

In 1991 Sergeant Joseph Campbell of the Division of Fish and Wildlife Protection in Anchorage, Alaska, received a tip from “one of my sources” that two Asian men would be arriving shortly at the airport carrying a shipment of undeclared gallbladders from Canadian bears. Traffic in bear gallbladders is internationally regulated and is largely illegal. Campbell’s source turned out to be right. “I met the men at the airport,” says Campbell. “They had 174 bear gallbladders in a handbag.”

MYSTERY MATTERS SMUGGLING

Bear gallbladders are used in traditional Asian medicine to treat gallstones, liver disease, and a variety of other ailments. Unlike rhinoceros horn, and many of the other animal-derived substances used in Asian medicine, bear gallbladders do contain a compound that has therapeutic value. This compound is ursodeoxycholic acid, one of the bile acids produced by the bear liver, concentrated and stored in the gall bladder and ultimately released into the intestine to help digest fats. A synthetic form of this bile acid, ursodiol (“ursa” means “bear” in Latin), has been shown to be effective in treating both gallstones and a liver disease called primary biliary cirrhosis.

Although a synthetic substitute for bear gallbladders is available, many Asians prefer the real thing. In China and Korea, people collect bile from bears kept in small cages. These bear farms operate like dairies—the bears have catheters implanted in their gallbladders so their bile can be “milked.” As cruel as this may sound, farming bears is the most humane way of getting their bile. The other option is to kill them. The black market demand for bear gallbladders has so depleted Asian bear populations that they are in danger of extinction. Because of the decline in Asian bears, people are killing more and more North American bears for their gallbladders. In Canada, black bear carcasses have been found with just their gallbladders cut out.

Although many Asians prefer real bear bile, only the wealthy can afford it.

Devotees of traditional Asian medicine will pay \$250 per gram for dry bear gallbladders or “galls,” the most commonly sold form. Galls weigh between 30 and 50 grams, which means a single gall has a street value of \$7,500 to \$12,500, making the trade lucrative enough to tempt people to flout the laws. Importing bear gallbladders into the United States requires a permit, and most states prohibit selling bear gallbladders.

American black bear. Many are killed solely to harvest the gallbladder.

PHOTO COURTESY JOSEPH CAMPBELL,
ALASKA FISH AND WILDLIFE PROTECTION

BEAR GALLS

by Robin Meadows

The two men apprehended by Campbell in the Anchorage Airport had bought their galls in Canada for an estimated \$35,000 (which works out to the bargain price of \$200 per gall), and had brought them to first Chicago and then to Anchorage, which is a convenient point of departure for Asia. The men had intended to go on to Korea, where the galls could have fetched the staggering sum of more than \$1 million. If convicted, the men would face a penalty of up to \$250,000 in fines and five years in prison for not declaring the bear gallbladders when they entered the United States.

To make a case against the men, Campbell had to prove two things: first, that the gallbladders had been for sale and, second, that they had indeed come from bears. The first part was easy. "I asked them if the galls were for sale and they said yes," recalls Campbell.

The second part, proving the origin of the galls, was harder. When dry, bear gallbladders are the size of a large fig and are "dark, dark brown with some gold. They have a very distinctive smell and taste. Once you've smelled them—or tasted them, if you're brave—you don't forget it." But no matter how certain he is, Campbell needs more than his opinion to make a case. For proof that is admissible in court, he relies on Edgard Espinoza, chief of the Criminalistics Section of the U.S. National Fish and Wildlife Forensic Laboratory in Ashland, Oregon.

To determine whether the 174 confiscated gallbladders came from bears, Espinoza analyzed the gall's bile using a method that he developed with Lee Hagey, a graduate student who worked with gastroenterologist Alan Hofmann at the University of California, San Diego. The method uses high-pressure liquid chromatography (HPLC) to separate and identify the various compounds found in bile.

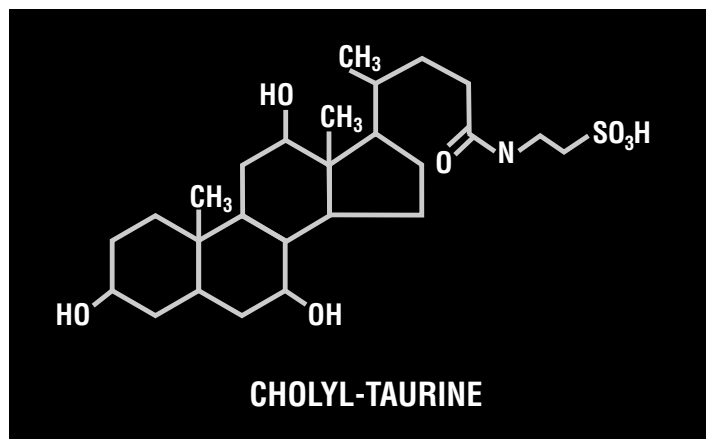


Figure 1. Cholyl-taurine is the chief ingredient of the bile of carnivorous animals. Bear bile contains this compound and two others of very similar chemical structure which, together, facilitate absorption of fat in the small intestine.

This 20-centimeter (8-inch) bear gall was confiscated by the Alaskan Fish and Wildlife Protection Agency. In a recent article in the *Journal of Forensic Sciences*, Edgard Espinoza wrote, "A desiccated bear gallbladder will sell for \$15 in Idaho, \$1500 in Hawaii, and \$55,000 in Korea. These prices have created an illegal international black market for bear gallbladders by individuals involved in criminal wildlife commercialization. The trade in bear parts has placed the Asiatic bears in danger of extinction and the demand has now turned to North America."

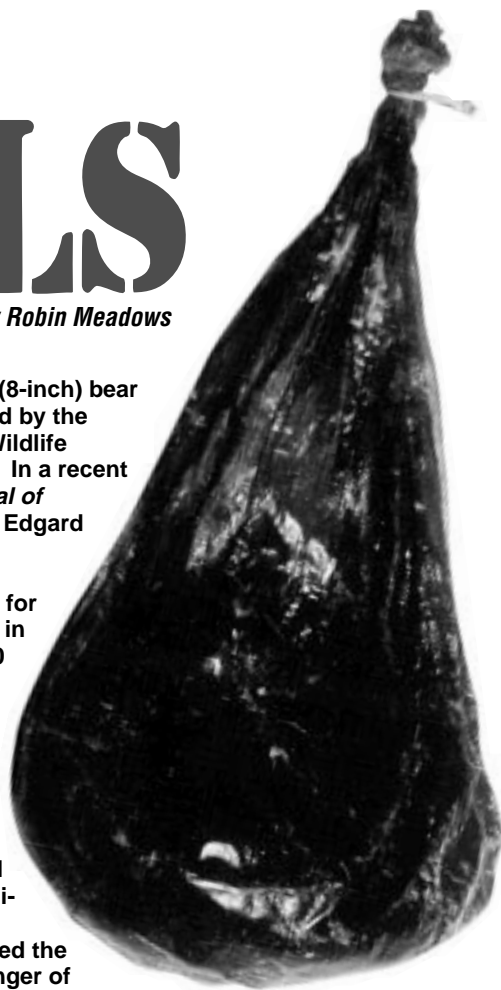


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A bile sample is added to a stream of liquid solvent (in this case, a mixture of water and methanol) that flows through a narrow metal tube called the column. The solvent must be pumped under high pressure because the column is densely packed with C-18-coated silica (octadecyl silane). The bile compounds stick to the surface of the silica beads because they are soluble in octadecyl silane, then redissolve into the liquid stream. Because the various bile compounds differ in solubility in liquid solvent versus octadecyl silane, they spend different amounts of time attached to the beads and, therefore, emerge from the column at different times. "A good analogy is mixing honey and lemon juice, putting the mixture through a hose, and then turning on the water. Naturally the lemon juice comes out first because the honey sticks to the inside of the hose," explains Espinoza.

Espinoza and Hagey had previously used their method to establish that bears have a bile profile (the kinds and amounts of bile compounds) that is unique in the animal kingdom. Bears have three main bile acids: tauro-ursodeoxycholic acid (UDCA), tauro-chenodeoxycholic acid, and tauro-cholic acid. Analyses of 600 non-bear species showed that none of them have the bile acid profile characteristic of bears. These species include giant pandas and red pandas (thought by some biologists to be closely related to bears) and pigs (gallbladders from pigs look just like those from bears and are often substituted for them on the black market).

Although there are other species (including people) that have UDCA, most of them have only small amounts of this bile acid. The only non-bear species known to have significant amounts of UDCA is the nutria, a beaver-like South American rodent. However, nutrias and bears have different forms of UDCA that can be easily distinguished by HPLC (the UDCA in nutrias is bound to the amino acid glycine whereas the UDCA in bears is bound to the amino acid taurine).

Interestingly, North American bears have far more UDCA than Asian bears. Although UDCA accounts for only up to 8% of the total bile acids in Asian bears, the compound accounts for an average of 39% of the bile acids in American black bears. Brown bears and polar bears, which are both closely related to American black bears, also have relatively high amounts of UDCA (19% and 17%, respectively). The North American species evolved more recently than the Asian species, which may have some effect on the difference in UDCA levels between the two groups.

Espinoza has analyzed hundreds of purported bear gallbladders

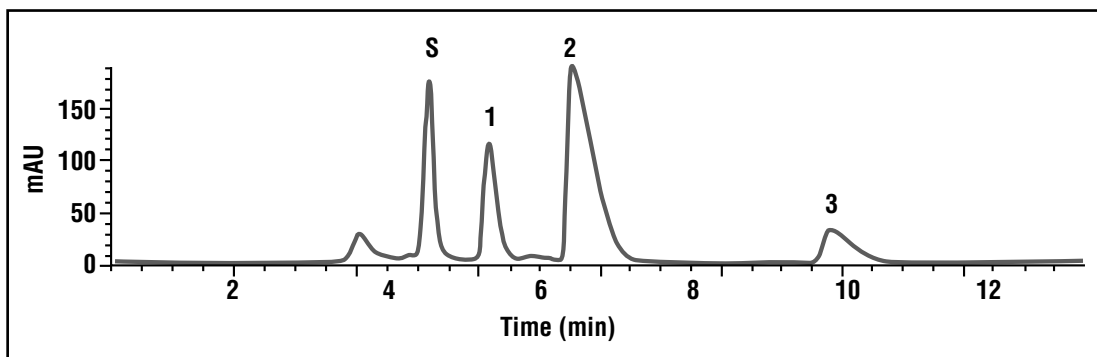


Figure 2. High-performance liquid chromatography, HPLC, was used to separate and identify the major chemicals in bile. Bear bile was mixed with solvent and a standard marker compound, then injected into the HPLC column. Five minutes later the standard emerged (peak S on the graph), followed by ursodeoxycholy-aurine after six minutes, cholyl-aurine at eight minutes, and chenodeoxycholy-aurine at 12 minutes. When chemists analyzed bile from a domestic pig, they found different compounds, which formed peaks at different times, making it easy to distinguish bear galls from pig galls.

seized as criminal evidence in Hong Kong, Taiwan, and Malaysia, as well as in the United States and Canada. Although only about 20% of the gallbladders seized in Asia and the United States actually came from bears (the rest were from pigs), 85% of those seized in Canada were from bears.

When Espinoza analyzed the 174 gallbladders that Campbell had seized at the Anchorage Airport, he found that 169 of them were indeed from bears; tests of the other five gallbladders were inconclusive. "If it hadn't been for the forensics lab we wouldn't have had a case," says Campbell. "We depend on it more and more."

The two men caught with the handbag full of bear gallbladders were prosecuted by federal authorities in Chicago, their port of entry into the United States, and fined for importing undeclared goods. "They also lost their \$35,000 [what they had spent on the bear gallbladders]," says Campbell. "The prosecutors figured that altogether that was enough punishment."

Robin Meadows is a freelance science writer living in Fairfield, CA. A previous article written by Ms. Meadows for Chem Matters magazine ("Saint's Blood," February 1993) won the top award from the Society for Technical Communication.

FOR FURTHER INFORMATION:

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Photograph not Available

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Because Asian bears are hunted for their bile, which is used to prepare a medicine, their population in the wild has decreased dramatically. A fully effective synthetic drug is available, but many Asians prefer the "natural" medicine. This Asian bear, photographed in a Chinese "bear farm" in 1993, was cruelly restrained in a cage so small that it could not move, and a catheter was surgically implanted in its bile duct. Periodically, a tube is attached to the catheter valve (right) to milk the valuable fluid. Bear farming is a lucrative business, but when bile production slacks off, the once-valuable animal becomes a liability and is killed.