

## Combination antimalarials confound anticounterfeit tests

To keep the malaria parasite in check, multiple antimalarial drugs are commonly blended into a single pill. Such artemisinin-based combination therapies are an effective way of thwarting the evolution of drug resistance, but they also provide a golden opportunity for counterfeiters, as tests designed to identify sham monotherapies don't always work for drug combos.

One common field test, for instance, involves dissolving ground-up combination pills with lab reagents; if the pill contains artemisinin, the solution turns yellow, and a deeper golden hue equals more artemisinin. But at least two antimalarial drugs on the market are already yellow, so the test might change color even if the pill contains no artemisinin, warns Harparkash Kaur, a chemist at the University of London.

The problem can be overcome. One solution is to separate the compounds before performing the assay. Michael Green, a chemist at the US Centers for Disease Control and Prevention in Atlanta, has developed such a test (*Trop. Med. Intl. Health* 6, 980–982, 2001), but he admits that this necessitates an extra step.

Another workaround is a lab technique called thin-layer chromatography. Global Pharma Health Fund, a charity funded by the pharma giant Merck, sells a \$6,800 'minilab' that contains a chromatography test in addition to Green's color test and other anticounterfeit tools. As *Nature Medicine* went to press, the charity had

shipped 347 minilabs to 70 countries.

But the minilab chromatography test requires ultraviolet lamps, which can burn out under strenuous field conditions, Kaur points out. So, last year she and Jean-Robert Ioset, of the Drugs for Neglected Diseases initiative in Geneva, developed an easy-to-read assay that reveals how much artemisinin is found in a pill through colored spots that can be viewed without the aid of ultraviolet light (*PLoS One* 4, e7270, 2009).

Even as these new tests come on board, however, the extent of the counterfeit problem remains unclear. That's why Kaur, Green

and others—with backing from the Bill & Melinda Gates Foundation—are now working to determine the prevalence of counterfeit antimalarials in Africa. Knowing this will help researchers pinpoint the causes of emerging drug resistance, Kaur says.

And getting a grip on the problem is an important first step toward solving it, adds Patrick Lukulay, who heads a project aimed at rooting out counterfeit drugs in developing countries at US Pharmacopeia, a Maryland-based nonprofit. "Knowledge," he says, "will lead to action on the part of the authorities."

*Cassandra Willyard, New York*

### The cost of ineffective antimalarials

"Counterfeit drugs kill!" reads the World Health Organization's (WHO's) anticounterfeiting slogan. Yet no one had ever calculated just how many deaths fake meds cause. So, last year, Andreas Seiter, the World Bank's global pharmaceutical industry fellow in Washington, DC, crunched the numbers. Drawing on estimates from the WHO, Health Action International and others, Seiter estimated the health and economic costs of substandard and counterfeit antimalarial drugs in a typical malaria-endemic African country of 20 million people—about the size of Ghana. Here are Seiter's back-of-the-envelope calculations:

**4 million**—Number of drug treatments for malaria per year.

**800,000**—Number of treatments with ineffective malaria drugs.

**4,000**—Number of childhood deaths owing to these ineffective drugs.

**0.5**—Days per year spent by the average worker to pay for these ineffective drugs.

**3.2 million**—Total number of working days spent to earn money for ineffective drugs.

Source: *Clin. Pharmacol. Ther.* 85, 576–578 (2009).

## Anticounterfeit campaigners go back to school

In May 2007, 18 industry and government officials met in a conference room in East Lansing, Michigan initially to discuss one thing: packaging.

The group included people from the pharmaceutical, food chemical and automobile industries, as well as representatives from the US Food and Drug Administration and Department of Agriculture. John Spink, a certified packaging professional at Michigan State University (MSU), had convened the meeting to ask for advice on how best to study packaging for food and product protection.

The group, however, had a better idea: they needed an all-encompassing, holistic understanding of anticounterfeiting strategy. And they unanimously agreed that on-the-ground training was more important than academic research.

So, a year later, Spink launched a 14-week

online graduate course in anticounterfeiting strategy spanning approximately 20 scientific disciplines, ranging from social anthropology to analytic chemistry to information technology—the first such program in the world. "We were specifically asked to do this because they weren't finding that core strategic perspective," says Spink, who worked for 12 years with the oil giant Chevron. "It's outreach, teaching and research all in one."

After taking the class last year, Doug Moyer, formerly the global packaging engineering manager at Ford Motor Company's Customer Service Division near Detroit, helped launch a separate graduate class at the MSU College of Human Medicine focused solely on counterfeit drugs. One of the handful of students who is taking the pilot class is Jacob Atem, one of the so-called 'lost boys of Sudan', who plans to open a clinic in his home village of Maar. "In my clinic, I don't want to give

fake drugs that aren't effective," he says. "My eyes are now open to all these problems that are rife in Africa."

As yet, no law enforcement officials have taken Spink's course.

Industry, however, is reaching out to educate police officers on anticounterfeiting. Pfizer's senior director of global security, Patrick Ford, and his staff train prosecutors, judges and detectives on the dangers of counterfeit medicines.

His team also trains them on carrying out covert, undercover meetings with counterfeiters and trying to out shady online pharmacies. "It's more than just going out and buying products and arresting the bad guys," stresses Ford, a former US Federal Bureau of Investigation agent himself. "It's frankly making the whole global environment more aware and safer for our patients."

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