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## Shelter Island and Fire Island 4-Poster Deer and Tick Study

As part of a multi-year study to determine whether 4-Poster devices can reduce tick populations on Shelter and Fire Islands, deer are being sampled for residues of the pesticide permethrin in meat, liver and on hide. Results of preliminary sampling indicate that the health risks of handling and of consuming venison or liver from deer known to have visited a 4-Poster device on Shelter Island is very low. The sampling results currently available represent only a portion of the sampling that will be conducted over the next several years, and more results will become available.

### Background

A multi-year study is being conducted on Shelter Island and Fire Island, New York to determine whether a device known as 4-Poster can reduce the population of ticks. The 4-Poster device is a passive feeding station designed to control ticks that utilize deer as a host, such as adult black-legged ticks (*Ixodes scapularis*) and immature and adult lone star ticks (*Amblyomma americanum*). These species of ticks can transmit diseases to humans including Lyme disease, babesiosis and ehrlichiosis. As a deer feeds on the bait (corn) at a 4-Poster station, the animal's neck, head and ears brush against the rollers of the device which are coated with an oily liquid containing the insecticide permethrin. The permethrin then kills ticks on the deer, which should reduce the number of adult ticks that will lay eggs. Studies in other states have shown large reductions in tick populations in the years following use of 4-Poster devices, which may reduce the risks of disease transmission to humans.

Aside from its use on the 4-Poster device, permethrin is widely used as an insecticide on numerous food/feed crops, livestock and livestock housing, buildings, indoor and outdoor residential spaces, pets and for community-based mosquito control. In addition, certain products containing permethrin can be sprayed onto clothing, but not directly on skin. Permethrin-impregnated clothing is also available to hunters and hikers, and typically contains 0.5 percent permethrin. Permethrin kills ticks and insects that come in contact with treated clothes.

The New York State Department of Health and hunters expressed concern during the 4-Poster evaluation process about the potential health risks from exposure to permethrin. Due to the use of the 4-Poster on Shelter Island (where deer hunting is permitted), hunters and others who eat the deer could be exposed to permethrin that is in or on the meat or from contact with a deer's hide while handling and dressing the deer. To determine the levels of permethrin in and on deer, ten deer known to feed at a 4-Poster device, in addition to five deer

from a comparison area (North Haven), will be harvested and sampled during the hunting season each year as part of the multi-year study.

In September 2008, New York State Department of Environmental Conservation (DEC) and Cornell University staff harvested three deer on Shelter Island as a preliminary effort to measure permethrin levels. These deer were taken from an area where 4-Poster devices were deployed and deer have been feeding since Spring 2008. These initial samples were obtained from full-grown does, and included hide swabs and meat from the neck region, as well as liver. Swab samples from hides were analyzed by DEC chemists, and no permethrin residues were detected. Permethrin residues were not detected in the liver and meat samples analyzed by Cornell's Animal Health Diagnostic Center (AHDC), as well. While these deer were harvested in areas near 4-Poster devices, it is not known if and when they actually fed at a device.

During October 2008, another preliminary harvest was conducted of three deer from Shelter Island and one deer from North Haven where no 4-Poster devices are used. Deer from Shelter Island were selected for harvest and sampling based on known use of 4-Poster devices through photo documentation during Cornell camera surveys. Meat and swab samples of hide from the neck region, as well as liver samples, were collected from each of these deer and sent to laboratories for measurement of permethrin residues. Samples from two Shelter Island deer were sent to two laboratories, Eurofins Central Analytical Laboratories (Metairie, LA) and Cornell's AHDC; samples from the other two deer were analyzed by Cornell AHDC only.

### **Permethrin Residue Results for October 2008 Samples**

Permethrin residues were detected in meat samples of two deer from the treatment area at levels ranging from 31 to 88 micrograms per kilogram. Permethrin residues were not detected in meat of the third deer from the treatment area nor in the deer from the comparison area. Permethrin residues were not detected in liver samples from any of these four deer. The hide wipe samples from the three deer in the treatment area contained levels of permethrin ranging from 2.6 micrograms per swab to 704 micrograms per swab; a level of 0.2 micrograms per swab was found on the deer from the comparison area. Residues on the hide of the deer in the treatment area were expected because they were known to have visited a 4-Poster device.

The meat samples were taken from the neck area of the deer directly below the area where the hide swabs indicated the presence of permethrin. Because the hide was cut open in this area to take the meat sample, there is the possibility that the permethrin residues measured in meat may have resulted from residues accidentally transferred from the hide to the meat during sampling. This possibility is being evaluated and the sampling method may be modified to minimize the chances for such cross-contamination in future deer sampling efforts.

### **Health Risks from Permethrin Residues**

Risks to people from eating venison from deer harvested on Shelter Island can be conservatively estimated. The U.S. Environmental Protection Agency's (EPA) Exposure Factor Handbook reports that an adult hunter consumes about 0.3 pounds of venison in a meal. If this meat contains the highest permethrin residue found in the study (88 micrograms per kilogram) and such a meal is consumed every day (approximately 110 pounds of venison per year), the hunter's permethrin exposure would be about 0.2 micrograms per kilogram body weight

per day. This level of consumption is about 1,400-fold lower than the chronic population adjusted dose (cPAD) established by the EPA. The cPAD is the amount of a chemical that a person (adults or children) could consume every day for a lifetime (70 years) and not be expected to have adverse non-cancer effects.

The EPA sets limits on the amount of pesticide residues that may be present in food marketed in the U.S.; these limits are called tolerances. Tolerances have not been established for permethrin in deer meat, but the tolerance for cattle, goat and sheep meat is 100 micrograms per kilogram. The permethrin residues detected in meat of deer on Shelter Island are below these tolerances.

Permethrin caused some tumors in laboratory animals exposed to this chemical for their lifetime and is classified by EPA as a “likely human carcinogen”. Using EPA's established number for cancer potency and the venison consumption rate indicated above, the increased cancer risk would be  $1.7 \times 10^{-6}$  (about one in a million) after a lifetime of exposure. The EPA typically considers risks of about  $1 \times 10^{-6}$  or less to be negligible.

The swab samples from deer hide indicate that hunters could be exposed to permethrin residues from skin contact with the hide, particularly in the deer's neck region. The amount of permethrin a hunter might be exposed to by this route is difficult to determine. Skin exposure to permethrin residues can be minimized by wearing rubber or latex gloves when handling deer. Also, hunters should avoid letting the hide contact the venison during handling of the deer.

## **Summary**

The permethrin residue data currently available result from the preliminary sampling of only several deer from Shelter Island and North Haven. These sampling results indicate that the health risks from permethrin residues when consuming venison from deer harvested on Shelter Island would be very low or negligible. Nevertheless, the choice of whether to consume venison from deer harvested in the treatment area is a personal one. The additional deer sampling that will take place over the next several years as part of the multi-year study will help further assess potential exposures.

## **Additional Information for Hunters**

Deer and other game can carry infectious organisms. To minimize the transmission of these organisms when handling game, hunters should take appropriate precautions. For more information, visit:

<http://www.nyhealth.gov/environmental/outdoors/fish/fish.htm#other>

Also, recent research indicates that small lead fragments can be present in deer harvested with lead bullets. Measures to reduce lead exposure from deer meat should be taken. For more information, visit:

<http://www.dec.ny.gov/outdoor/48420.html>

If you have questions about this fact sheet, call the New York State Department of Health, Center for Environmental Health hotline at 1-800-458-1158, extension 27820.

December 11, 2008  
BTSA