How CBP's laboratories are protecting the public and the U.S. economy

Fighting FRAUD

BY MARCY MASON

In late December 2010, the news broke about a Seattle court case involving counterfeit honey. A 70-year-old Bellevue, Wash., man, Chung Po Liu, had been sentenced to a year and a day in prison and was ordered to pay $400,000 in restitution for importing falsely declared Chinese honey.

photo by Christopher Kana

Liu was trying to avoid paying $2.9 million in tariffs on the honey, which had been shipped through the Philippines and Thailand where it was relabeled to make it appear as if it were a product of those countries.

But aside from attempting to avoid paying millions of dollars in anti-dumping duties that had been added to the price of the honey to protect U.S. industry, Liu's deception had endangered the American public. Some of the honey was contaminated. When the shipments arrived at the port of Seattle, samples of the honey were sent to the U.S. Customs and Border Protection laboratories for testing. There, the true origin of the honey was discovered and the CBP scientists found that it was tainted with Ciprofloxacin, an antibiotic that is banned in the U.S. as an unsafe food additive.

While few outside the trade community are aware of the vital role that the CBP laboratories play in protecting Americans and the U.S. economy, the labs' work is critically important to keeping the public safe from counterfeit, substandard, or any other type of fraudulent goods.

"In order to determine whether goods are fraudulent, you need technical analysis. You need to be able to physically analyze the shipment," said Ira Reese, the executive director of CBP's Laboratories and Scientific Services division. "It's not something you can do from a cursory glance or examination. It requires an in-depth look by scientists."

And as Reese pointed out, "products don't stop being imported incorrectly until you take some action to stop them. Legally, it is very difficult to develop a case without the presentation of physical evidence," he said. "Our labs present the physical evidence that can be further investigated or brought into court for prosecution. It gives legal reasoning or probable cause for seizure of the material so it doesn't enter the commerce of the U.S. and end up on store shelves."

Over the years, the CBP laboratories have tested a multitude of suspect goods. Starting in the 1950s, the labs began testing for counterfeits as part of the U.S. Customs Service, one of CBP's legacy agencies. "Customs did most of the investigations on imported alcohol," said Reese. "There were big investigations regarding the importation of fake brandy, which was alcohol mixed with flavorings and caramel coloring," he said.

'Counterfeiters will use whatever materials they have to make a facsimile of a legitimate product. ***They don't care if it's dangerous.*** *They're just out to make money.'*

—Stephen Cassata, CBP senior science officer

As time passed, the labs expanded their testing of counterfeit and substandard products. All kinds of goods were analyzed including designer clothing, handbags, shoes, jewelry, perfumes, toys, computers, pharmaceuticals and the list goes on. "Anytime there's the potential to make money, there's a counterfeit," said Reese.

Dangerous goods

Although the economic losses to American companies are staggering, estimated conservatively at hundreds of millions of dollars per year, that's not all that's troubling. Many knockoffs are dangerous. "Counterfeiters will use whatever materials they have to make a facsimile of a legitimate product. They don't care if it's dangerous. They're just out to make money," said Stephen Cassata, a senior science officer who works at CBP's Laboratories and Scientific Services headquarters in Washington, D.C. "They don't pay any licensing fees to a legitimate rights holder and there's no real inspection of these products for quality assurance. So wearing apparel, for example, may still have chemical solvents in the fabric that could irritate your skin."

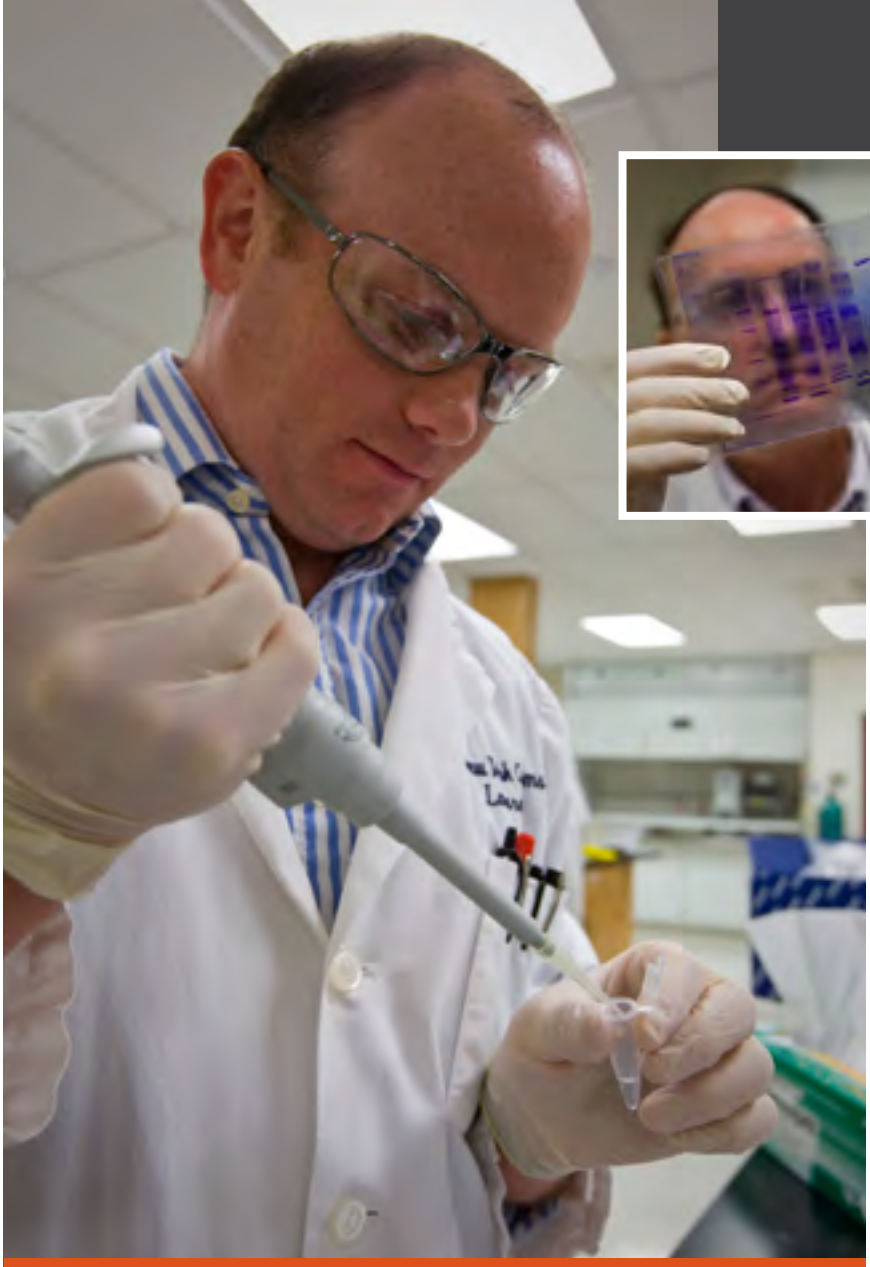
But the dangers can be worse. In 2007, the CBP labs were on high alert when cats and dogs were dying from melamine-tainted pet food. "It went on for about six months," said Reese. "Instead of putting expensive protein into the products, they used melamine, a cheap chemical used to make plastics. It resulted in killing a lot of dogs and cats, causing them to die of kidney failure," he said.

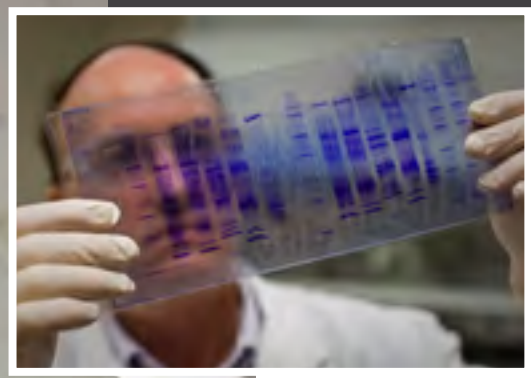
That same year, the CBP labs also found toothpaste containing diethylene glycol, a poisonous chemical used in antifreeze. "It was suspected out in the field and they sent it to us," said Reese. "We confirmed their suspicion."

The CBP labs also have uncovered other highly dangerous counterfeit products that could harm unsuspecting consumers. With the advent of the Internet, counterfeit and unapproved drugs from fake online pharmacies have become readily available. "I did a chemical analysis on a pharmaceutical shipment that was sent by one of our officers to the Chicago lab," said Mike McCormick, a CBP science officer who is now based at the agency's Washington, D.C., headquarters. "There were two active ingredients to treat erectile dysfunction in the same tablet—sildenafil citrate and tadalafil, the active ingredients for Viagra and Cialis respectively," he said. "This combination hasn't been clinically tested or been approved, so you wouldn't know what kind of an effect it would have."

Likewise, the CBP labs are at the forefront of nearly every economic or safety-related issue that involves potentially fraudulent imports or exports. For example, since 2003, when the Department of Commerce issued an antidumping order to protect the domestic catfish industry, CBP's New York lab has been testing seafood to identify mislabeled fish.

The problem arose because pangasius, a Vietnamese fish that has a striking resemblance to catfish, was being sold below fair market value and was negatively impacting the sale of U.S. catfish. As a result of the antidumping order, importers of the Vietnamese fish were required to pay higher duties to compensate for the unfair pricing.





★ Using a protein identification technique, Bryan Ham, a CBP New York laboratory scientist, compares protein from an unknown fish sample with authentic references to see if they match.

photos by Gerald Nino

★ CBP scientist Matthew Birck prepares a sample for DNA bar code testing.

This, in turn, led to mislabeling of the fish to pass it off as everything from catfish to sole to flounder to grouper to avoid paying the extra tariff.

CBP's New York lab initially used protein testing to identify the fish. "We were looking at the proteins in the fish to identify catfish and the three species that were named in the dumping order," said Laura Goldstein, the director of CBP's New York laboratory. The technique required authentic references of each type of fish so that Goldstein's team could do side-by-side comparisons with the test samples to see if the proteins matched.

DNA testing

Eventually, the protein testing became outdated and the New York lab discovered a more advanced technique of identifying species using DNA bar coding. The bar coding analysis identifies species by using a section of DNA from the organism's genetic material. A key component of the DNA bar coding process is a database that contains a library of species identifiers. "We're comparing samples that are submitted to the laboratory for analysis with the known species in the database," said Goldstein. "What we're doing is called nonhuman DNA testing. We're looking to identify a species rather than an individual. Human DNA testing looks to identify an individual," she said.

The database contains DNA bar codes for more than 2 million specimens of plants and animals, including approximately 14,000 species of fish, not including shellfish. "Using our old technique, we needed authenticated samples that were very difficult to obtain. So we were limited in what we could identify previously," said Goldstein. "Now we can just take our unknown and search it against the database and look at the results. We can identify a much larger range of products."

The DNA testing is also more accurate. "It's a much more specific and accurate technique because of the coding matches. You get a match or you don't get a match. It's really as simple as that," said Goldstein. "And the matches are 98 percent probability or better."

But how does all of this protect the American public? "We're looking at the species and identifying if it's what it's being claimed as, what it's being imported as, and what it's being sold as," said Goldstein. "We're also testing the fish for contaminants such as antibiotics and antifungals that we don't want in our foods," she said. "In some cases, we're working with other agencies that look at products that are sold here in the U.S. We're trying our best to keep unsafe products out of the marketplace so that people aren't exposed to them."

In recent months, high profile studies on seafood fraud have drawn considerable attention to the problems of mislabeled fish. "It's an age-old problem. Mislabeling of seafood is not a new concept," said Matt Fass, the president of Maritime Products International, a fourth-generation, family-owned and operated company that imports,

'The CBP lab scientists are on the frontlines ...and they're crucial. ***Their ability to find fake products is a major part of the war on counterfeits.'***

—Brian Donnelly, global security director for the Americas region, Pfizer

exports and distributes seafood products from all over the world.

"We've done a lot as an industry to police ourselves, but it helps to partner with the government agencies that can also be out there with effective enforcement tools such as the DNA testing that the CBP labs are using," he said. "As consumers, people should know what they're buying. They should know what they're eating. We all want to know what's going into our bodies."

Contaminated honey

During the early 2000s, honey became another concern of the CBP labs. "The Chinese were importing honey into the U.S. at a very low price and it was endangering our domestic industry," said Carson Watts, the director of CBP's Savannah laboratory.

In 2001, after the Department of Commerce imposed stiff antidumping duties on Chinese honey, some of the major U.S. honey companies visited the Savannah lab. Chinese exporters were circumventing the antidumping duties and the U.S. companies wanted the CBP scientists to find a way to protect the domestic industry. "At the time, we weren't able to tell where the imported honey came from," said Watts. "One of the things we stumbled onto was the fact that the Chinese were using the antibiotic chloramphenicol to keep the beehives healthy, and it was showing up in the honey. So the very first thing we did was test the honey for chloramphenicol," he said. "If it contained chloramphenicol, it was pretty much a dead giveaway that the product came from China."

Furthermore, chloramphenicol is prohibited in food products and as such the adulterated honey would not have been allowed into the U.S. for safety reasons. "For a small segment of the population, exposure to chloramphenicol will induce a condition called aplastic anemia," said Watts. "Aplastic anemia is a blood disorder that can be fatal. While chloramphenicol is used in the United States to treat some very serious infections, if someone develops aplastic anemia, he or she could die," said Watts. "It's imperative to keep a food product that contains chloramphenicol off the store shelves."

It didn't take long for the Chinese exporters to catch on. "For a short period of time, the chloramphenicol disappeared," said Watts. "They knew we were using that as a marker to identify honey coming from China."

But by that point, the Savannah lab had created a database to determine the honey's geographic origin. When the U.S. honey companies had visited the lab a couple of years earlier, the CBP scientists had asked them for help. "We told them that one of the specialties of the Savannah laboratory was identifying country of origin based on trace metal analysis," said Watts. In other words, the honey could be identified by its trace metal elements such as chromium, iron or copper. "If the companies could help us obtain honey from various countries, we might be able to develop a profile to tell us where the honey came from," he said.

The honey companies complied and the Savannah lab developed the ability to determine the honey's geographic origin. Then, the Chinese exporters started transshipping the honey to different countries. "The honey was going to Thailand, Malaysia, India and various other places so it wouldn't enter into the U.S. as Chinese honey," said Watts. As the Chinese exporters changed their transshipment routes, the Savannah lab needed to obtain samples of honey from each of the countries. "We were literally chasing them around the globe," said Watts.

Changing strategies

Then the Chinese exporters changed their strategy. This time the shipments were sent from China, but they weren't declared as honey. The shipping documents labeled the cargo as sugar syrup. "They began to

Uncovering FAKES

As part of the testing that the CBP labs do to protect consumers, the CBP Savannah laboratory found that these honey samples were, in fact, sugar syrup.

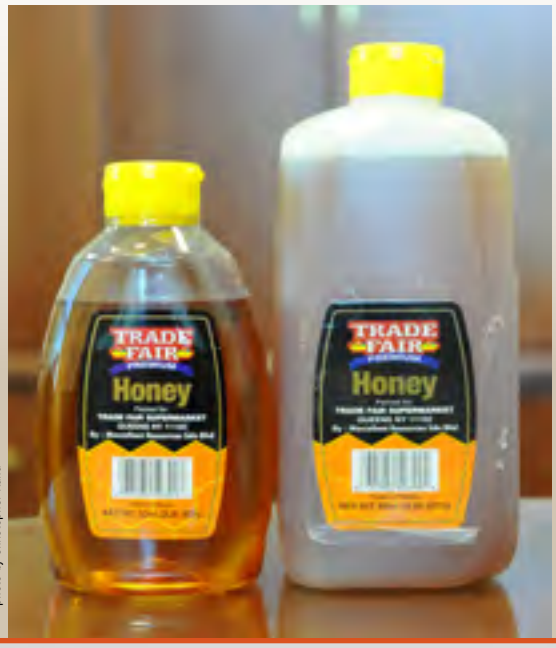


photo by Christopher Kana

adulterate the honey with sugar syrups in an effort to find another way to get around the antidumping duties," explained Watts. With the addition of sugar syrups, the product no longer tested as pure Chinese honey, and if the percentage of syrup was high enough, the shipment wouldn't be subject to the duties. "The cheapest ingredient to adulterate honey with is high fructose corn syrup," said Watts.

As the cat-and-mouse game continued, the Savannah lab discovered it could detect the high fructose corn syrup by identifying differences in the syrup's carbon atoms. "Almost a year went by and again the Chinese exporters wised up," said Watts. "They realized that the CBP labs could tell if the honey had been adulterated with high fructose corn syrup, so they switched to high fructose rice syrup instead." The percentage of high fructose rice syrup was undetectable because the differences between the syrup's and the honey's carbon atoms were indistinguishable.

At that point the Department of Commerce changed the antidumping order to say that imported Chinese honey containing any amount of rice syrup would be subject to the additional antidumping duties, which currently run as high as $2.63 per kilogram.

Most recently, Chinese exporters have adopted a new strategy. The shipments are no longer honey. They are now 100 percent rice syrup and the shipping documentation is accurate. "We analyzed a sample in the lab last week," said Watts, "and sure enough, there wasn't any honey in it, but the packaging on the product for retail sale says it's pure honey. They're trying to pull the wool over the public's eyes."

Substandard bolts

The CBP labs also protect the public by testing goods to make sure they aren't substandard. For more than 25 years, the labs have been testing graded fasteners and bolts to ensure they meet specification. The dangers of substandard and counterfeit fasteners were highly publicized during the mid- to late-1980s when they were linked to serious construction and engineering failures, which, in some cases, resulted in death. In 1990, the Fastener Quality Act was signed into law requiring that fasteners and bolts meet certain standards for strength, grade and manufacturer's marks.

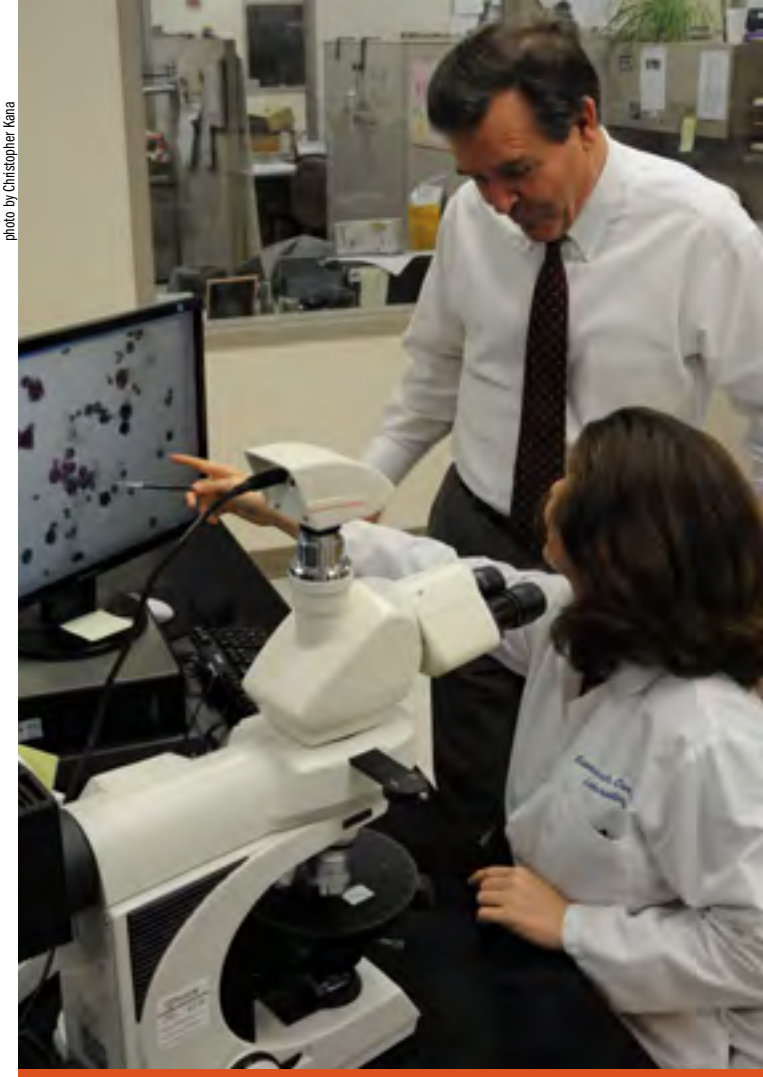
At the CBP Chicago laboratory, fasteners and bolts are tested for tensile strength using a 400,000-pound universal testing machine. "It's a big hydraulic lifter that's holding the top of the bolt. It can lift 200 tons," said Ernie MacMillan, the assistant director of CBP's Savannah laboratory, who for several years led the Chicago lab's team that tests metal, ceramic and mineral goods.

"When we test the bolts, we pull them until they break. When we're done, the bolt looks like a piece of taffy," he said. One of the strongest fasteners is a 1 1/2-inch, grade 8 bolt. "It's strong enough to lift 17 large African elephants without breaking," said MacMillan.

The CBP labs also test the bolts for hardness, especially at the surface. "We test the surface hardness of the bolts because the steel is heat treated," said MacMillan. "When it's heated, the surface of the steel can either lose carbon or gain carbon. If it loses carbon, it gets too soft. If it gains carbon, it gets too brittle. Somewhere in the middle is where it should be."

The bolts also undergo other tests to check the chemical composition and the manufacturer's mark. "A fastener or a bolt is suspect right away if it doesn't have a manufacturer's mark," said MacMillan. "It's already not in compliance with the Fastener Quality Act, which says it must be marked. As soon as you see one of those, you know you've got a problem."

photo by Christopher Kana



★ CBP scientist Sharon Stricklin discusses the microscopic analysis of an adulterated honey sample with Carson Watts, the director of CBP's Savannah laboratory.

Counterfeit electronics

Electronics are among the most highly counterfeited goods that the CBP labs test. "We first noticed a counterfeiting problem in the early 1990s, when we began looking at electronic components," said Jenny Tsang, the assistant director of CBP's San Francisco laboratory. "Then we didn't see anything for awhile, but in the last several years, we're seeing a lot of counterfeit computer chips, routers, switches and other electronic products."

According to Tsang, reused chips are especially prevalent. "Chips are counterfeit more and more because nowadays we salvage our computer parts and send the waste to China or India for recycling," she said. "Instead of throwing these parts out, counterfeiters remove the chips, scrape off

the original manufacturer's markings and then remark them with forged dates, brand names and product codes to resell them as brand new," said Tsang.

"We've also seen a lot of components that were originally a genuine product, but then have been remade to look like a much higher-value product from the same manufacturer, so that counterfeiters can sell it for a much higher amount," said Tsang. "With counterfeiters, it all comes down to money. They use whatever means is necessary to sell goods at a higher price. For consumers, it's almost impossible to identify counterfeit electronic products by looking at them," she said.

The dangers of bogus computers, routers and chips have been well documented. Fake electronic and computer components have cost the electronics and information technology industries an estimated $100 billion per year, according to the Electronic Components Industry Association. But the seriousness of the problem extends way beyond economic damage to U.S. companies. "Counterfeit products not only put Cisco's brand name at risk, but also potentially places at risk all of the networks that use those products and the individuals that come in contact with them," said Paul Ortiz, the head of worldwide brand protection for Cisco Systems Inc., one of the world's leading networking technology firms based in San Jose, Calif.

"If a chip is not meeting specification—if it gets too hot or it's not functioning properly—that's potentially a big safety concern," said Tsang. "Counterfeit chips in a computer can ruin infrastructure, which could potentially paralyze the flow of trade or our nation's security systems."

Malware concerns

There are also growing concerns that chips could be embedded with malware, malicious software designed specifically to damage or disrupt a system. "It could shut down a power grid or a hospital operating room. The possibilities are endless," said Tsang. Likewise, it could allow a third party to gain access to sensitive personal or government information.

CBP's San Francisco lab uses a variety of testing techniques to weed out the counterfeits. Last year, the lab purchased new X-ray equipment to examine as many as a

★ Jenny Tsang, the assistant director of CBP's San Francisco laboratory, applies a chemical solvent to a computer chip to see if its coating or manufacturer's markings can be removed, one of the many signs of a counterfeit chip.

photo by Collin Ma

*'In order to determine whether goods are fraudulent, you need technical analysis....**It's not something you can do from a cursory glance or examination.** It requires an in-depth look by scientists.'*

—Ira Reese, CBP executive director, Laboratories and Scientific Services

PROTECTING THE PUBLIC

The CBP labs have helped other agencies protect the American public. For example, in 2010, the labs tested shipments of honey from Mongolia to confirm the country of origin. The CBP scientists discovered the honey was actually from China and that some of the product was contaminated with antibiotics. The shipments were seized and the U.S. Food and Drug Administration, the regulatory agency responsible for assuring that food coming into the U.S. is safe, was notified.

The FDA attempted to contact the importer, but the shipment was abandoned and no importer could be found. This, in turn, sparked an FDA investigation. "We found thousands of pages of fraudulent documents from various importers. We call them 'shell companies,'" said Nicholas Lahey, an investigator for the FDA's Los Angeles District Import Operations. "Our investigators found that a lot of these shell companies are really just P.O. boxes. There aren't any actual company locations. They file articles of incorporation, but there's no one present in the U.S. They're in China," he said. "The only people here are paid freight forwarders and brokers."

The investigation also revealed that the company fronts involved a couple of freight forwarders who were importing restricted and prohibited products that could harm the public. The FDA kept a close watch on the freight forwarders and in 2012 targeted a shipment of apple juice that one of the freight forwarders was handling for a client. Both the CBP and FDA labs tested the apple juice and found fraud. "Lo and behold, it was not Chinese apple juice. It was Chinese honey contaminated with trace levels of arsenic, lead and antibiotics," said Lahey. "We never would have looked at the apple juice if we hadn't done the investigation, which was initiated because of the country of origin testing done by the CBP labs."

This prompted the FDA to look further. "We found a slew of other companies that were bringing in different commodities, not just honey. There were dietary supplements and other FDA-regulated products," said Lahey. "It triggered a whole chain, which again, was based on the CBP lab results from two years earlier."

—Marcy Mason

thousand chips at a time. "We look to see if there are inconsistencies in the way the chips are configured," said Tsang. The lab also does a surface examination of the chips. "We use several different solvents," she said. "We're testing to see if the coating comes off. It's one of the indications that a chip could be counterfeit."

If a chip, component or networking system is suspected of being counterfeit, the lab contacts the rights holder. For example, said Tsang, "If it's a Cisco product, we confer with them. Cisco has a database and each of the products has its own serial number, model number and date code. If they all don't match, that means the product is counterfeit."

The value of the CBP labs has not gone unnoticed. "The CBP lab scientists are on the frontlines with the officers and they're crucial," said Brian Donnelly, the global security director for the Americas region for Pfizer, one of the world's largest pharmaceutical companies. "Their ability to find fake products is a major part of the war on counterfeits. An alert officer may see something is not quite right, but he or she isn't in a position to act upon it until the laboratory is able to confirm the contents of the product."

The CBP labs, which are located throughout the U.S. and in Puerto Rico, have other advantages too. "Our labs will test goods as fast as we can," said Donnelly, a registered pharmacist and retired FBI special agent, "but if CBP has laboratories in the same city as the ports, the scientists are able to turn around a quick and effective result potentially within minutes or hours of interacting with the product, which can greatly facilitate a criminal investigation."

But it's an ongoing battle and an evolving process. "We're continuing to refine our techniques. The CBP labs are not in a position of stasis," said Watts, the director of CBP's Savannah lab. "We have our ear to the ground, and as smuggling techniques and technology change, we're addressing them early on." ■