabit 66 of the 366 islands. Self-governed and semi-autonomous from Panamanian rule, the Kuna have maintained a very traditional culture and visiting the islands is almost impossible for foreigners. "It requires Chief approval even just to enter the islands; you can't even get off the plane or boat without permission," said Sherri Porcelain, director of the disaster research program for global public health at the University of Miami. Porcelain has worked with the Kuna since the 1980s and it's only because of her longstanding relationship with the indigenous people that 13 University of Miami students were able to travel with her to the island of Ticantiki in the San Blas this past January. The education abroad program gave them hands-on experience in global health and international development, Porcelain said. She shares her vast experience working in the San Blas with students in the classroom but "you know, students don't want to live vicariously through an instructor's experience, they really want to become fully engaged," she said. So her approach is to "give them the theories and the models in the classroom and then take them out there."

University of Miami students and indigenous Kuna Indian children in the San Blas Islands.

While in Ticantiki, students worked on several projects designed to help the community. One example was a small epidemiological study to test the villagers' water supply for bacteria. Ticantiki had only recently acquired access to running water, said Kelly Withum, a master's student in public health, who designed and performed the study, which won an award in a University of Miami Delta Omega Public Health Honors Society poster session. A World Bank-funded project had put a new dam in a river up in the mountains on the Panama mainland. That helped collect enough water to travel down PVC pipes from the river to a storage tank on the island and from there to spigots for the community and for each household. Before that, the Kuna had to canoe over to the mainland to get water, so the new system was a welcome improvement. However, because diarrheal disease was a problem on the island, it wasn't necessarily clear that the water was actually safe to drink. So, Withum brought a bacteria test kit with her and sampled the various water sources, including the freshwater spigots, the storage tank, and the source water on the mainland of Panama. The study gave her a firsthand look at some of the difficulties of working in an austere environment. Getting to some of the sampling sites, for example, the source water, took a several-hour hike through dense jungle. And "without having electricity or having a way to actually culture bacteria, we had to do a rapid testing," Withum said. The team couldn't bring a lot of supplies in addition to all their food and water because the only way to get to Ticantiki is by canoe.

Withum tested a total of 25 water samples and all of them, including the freshwater spigots that residents use as their direct source of drinking water, tested higher in total bacteria than what EPA regulations consider safe. She now plans to get in touch with the World Bank and make them aware of the issue. "We would like to let them know that even though our project was small we found things that may need to be looked into with the local Ministry of Health to help the Kuna on this island." Boiling the water would eliminate the problem "but that's a matter of limits of fuel and limits of time," Withum said. And there is much more to such a project than just the scientific aspect, Porcelain said. It is important to be sensitive to the local culture, the political and economical situation, and to respect it. "You have to make sure that the dialogue is bottom up and not top down," she said. "And you have to be careful who you talk to and how you present [informa-

KELLY WITHUM

tion]…you don't want to offend." Doing on-the-ground work helped students understand that and see the importance of experiencing the local culture and putting it into context "before making any drastic changes or saying, 'Oh, this is all wrong,'" Withum said.

Rachel Libby, a University of Miami master's student in Latin American studies with a focus on public health, agreed. Her project involved educating the locals about a simple but effective treatment for diarrheal disease, one of the leading causes of death for children in the developing world. Living within the Kuna community and meeting with local health professionals and spiritual healers highlighted the importance of making any education efforts relevant to the local culture. "My eyes were definitely opened to the need to understand the cultural and religious beliefs and traditions of a community before you can effectively treat them," Libby said. "You can't discount someone's beliefs… when you are trying to develop a way to address health in a community you have to look at how that community sees health, not at how we see health." That was an important lesson that will be valuable in her future work as a medical professional, she said. "You go through years and years of school and you expect to be the expert but this was kind of a reminder that you don't know the community and you don't know their reality and you have to listen and understand and involve the community in every step of the process if you are really hoping to have an impact."

Cultural Immersion

An education abroad experience such as this also teaches students about the rough living and working conditions that are often typical in the field of international development and global health. During their time in Ticantiki students live the life of a Kuna, Porcelain said. They stay in huts, sleep in hammocks, and rise before dawn. "These are rough living conditions and they are not for everyone," she said. "Often, three days in students say 'This is much tougher than I thought.'" But that's a valuable lesson because students who plan to pursue this line of work have to be prepared for any kind of situation, said Porcelain, who has worked in developing countries all over the world. "It's not only about helping people but it's also about what you need to do to get to do that," she said. "You never know, a plane might forget to pick you up, that's happened before. I've been left for days sometimes."

The trip also let students experience a very different culture and witness the unique challenges faced by such an isolated society. "I have spent time in Haiti and Cuba and throughout Central and South America but I had never been in an indigenous community," Libby said. One of the issues the Kuna community in the San Blas was struggling with was the need to modernize while maintaining their traditions and cultural identity, she said. More and more members of the younger generation are starting to leave the island and get an education in urban areas, such as Panama City. They return with new impressions and ideas that are not always welcome. "Some of the older members in the community are concerned because they see their traditional culture and belief system as being challenged by this younger generation that goes to Panama City and comes back with this urge to modernize."

Indigenous Kuna Indian woman in the San Blas Islands. Inset: Kuna toddler in Ticantiki

JULIE HOLLENBECK. INSET PHOTO COURTESY RACHEL LIBBY

In 2009, the Kuna Indians on the island of Ticantiki obtained access to running water with new spigots installed in the community. In 2010 spigots were installed at each household (many of which are thatched roofed homes). Testing and analyses by University of Miami student Kelly Withum showed that water from some community and household spigots contained high bacteria levels, highlighting the need for a public health educational program in the community.

Combating HIV/AIDS

HIV/AIDS, which has never been a problem in Ticantiki and is generally not mentioned in this conservative culture, is a problem in urban areas. But members of the young generation now leaving for the cities need to be prepared for it. That's why Libby took part in an HIV/AIDS awareness project. It was the first time that the community allowed an outsider—or anyone—to speak to Kuna youth about sexually transmitted diseases, Libby said. "The health care providers on the island were excited about that because they said they weren't allowed to talk about these things," Porcelain said. The students had to ask for approval and discuss in detail with the community leaders what they would talk about and how. And it turned out that "many of the families didn't want their son or their daughter participating in this kind of discussion," Libby said. But the students were allowed to invite a few dozen boys and girls between the ages of about 14 to 20 and gave them basic sex education that they had never had before, Libby said. "Now they are no longer going into it blindly."

Sex education is an important of part of HIV/AIDS prevention but there are other ways by which the virus spreads and those can be much harder to circumvent. One example is mother-to-child transmission (MTCT). The vast majority of children worldwide become infected during pregnancy, in delivery, or during the time they are breastfed. Babies have a 10 percent chance of getting HIV from their infected mother just through birth but that risk can triple or even quadruple if they are breastfed, according to Chandice Covington, professor and interim dean of the Anita Thigpen Perry School of Nursing at Texas Tech University Health Sciences Center. That problem is easily avoided in the developed world but in countries that have no bottles, formula, or even clean water, breast milk is all a mother has to keep her infant alive. That is the case, for example, in sub-Saharan Africa. The small district in eastern Kenya where Professor Covington began her research about a decade ago sees about 1,000 cases of pediatric AIDS every year. To put this in perspective, "in the whole United States, we have less than 100 cases every year," Covington said. "That's how dramatic it is for them there." But there is hope, and not least because of Covington's research.

Covington initially came to Kenya on a quest unrelated to HIV/AIDS. She and her team had set out to study the benefits of breastfeeding, "and the only place where we could do that was in a culture where breastfeeding was highly regarded and practiced extensively," she said. So they decided to work with women in Kenya's tribal societies, some of whom had breastfed for three consecutive decades or longer.

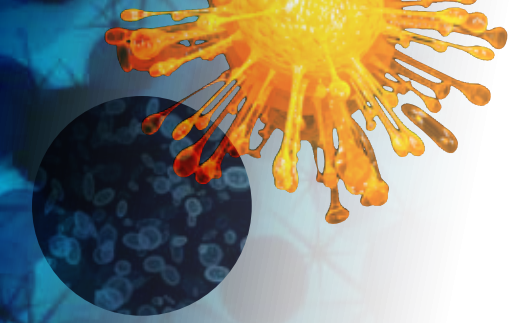
During their studies Covington and her colleagues discovered something unexpected and rather astounding: postmenopausal women in their 50s, 60s, and 70s could still breast feed a baby. At first, the team was stunned but it actually made sense, Covington

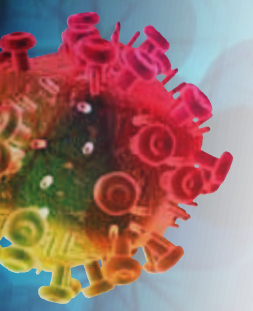
KELLY WITHUM. OPPOSITE PAGE: RACHEL LIBBY

University of Miami student Kelly Withum is testing the water delivered through household spigots on the island of Ticantiki.

said. Historically, in a society where large families live in close quarters and have no access to bottles or pacifiers it was commonplace for women other than the mother to step in when a baby started crying. "You never let the baby cry if mom's not there, so you pick the baby up and put it to your breast," Covington said. Although most of the grandmothers didn't think the baby was getting anything except a pacifier, they actually produced milk. Later, when Covington and her team analyzed samples during a study to test grandmothers' milk, they checked for the essential fats and proteins and found that more than half of the women produced fully functioning milk. That gave Covington an idea: what if grandmothers could step up to the plate as surrogates if their children were HIV-infected? It turned out that some women had already been doing just that but the practice was not widely talked about. Immediately, "there was a lot of interest," Covington said. "We had many grandmothers and their daughters knock on our door and say 'How can we do this? I'm young and I can feed this baby, I don't have HIV but my daughter does and we don't want to lose this baby. This is her third or fourth pregnancy and the babies lasted only a few months or a year and then they died, please help us.'"

But even though surrogate feeding is one viable option "we also knew that there is this very special relationship between mothers and their babies," Covington said. So she and her team came up with another ingenious idea: they started working on a breast shield, a very thin silicone-like film that would deactivate the virus but keep the rest of the milk's ingredients intact. This past February they went back to Kenya and collected breast milk samples from HIV-infected women in Nairobi. Funded by the Bill and Melinda Gates Foundation and in collaboration with the Israeli company Cupron Inc. and lead researcher Gadi Borkow they ran the samples through a mock-up of what the shield would have in it, mainly copper ions, and confirmed that the virus was deactivated in the process. Much research still needs to be done before such a shield could become available, Covington cautioned, but so far the results are promising. And Cupron Inc. agreed together with the World Bank to make the shield available at no charge, which would make it a viable solution—and not just for Africa. Many other places around the world are facing the same dire situation, Covington pointed out. For example, "India has a billion people and even though less than 5 percent of the population has HIV, if you take 5 percent times a billion, you have a lot of people." And that's the case for large parts of Asia. Bibha Gau-





While the need for help with respect to the HIV/AIDS pandemic is blatantly obvious in so many regions of the world, it often isn't that easy to even figure out what a community's most fundamental needs might be.

tam, a native of Nepal and nursing PhD student at the University of North Dakota, accompanied Covington, who is her research adviser, on the trip to Nairobi. "I saw that people in Kenya and in Nepal are living in similar situations," said Gautam, who had worked with HIV-positive intravenous drug users in Nepal. But it was inspiring to see the determination in Nairobi, she said. "It was amazing to see these women come to the clinic; 17- and 18-year-old girls carrying their babies. These women live in poverty, like in my country, and I was so amazed to see their perseverance and how they gathered the courage to come forward and help researchers like us." Some of the women had only recently been diagnosed and in many cases their relatives didn't even know they were infected. Gautam came to the United States in 2005 and plans to eventually return to Nepal, where she will be able to put the U.S. education she is receiving to good use, she said. "Once I have enough experience, yes, definitely, I will help the people in my country."

Preventing Other Infectious Diseases

While the need for help with respect to the HIV/AIDS pandemic is blatantly obvious in so many regions of the world, it often isn't that easy to even figure out what a community's most fundamental needs might be. Lori and Mark Halverson-Wente, both at the Rochester Community and Technical College (RCTC) in Minnesota, found that out when they first went to Cambodia to prepare a service-learning education abroad program a few years ago. "Our daughter was playing volleyball with Cambodian boys [at a school] in a rural village and at some point she needed to use the bathroom," Mark said. Through a translator she found out that there wasn't one. While this is not that big of a deal for boys, it often leads to girls dropping out of school. Moreover, lack of such fundamental sanitation facilities as flushable toilets is one of the major underlying causes of the spreading of infectious disease. So the team started a successful program called "One toilet at a Time," now in its sixth year. Since then the RCTC's projects in Cambodia have expanded and now include not only the building of toilets but also sanitation education, the distribution of malaria nets, and water testing and analysis in rural areas of Cambodia.

Lori and Mark started the service-learning program together with Kim Sin, a Cambodian native who fled the Khmer Rouge regime in the 1970s when he was a toddler and eventually ended up at RCTC in Minnesota. The trips allow students to experience a culture they have never been in contact with before. "They get to see that there is a world out there that is so different from what they experience day to day, a world where people live on one dollar a day. That gives them a sense of appreciation for what they have," Mark said. They also get to see what the country is going through as it recovers from the trauma of the genocide under the Khmer Rouge regime. During that time "families were separated and nobody could trust anyone because they could be reported and sent off to be executed," Mark said. "This climate continued even through the 1980s when Cambodia was ruled by Vietnam, so really the foundation of their entire culture and society was compromised greatly." That also makes it challenging to set up successful service-learning projects to begin with because it's difficult to gain the trust of the locals. "We need to understand that we are outsiders, and they will always view us as outsiders," Mark said. "And we simply can't have the attitude that we can jump in for a couple of weeks during winter break and make everything all right." So the RCTC team started to partner up with competent local organizations. And during their time in Cambodia, U.S. students team up with Cambodian college students and work on community projects together. "I truly believe that this collaboration is an empowering situation for both," Lori said. Moreover, "it inspires them and gives them confidence that they can go out and make a positive difference in the world, however small," Mark said.

Once students return to the United States they give presentations about their projects in Cambodia at schools in their local communities and teach and share their experiences. "We really believe that local and global are connected and this is one way in which we can do that," Lori said. "In the end, what difference does it make if you spend two weeks in Cambodia if you are not willing to cross the street to help your neighbor?" **IE**

NICOLE BRANAN is a freelance journalist based in Colorado Springs, Colorado. Her latest article for *IE* was "One Earth, One Sky" in the July/August 2009 issue, which was also part of the "internationalization of science disciplines" feature series.