Camels, the source of the Middle East respiratory syndrome (MERS) outbreak that started in 2012, await sale at a market northwest of Cairo in 2015. The legal trade in wildlife is as serious a risk for the spread of zoonotic diseases as the illegal trade, experts warn. Photograph by Ahmed Gomaa Xinhua / eyevine/Redux

AnimalsWildlife Watch

To prevent the next pandemic, it's the legal wildlife trade we should worry about

Millions of live animals enter the U.S. each year without disease screening—leaving us vulnerable to another outbreak, a former wildlife inspector says.

10 Minute Read

By **Jonathan Kolby**

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Twenty thousand live bullfrogs from China that will be cooked and eaten as frog legs. Forty green monkeys from St. Kitts and Nevis for biomedical research. Three hundred giant clams from Vietnam and 30 stingrays from the Brazilian Amazon for home aquariums.

That motley assortment is a miniscule glimpse of what the legal international wildlife trade might look like on a given day in any of the 41 ports of entry staffed by U.S. Fish and Wildlife Service inspectors. I routinely saw consignments like these—alongside crates filled with shampoo bottles, cucumbers, and freshly cut roses—at the Port of Newark, New Jersey, when I was a wildlife inspector, from 2004 to 2010.

At airports, seaports, and land border crossings in 2019, $4.3 billion of legal wildlife and wildlife products was imported into the U.S. Approximately 200 million live animals are imported to the U.S. annually, according to a five-year trade report: 175 million fish for the aquarium trade, and 25 million animals comprised of an array of mammals, amphibians, birds, insects, reptiles, spiders, and more. On top of that, thousands of illegally traded shipments of wildlife are intercepted each year. In 2019 alone, the agency opened more than 10,000 illegal wildlife trade investigations.

The diseases that hitchhike into the country on legally imported wildlife continue to go largely unnoticed.

But along with such a diversity of wildlife, a kaleidoscope of pathogens is also entering the country. My experience with the Fish and Wildlife Service, where I worked for 10 years, first as a wildlife inspector and most recently as a policy specialist regulating and managing the international wildlife trade, showed me that although many controls have been implemented to combat illegal trade, the diseases that simultaneously hitchhike into the country on legally imported wildlife continue to go largely unnoticed.

Importing any live animal brings with it the risk of disease—to native wildlife, to livestock, and to people. The outbreak of the novel coronavirus in China, theorized to have jumped from bats into humans and then spread at a wet market in Wuhan, possibly through an intermediate host, has shined a spotlight on how easily zoonotic diseases can emerge from wildlife. Indeed, an estimated 60 percent of known human diseases originated in animals, according to the World Organization for Animal Health.

Much of the public discussion around COVID-19 has focused on the potential role of the illegal wildlife trade in spreading pathogens. But as a wildlife trade specialist and conservation biologist—I studied the spread of disease among imported frogs—I've learned that we need to think just as critically about the risks and vulnerabilities presented by the massive legal trade, which continues to place both ourselves and the world at risk of more pandemics.

With few exceptions, the U.S. has no laws specifically requiring disease surveillance for wildlife entering the country, and the vast majority of wild animal imports are therefore not tested. Inspectors with the Fish and Wildlife Service are the first to set eyes on an imported shipment of animals, and they're charged with enforcing a variety of national and international laws, regulations, and treaties that focus on preventing illegal and unsustainable trade. But its mandate doesn't extend to monitoring animal or human health. Its only responsibilities related to disease are the enforcement of rules limiting trade in certain fish and salamander species, which have the potential to spread devastating disease to other animals of their kind.

In fact, no federal agency is tasked with the comprehensive screening and monitoring of imported wildlife for disease.

The Centers for Disease Control and Prevention (CDC) regulates the importation of wildlife and wildlife products known to "present a significant public health concern," focusing primarily on bats, African rodents, and nonhuman primates, Jasmine Reed, a CDC spokesperson, wrote in an email. The U.S. Department of Agriculture (USDA) intervenes only if there's a disease risk to poultry or livestock animals of agricultural importance.

This leaves millions of animals that come into the U.S legally each year unchecked for diseases that have the potential to spill over to humans or other animals.

The CDC insists it's keeping an eye out. "CDC works closely with other federal agencies to ensure animals and animal products that present a public health concern are regulated," Reed says. "Through our partnerships with international agencies, we are constantly evaluating and assessing what we and the international public health community do to detect, prevent, and control zoonotic disease threats."

"I'm confident that our authorities are doing the best they can with the resources they have," says Catherine Machalaba, a policy advisor for EcoHealth Alliance, a nonprofit focused on the connections between human and wildlife health. "But I'm not confident that's a good enough benchmark when we're talking about leaving the door open [to potential diseases that are] a threat to our health and security."

About two million American bullfrogs are imported live to the U.S. from factory farms abroad each year to be eaten. Legally imported frogs have been found to carry the devastating. Photograph by Jonathan E. Kolby

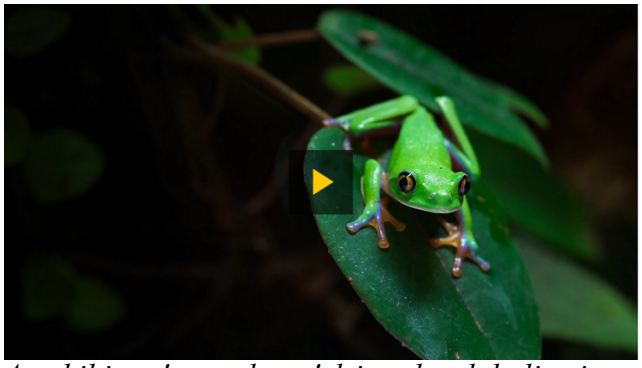
The problem isn't unique to the U.S.—most countries do not have a government agency that comprehensively screens wildlife imports for pathogens. "The absence of any formal entity dedicated to preventing the spread of diseases from the wildlife trade is such a chronic gap around the world," Machalaba says. "When multiple agencies have to be called in for any given shipment, personnel is limited, and coordination is lacking, there's bound to be gaps—a false sense of security that another agency has it covered."

Outbreaks from legal trade

Many recent zoonotic outbreaks affecting people sprang from trade that was allowed at the time, says Lee Skerratt, a wildlife biosecurity fellow at the University of Melbourne, in Australia.

In 2003, for example, people in six U.S. states became ill from exposure to the monkeypox virus after it entered the country in a pet trade shipment of 800 rodents from Ghana. In that shipment, African giant pouched rats, rope squirrels, and dormice carried the virus. It spread to prairie dogs held in the same pet trade facility, which were then sold to the public, starting the animal-to-human outbreak. Luckily, although human-to-human transmission of monkeypox can occur, no cases were confirmed.

Three months after the infected animals had been imported, the CDC banned the import of all African rodents into the U.S. That gave the Fish and Wildlife Service the legal power to detain shipments in violation of the ban and alert the CDC, which could choose to require quarantine, re-exportation, or euthanization of the animals.



Amphibians 'apocalypse' driven by globalization, wildlife trade. Humans have never been part of a pandemic on the scale of chytrid. Even tragedies such as the Black Death devastated only one species of mammal: humans. By

contrast, emerging. …Video by Katie Garrett and Jonathan Kolby

Although this outbreak led to an import ban on African rodents, the government stopped short of doing any risk assessments to consider whether rodents from other places might also carry diseases that would require regulation, Machalaba says.

"Wildlife coming into the U.S. are sourced from many countries that are 'hot spots' for emerging diseases—of potential concern for human health but also posing threats to other sectors via our food systems and ecosystems," Malachaba says.

Warnings about shortcomings

Officials have long known about the gaps in the U.S.'s regulatory system. In 2005, the National Academies of Science published a report that found a "significant gap in preventing and rapidly detecting emergent diseases" from imported wildlife.

Five years later, the U.S. Government Accountability Office, which audits government spending and operations, published a report on live animal imports and diseases. It found that the Fish and Wildlife Service "generally does not restrict the entry of imported wildlife that may pose disease risks." Furthermore, the report says, the CDC doesn't use its full power to prevent the import of live animals that pose a risk of zoonotic diseases.

The 2010 report recommended that the CDC, the Fish and Wildlife Service, and USDA develop and implement a coordinated strategy to prevent the import of animals that may be carrying diseases. But a follow-up assessment in 2015 found that the agencies did not take action. There simply weren't the economic or staffing resources to make it happen, it says.

The ability to prevent and control emerging zoonotic diseases requires an understanding of the diversity and abundance of pathogens being imported. But without monitoring and surveillance of imported wildlife, we don't have this information, Skerratt says. "This is a problem for the wildlife trade as there is much that we don't know, especially for diseases that could affect other wildlife," he says.

The CDC also acknowledges the lack of research. "We need more data through risk assessments and basic research before adding any new regulations," Reed says.

But it's a Catch-22: For an agency to systematically collect pathogen data from wildlife imports, it would need a legal mandate from the government. But the government is only likely to do that once it has pathogen data to guide its decisions.

Amphibian cataclysm

Pathogens passed from animals to humans aren't the only cause for concern. Amphibian chytrid fungus, the aquatic fungal pathogen *Batrachochytrium dendrobatidis*, is the first disease known to infect hundreds of species simultaneously and drive many of them toward extinction. It's so dangerous because it can jump between nearly any amphibian—a class with more than 8,000 species. It has already spread to remote protected areas around the world. From my Ph.D. research, I discovered that imports of factory-farmed American bullfrogs—nearly 2.5 million a year, more than any other live amphibian species—introduce frighteningly high numbers of chytrid-infected animals into the U.S.

The deadly amphibian chytrid fungus, introduced to the U.S. through the legal wildlife trade, has spread

to native frog species across North America, even in protected areas like King's. Photograph by JOEL SARTORE, Nat Geo Image Collection

Scientists note the role of legal transcontinental trade in driving the chytrid pandemic—yet the trade continues, despite the biological and economic cost. Domestically, for example, the Fish and Wildlife Service has spent millions of dollars to prevent chytrid-driven extinctions of native species, such as the endangered Wyoming toad, through captive breeding and reintroduction efforts, while continuing to allow legal importation of amphibians that spread the very pathogen threatening those native species.

Humans have never been part of a pandemic on the scale of that now affecting amphibians. Even tragedies such as the Black Death, in the mid-1300s, and the 1918 influenza pandemic devastated only one species of mammal: humans. By contrast, emerging wildlife diseases, notably chytrid, have been much less picky in the diversity and numbers of animal hosts they infect and kill. Imagine what it would be like if the next pandemic could infect hundreds of the world's 5,000 species of mammals—including humans—causing many to become extinct.

The best way to minimize risk

An enormous variety of plants and animals are involved in the international wildlife trade, and many are a regular part of our daily lives: Imported seafood for dinner; timber for building homes and musical instruments; pet birds and frogs and aquarium fishes; mother-of-pearl buttons on dress shirts; medicinal plants like ginseng; cosmetic essential oils such as argan and frankincense; and even many of the orchids and cacti for home decoration. This is why ending the legal trade in wildlife seems unlikely, and why, Skerratt says, controlling disease at the source is the best way to minimize the risk to public health.

There seems to be a lack of economic incentive to create a wildlife health law in the U.S. to regulate the pathways of spread of wildlife pathogens.

Priya Nanjappa, Director of Operations, Conservation Science Partners, Inc.

Key to reducing the spread of pathogens is a "clean trade" program, in which private industry and government officials work together to implement safer strategies, according to Matthew Gray, associate director of the University of Tennessee Center for Wildlife Health, in Knoxville.

Gray says that clean trade could involve testing either before transport or at the border, so that animal health certificates could accompany wildlife—similar to what's required for livestock. "If clean trade is not economically sustainable, government subsidies could be provided, as done often with agriculture," he says.

It shouldn't be too difficult to develop a program in the U.S. to monitor imported wildlife for pathogens and develop risk assessments, says Peter Jenkins, senior counsel for Public Employees for Environmental Responsibility, an environmental nonprofit. "We have a very good model of this, and it's the U.S. livestock trade." The USDA's Animal Plant and Health Service implements a comprehensive system of veterinary services and trade controls to reduce the risk of importing pathogens that can harm animals, including cattle, sheep, poultry and others.

Jenkins estimates such a program could be implemented for a reasonable cost, with just $2 million and six full-time government employees, a figure developed with Congressional staff in 2015 when Jenkins was lobbying to expand the Fish and Wildlife Service's "injurious wildlife" program. "We're not talking about a Cadillac program. We just need people doing the research, making risk-based predictions, and then operationalizing those predictions to reduce risk."

Yet it hasn't happened.

"There seems to be a lack of economic incentive to create a wildlife health law in the U.S. to regulate the pathways of spread of wildlife pathogens, but the COVID-19 disease highlights the consequences of our lack of understanding of these pathogens," says Priya Nanjappa, director of operations at Conservation Science Partners, Inc., a nonprofit that provides research and analysis for conservation projects.

The lack of incentive, Najappa says, seems to stem from the false belief that if an imported disease doesn't immediately threaten public health or agricultural animals, it's not a major threat to economic interests. But take white-nose syndrome, a fungus that has decimated millions of bats, across several species, in the U.S. Some of these bat population crashes led to Endangered Species Act protections, which in turn place restrictions on economic activities such as logging within the species' habitats.

The CDC, Fish and Wildlife Service, and USDA did not comment on what kinds of resources the agencies would need to do additional risk assessments, implement monitoring for diseases in the wildlife trade, or whether the pandemic would prompt them to push for increased disease surveillance.

With COVID-19 aiming a spotlight on long-existing deficiencies, now is the time for the best minds in the Fish and Wildlife Service, CDC, USDA, industry and academia to come together and consider what steps can be taken to sew this hole shut, before the next animal-origin pandemic is thrust into our daily lives.

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