

# DNA barcoding of parasitic worms: Is it kosher?

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When rabbis from the Orthodox Union started finding worms in cans of sardines and capelin eggs, they turned to scientists at the American Museum of Natural History to answer a culturally significant dietary question: could these foods still be considered kosher?

Using a technique called "[DNA barcoding](#)" at the Museum's Sackler Institute for Comparative Genomics, researchers identified the species and life cycles of the [parasitic worms](#) to determine whether the food's preparation violated Jewish dietary laws. The results, which were recently published online in the *Journal of Parasitology*, show that although the food contains a handful of species of [roundworms](#), it is kosher.

"About 75 percent of all pre-packaged food has a kosher certification," said Mark Siddall, a curator in the Museum's Division of Invertebrate Zoology. "Many people, not just those in the Jewish community, look for this certification as a symbol of quality assurance in food preparation. If you're a food provider and you lose that certification, you're going to take a large hit."

The study began last March, when rabbinical experts from the Orthodox Union, the largest organization that certifies food products for the Jewish community, brought a variety of kosher-certified [sardines](#) and capelin eggs to the Museum. Their concern: the presence of the worms might be a sign that intestinal contents were allowed to mix with sardine meat or preserved capelin eggs during food preparation. If that were the

case, kosher certification would be compromised.

The key to determining whether the canned food was improperly handled is in the worms' life cycles, Siddall said. "Some species of worms live in the muscles of fish when they're in the larval stage," he said. "Other species live in the fish's [intestines](#) when they're adults. We already know the life cycles for these parasites, so all we have to do is figure out what species were present in the canned food."

To do this, researchers used genetic barcoding, a technology based on a relatively short region of a gene in the mitochondrion, an energy-producing structure located outside of the cell's nucleus, that allows researchers to efficiently identify the species from which a piece of meat—or even a leather handbag—came from.

Work by Museum scientists has long included and promoted this technique, which has identified the presence of endangered whales in Asian markets, documented fraud in the labeling of tuna, and determined the species of animals on sale in African bushmeat markets. In this case, the scientists identified a handful of different nematode [species](#), none of which are known to live in the guts of fish during their lifecycles—therefore, there's no evidence of intestinal [worms](#) co-mingling with the fish meat or eggs.

As a result, the Orthodox Union issued a decision that the [food](#) remains kosher.

"To our knowledge, this is the first application of DNA barcoding to an obviously cultural concern," said Sebastian Kvist, one of the paper's authors and a student in the Museum's Richard Gilder Graduate School. "This paper really exemplifies what science is all about—helping people."

Provided by American Museum of Natural History

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