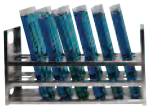
LAB-ORIOUS ENDEAVOR: The Dartmouth-Hitchcock Medical Center clinical pathology laboratory performs 2 million tests every year and employs about 200 pathologists, clinical laboratory scientists, technicians, and clerical staff.



THEN & NOW

A reminder of the pace of change, and of timeless truths, from a 1987 booklet titled *Norris Cotton Cancer Center History: The Early Years*:

"The first cancer center building—a two-story cement structure, located entirely underground, with three-foot-thick walls to shield new multi-million-volt radiation therapy equipment—was completed [in 1972]. . . . Personnel needs were also addressed. The plans called for [recruiting] a third radiation therapist."

5
Sites where Norris Cotton Cancer Center facilities are now located

200,000
Square feet at its main facility in Lebanon, N.H.

7
Number of radiation oncologists now on the staff

A high-tech solution to drug counterfeiting

Imagine picking up some teething syrup at the pharmacy, giving it to your toddler, and then discovering it had been laced with a toxic chemical normally used in antifreeze. The parents of 84 Nigerian children who died last year don't have to imagine that nightmare. But if Dartmouth graduate student Ashifi Gogo has his way, it won't ever happen again.

Horrific: Such problems arise when drug counterfeiters use cheap but often toxic fillers to extend their profits. In the case of the teething syrup, the toxic chemical was diethylene glycol, which looks, tastes, and smells like glycerin, a common component of such syrups. It's just one of thousands of horrific examples of counterfeit drugs sold in Nigeria and Ghana—including fake antibiotics and antiretrovirals. The World Health Organization estimates that more than a million people die of malaria every year and that 200,000 of those deaths could be prevented if all counterfeit antimalarials could be eliminated.

Gogo, a native of Ghana and a Ph.D. student at Dartmouth's Thayer School of Engineering, has developed a way to circumvent the massive fake drug industry and protect people from its harms. It's based on ordinary cell phones, which are very common in Nigeria and Ghana.

As part of Thayer's Ph.D. innovation program, Gogo founded his own company, Sproxil, which uses cell phone technology to verify if a drug is real or fake. The concept is simple: before distributing the drugs, the pharmaceutical company applies to the package a scratch-off label with a unique ID number. The consumer texts the ID to a phone number. The ID is then sent to a central drug data depository in the U.S. A text message comes back automatically, telling the consumer if the drug is real or fake and its correct name, manufacturer, and dosage. The message also includes advertising discounts from the manufacturer, offsetting the cost of the text message. The technology works anyplace that has cell phone coverage.

By 2010, sales of fake drugs could reach $75 billion worldwide.

Gogo tested the concept by distributing a survey about Sproxil, with a sample drug and scratch-off panel, to 1,000 people in Accra, the capital of Ghana. Just 413 of the survey respondents were aware of fake drugs in Ghana, and only 152 suspected they had ever bought a fake drug.

Trial: Next Gogo undertook a major trial in three large cities in Nigeria, by coding "one million units of the nation's most popular diabetic drug," he explains. "This is the largest trial of scratch-off technology that I'm aware of."

Fortunately for Gogo, Nigeria's National Agency for Drug and Food Administration has been cracking down on counterfeit drugs since 2001. And the agency is quite supportive of the Sproxil technology, since it works well alongside the agency's other strategies, which include stricter importation regulations and training courses for pharmacists.

Most counterfeiters, says Gogo, are former narcotic dealers who turn to counterfeiting because the profits are huge and the penalties lenient compared to those for dealing narcotics. The U.S.-based Center for Medicines in the Public Interest estimates that by 2010, sales of fake

JON GILBERT FOX

Dartmouth graduate student Ashifi Gogo has developed a system that allows consumers to detect counterfeit drugs—a huge problem in some parts of the world—using a cell phone.

drugs could reach $75 billion worldwide. "For every dollar you put into fake meds," says Gogo, "counterfeiters get between $25 and $250 back. So it's incredibly profitable without the long jail-term risk of narcotics."

Gogo's concept is attracting kudos from high places. It received an Outstanding Commitment Award, with $10,000 of seed funding, from the Clinton Global Initiative. It won first prize in the U.S. and second prize worldwide in the 2009 Global Social Venture Competition. And Sproxil was named Technology Pioneer for 2009 by the World Economic Forum.

Extend: Gogo hopes to eventually extend the concept to all of West Africa as well as to India, where many of Nigeria's counterfeit drugs originate. Meanwhile, two recent Dartmouth College graduates who interned with Sproxil are also helping to spread the idea. Taylor Thompson, DC '08, and Nathan Sigworth, DC '07, launched a similar start-up, PharmaSecure, using cell phones to tackle counterfeit drugs in India.

The trickiest part for Gogo is not the technology, but getting pharmaceutical officials and government regulators to work together. "Industry is always trying to get easier regulation . . . [and] regulators are always . . . saying, 'Hey, we can shut you down,'" says Gogo. But, "it turns out that in this case, everybody realizes that the one who loses the most, the one who could die, is the consumer. . . . We're all here to keep the public safe."

Matthew C. Wiencke

INVESTIGATOR INSIGHT

In this section, we highlight the human side of biomedical investigation, putting a few questions to a researcher at DMS-DHMC.

Mary Jo Turk, Ph.D.
Assistant Professor of Microbiology and Immunology
Turk studies how the immune system can be used to treat progressive cancers. She has been at DMS and the Norris Cotton Cancer Center since 2004.

What are your primary research interests?
We are currently developing immunotherapies to provide long-lived protection against tumor recurrence and metastasis following surgery. We are also trying to understand how the autoimmune destruction of tissues enhances immune responses to cancers that arise from those tissues. Our main focus is on melanoma, but these principles also apply to other types of cancer.

What would you consider your most important work?
My most important work involved melanoma, but not in a laboratory sense. Last spring, my aunt was diagnosed with end-stage melanoma. The tumor was inoperable, and her doctors offered only palliative treatments. I contacted several doctors at Dartmouth and around the country, and we discovered that her tumor expressed a rare mutation that might enable it to respond to a new drug. After three months on the drug, my aunt's tumor has shrunk to less than half its original size, and she is again leading a happy, active life. I never expected that my knowledge of melanoma could have such an effect on the life of a loved one.

What are the keys to success in science?
Be original and be objective. Being original can be challenging. You may start working on a project only to find that part of it has just been published, or that someone else is going to beat you to the answer. Being objective can also be difficult, especially considering all the biases that are actually necessary to build the foundation of your knowledge. Just ask the right questions in the right ways, and let the data speak for itself. Allow the data to guide you to your next hypothesis.

What's your favorite nonwork activity?
Spending time with my daughter, Claire, who is 2½ years old. Our favorite activities include building houses out of blocks, going for walks, reading Doctor Seuss stories, and grocery shopping (she's the one pushing the tiny cart).

What is a talent that you wish you had?
I really wish I could play the guitar. I took lessons when I was in grade school and remember how much I used to enjoy playing. I wish I could play for my family and friends (although everyone would agree it's best if I don't sing).

Finish this sentence: If I had more time I would . . .
Read more fiction and spend more time traveling with my family.

What do you admire most in other people?
Compassion and selflessness. I don't believe society values these characteristics appropriately. I see too few people who truly embody them.

What three people would you like to have over for dinner?
Martin Short (the comedian), Karl Rahner (the theologian), and *Iron Chef* Masaharu Morimoto (to cook dinner).

Where do you do your best thinking?
Sanborn Library on the Hanover campus, because no one knows I go there—darn you reporters!

What did you plan to be when you grew up?
Believe it or not, I wanted to be an astronaut. I even had a summer job working at NASA for a few years. After realizing that my real interests lay in biology, I contemplated whether I could study the effects of zero gravity on cancers, then decided to give up the astronaut thing.