

Protecting Endangered Species – U.S. Fish and Wildlife Forensics Laboratory



The U.S. Fish and Wildlife Forensic Lab in Ashland, Oregon is helping to stop the export and import of rhino horn. The only wildlife forensic lab of its kind in the world, their work is identifying illegal exports and imports of products made from endangered wildlife as well as protected natural resources. JEOL is proud to share this story about how the AccuTOF-DART mass spectrometer is used to accurately identify the presence of rhino horn, as well as any suspicious items that may be made from endangered species, including pangolin and rare woods.

Trafficking of rhinoceros horn has had a tremendous impact on the decline of the species, which is listed in the Endangered Species Act of the United States and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Poachers kill a rhinoceros for its single large horn and sell it for as much as \$100,000 on the black market. The horn is highly valued in some cultures for its perceived medicinal purposes and its impact on the status of the person who possesses it.

International trade of rhino horn in any form is illegal. If a shipment is suspected to contain rhino horn, Customs officials need to be able to confirm the taxonomy and distinguish it quickly from what may be imitation. Both authentic and imitation horn may be shipped in the form of jewelry, libation cups, powders, and statuary. Smugglers who are part of an international syndicate have turned up in America, as well, attempting to buy or sell rhino horn.

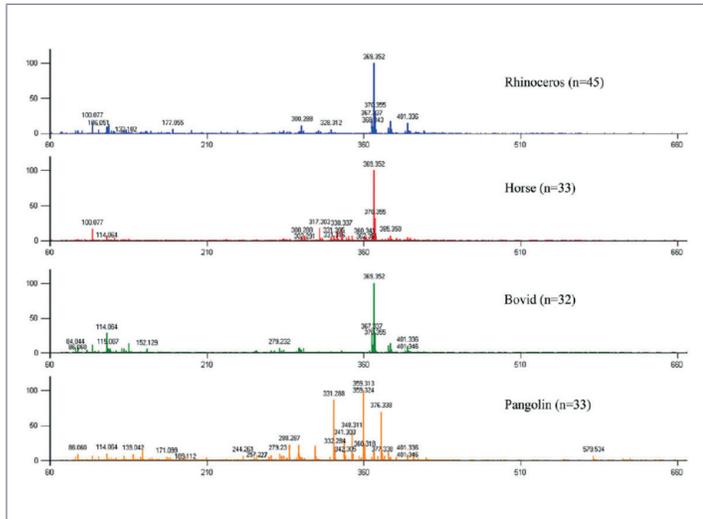
Here's where JEOL's mass spectrometer, AccuTOF™-DART®, widely used in forensics investigations, holds a new and important role in accurately identifying the source of the suspected keratinous materials and confirming if they are from the endangered rhinoceros. Thanks to Dr. Edgard Espinoza and his team at the United States Fish and Wildlife Forensic Lab, the standard for taxonomic differentiation of different sources of keratin, such as equine hoof, bovid horn, and pangolin scales has been achieved using the AccuTOF-DART.



Dr. Robert (Chip) Cody (JEOL) with Dr. Edgard (Ed) Espinoza (USFWS Forensic Lab), a rhino horn, and the AccuTOF-DART mass spectrometer.



A recent paper describes how the ambient ionization technique allows for exact mass measurements of ions from a solid matrix. The process is near-instantaneous and, unlike typical mass spec techniques, requires no sample preparation other than a sliver of the sample for analysis. Experiments using the AccuTOF-DART and further data analyses have provided the information necessary to determine the chemotypes of the keratin.



Average spectra of individual samples for each taxonomic keratin group.

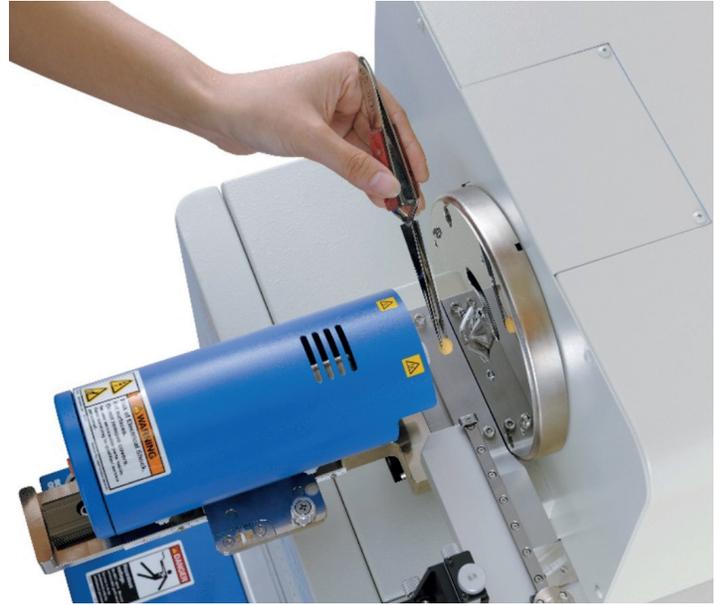
U.S. Fish and Wildlife Forensic Lab, located in Ashland, Oregon, is the only dedicated crime lab for wildlife in the world. It was opened in 1989 to help deter illegal exports and imports of products made from endangered wildlife as well as protected natural resources, like Madagascar Rosewood.

The lab serves 180 countries who signed the United Nation's CITES (Convention on International Trade in Endangered Species) Treaty, all 50 states in the U.S., 200+ special agents, and 120+ inspectors. It has also assisted the International Criminal Police Organization (INTERPOL) with forensic analysis.

With just 15 scientists on staff, USFWS Forensic Lab identifies the suspected animal or plant species and its origin, often from unrecognizable evidence that requires special analytical instrumentation for verification. The investigators use all the typical forensic methods including morphology, DNA analysis, and chemical analysis to verify what the animal or plant is, how it was killed, and to determine its origin.

Wildlife trade is the 4th largest illegal industry worldwide, behind narcotics, counterfeiting, and human trafficking. All rhino species are listed in the Convention on International Trade in Endangered Species (CITES), which prohibits commercial international trade in rhinos and their products and derivatives, including hunting trophies.

It's the chemical composition that provides the positive identification needed. For the past several years, the US Fish and Wildlife Forensic Lab has used the JEOL AccuTOF-DART, a mass spectrometer equipped with a JEOL-patented ion source (DART), that makes it possible to analyze a sample without altering it or having to go through any special preparation techniques. The DART can almost instantly detect the chemical fingerprint of contraband.



JEOL's AccuTOF-DART mass spectrometer in action.

Further reading:

E.R. Price, P.J. McClure, R.L. Jacobs, E.O. Espinoza (2018) Identification of rhinoceros keratin using direct analysis in real time (DART) time-of-flight mass spectrometry (TOFMS) and multivariate statistical analysis. *Rapid Communications in Mass Spectrometry*.

Get in touch

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