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HEALTH

'Fingerprinting' to stop flow of dark web drugs

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KEY THEME: OPEN TO THE WORLD

by Steve Gillman



Researchers are working to put trackers on the surface of pills that can be detected through blister packs. Image credit: Flickr/Konstantin Lazorkin

From invisible online markets, past border controls and straight to the consumer, fake pharmaceuticals are on the rise, but now a mix of anti-counterfeiting technology is helping halt the wave of fake drugs and their often lethal consequences.

As of December 2015, over 920 suspected SSFFC (Substandard, Spurious, Falsely labelled, Falsified and Counterfeit) medical products have been reported to the [World Health Organization](#).

Yet this could just be a glimpse of a much larger counterfeiting problem.

'It's like an iceberg,' said Dr Jamie Barras, a research fellow from King's College London, UK. 'The visible part of the problem is the drugs that are detected, which can run into the millions of pills every year, but what we can't see are the drugs that go undetected.'

The main appeal of drugs from the so-called dark web, which includes unsearchable web pages, is that the public can buy 'anything and everything' for cheap, without a prescription, and get it delivered straight to the door.

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But regardless of what people order, they share a needed common risk: they don't know what they are buying.

'Drugs often go through several hands before they reach the consumer; this could be years after they are manufactured,' said Dr Barras.

The reason drugs have use-by dates is that they break down and you get less of the active ingredient in a pill.

'The actual breakdown can change its chemical constituency in a way that may even be harmful,' warned Dr Barras, who is also the technical manager of the EU-funded CONPHIRMER project which developed a handheld scanner to detect counterfeit medical products.

The scanner uses radio waves to record a digital 'fingerprint' of the contents from suspicious medical packages in customs or post offices.

The project, led by Prof. Kaspar Althoefer of the Department of Informatics at King's College London, UK, can then compare these signatures with a database of legitimate pharmaceutical 'fingerprints', allowing for a better, non-invasive way to locate counterfeit drugs.

'There is always this question if there is a right to seize something,' said Dr Barras. 'But if you can give a definitive answer to that, at the sorting office, or at a market stall somewhere in equatorial Africa, you can give (customs) the confidence to take action.'

CONPHIRMER now plan to develop the scanner until they can license it to a company or attract further investment.



Researchers at a lab at King's College London, UK, developed a handheld scanner to detect counterfeit drugs. Image courtesy of the CONPHIRMER project

Gangs

Counterfeit pharmaceuticals are the product of crime, normally produced by gangs in India or China, and then exported around the world by other criminal organisations, either through the dark web or more conventional networks.

Gangs can also take legitimate medication out of the global supply chain, allowing it to be manipulated, repackaged and resold into higher-income countries.

'They (criminal organisations) are flooding the market with falsified medicines, exploiting the loopholes which exist in different regulations and legislations,' said Marco Musumeci, programme coordinator at the United Nations Interregional Criminal and Justice Research Institute (UNICRI) in Italy.

'They are extremely good at masking themselves behind a sort of smoke screen to appear as licit market operators which are, for instance, simply redistributing medicines from some place where there is too much supply and send it to some place where there is too much demand,' he said.

Criminal organisations are also able to swarm markets with 'knock-off' drugs as they are generally involved in a number of other illegal activities.

'If they are producing illicit drugs like ecstasy pills then they have the machines to make other pills,' added Musumeci.

'In terms of raw materials we know they use the cheapest, they don't care about what they put into the product.'

The Issue

As falsified medicines become more sophisticated the risk that they reach EU patients increases every year.

The repackaging of drugs is also opening up possibilities for organised crime. Repackagers are those responsible for adapting the packaging and leaflets to local languages and for further distribution.

Activities of repackagers are legal but what is often missing is an internationally recognised method to check repackaging authorisation. This is where organised crime can come into play.

‘A variety of legitimate operators across the supply chain may be vulnerable to organised crime pressures. It’s not just a question of corruption but of the intimidating power,’ said Musumeci.

‘In the EU every operator should be checked, but in other countries this may not be the case.’

Musumeci was part of the EU-funded SAVEMED project aiming to develop a solution for the illegal re-import problem. The project developed unique coding, marking, and special effects on products and packaging that can address the repackaging problem.

‘We used structural steel stamps that put a microstructure on the surface of pills which is in the pattern of a code and can be scanned by a high-speed 3D camera through its blister packs,’ said Professor Paul Glendenning, CEO of nano4U GmbH, who coordinated the technical work in the SAVEMED project.

By putting track and trace data on the pills, the medicine’s content will always match the packaging.

‘It’s taking authentication to a different level because pharmaceutical companies at the moment are focusing on verifying the primary packaging, while we were checking the drug against the package,’ said Prof. Glendenning, who is now looking for a company to take up the technology.

Arms race

Counterfeiters are constantly adapting their methods and have created an arms race with the industry in their attempt to take advantage of the market.

‘Counterfeiters will become more and more aggressive,’ said Dr Guggi Kofod from the University of Potsdam, Germany, and coordinator at the EU-funded ACfoil project, which has developed anti-counterfeiting hologram foils.

‘We need ... methods to prove the authenticity of medicine and treatments, both to protect the jobs that depend on the production and the consumers who need the products.’

Producing holograms on packaging is expensive, particularly ones made from nanotechnology, that’s why they are usually so small.

ACfoil solved this issue by combining a partner’s high-tech laboratories with another’s expensive packaging equipment to produce next-gen holograms that are 100 times faster and up to 10 000 times cheaper to make than current technology.

They are now looking to hire more staff in order to provide the hologram for big pharmaceutical companies.

In response the European Commission is funding different projects to tackle falsified and counterfeited pharmaceuticals as part of the Horizon 2020 funding programme.

Additionally, the [Falsified Medicines Directive](#), published on 1 July 2011, introduced safety features such as an EU-wide logo to identify legal online pharmacies, tougher rules on the controls and inspections of producers of active pharmaceutical ingredients, and strengthened record-keeping requirements for wholesale distributors.

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United Nations
Interregional Criminal and
Justice Research Institute
(UNICRI), Italy*

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'We can make unique products that are hard to replicate by counterfeiters,' said Dr Kofod. 'They demand a large investment so it would be very hard technologically and production-wise to match our holograms.'

With counterfeiters losing ground in the packaging battleground, it is just a matter of time until they turn their attention elsewhere.

According to Dr Kofod, the key in stopping fake drugs is to address the entire supply chain.

'If we could create a system with an unbroken chain of traceability, all the way from production to the end consumer, possibly via a scanning device or coding, and addressing repackaging, we put the power in the hands of the consumer, where it needs to be.'

More info

[CONPHIRMER](#)

[SAVEMED](#)

[ACfoil](#)