AGRICULTURE

Gamma ray–assisted SIT ridding Central America of pest

The USDA, aided by a simple but effective application of gamma radiation, is eliminating the screwworm fly in Central America.

IN THE EARLY 1950s, the U.S. Department of Agriculture (USDA) began a novel campaign using a tool called the sterile insect technique (SIT) to rid the country of the screwworm—the larva of the screwworm fly— and the $400 million in losses it inflicted on livestock producers each year. The fly lays its eggs on the open wounds of warm-blooded animals and causes death if untreated. Since 1966, the U.S. has been free of the pest. In a campaign joined by Mexico and Central American countries, the USDA, using flies sterilized by gamma radiation, has pushed the screwworm out of Mexico, Belize, Guatemala, El Salvador, and Honduras. Now, plans are being made to build a new sterile fly facility in Panama—where the campaign against the screwworm persists—and to phase out a facility in Mexico.

In spite of the official pronouncement that the United States is free of the flies, fear of the consequences of an outbreak keeps farmers and the USDA collaborating with other countries. In fact, on October 31, 1998, a rancher in Edwards County, Texas, submitted nine larvae he found in a wound on an Angora goat, and one was determined to be a screwworm fly larva. The fly that laid the egg may have entered the U.S. as a larva in a foreign animal, according to the Texas Animal Health Commission.

Adult screwworm flies are about twice the size of a housefly and have orange eyes and a bluish-green or grey body, with three dark stripes running down the back. A screwworm fly can lay as many as 2800 eggs on the open wounds of livestock during its 31-day lifespan. A screwworm larva grows by feeding on the flesh of its host, gouging into the animal for 5 to 7 days, until it reaches a size of just over ½ inch, at which time it drops to the ground. The larva tunnels into the soil, forms a protective case, and emerges as an adult fly from the pupa. A screwworm infestation can cause extensive damage to domestic livestock and other warm-blooded animals, and can kill grown cattle within 5 to 7 days, according to the USDA.

SIT was first successfully used to eliminate the screwworm from the United States, but has since been used in different areas of the world—in Tanzania, for example, against tsetse flies (*NN,* Jan. 1998, p. 56). At the Tuxtla Gutierrez sterile fly facility, in the southern Mexican state of Chiapas, millions of screwworm flies are raised and, while in the pupal

An aerial view of the Tuxtla Guttierez sterile fly production plant (Photos courtesy of USDA/Screwworm Eradication Program)

Adult screwworm fly

A worker at the Tuxtla Guttierez plant loading cylinders filled with pupae into irradiators

stage, dosed with 5000–5500 rads of cesium-137 for approximately 1 minute and 50 seconds, according to Donald Bailey, technical subdirector at the site. The radiation dose is designed to leave the flies normal, but sterile. The sterile male flies are released into the wild during carefully planned airplane missions. They then mate with wild female flies that produce no viable eggs, and the population of flies is slowly reduced.

In preparation for the intensified sterilization efforts in southern Central America, screwworm program officials are beginning to phase out the current sterile fly facility at Tuxtla Gutierrez. Advances in technology, streamlined production processes, and the need for fewer sterile flies in the vicinity of the Mexican plant have recently enabled program officials to reduce the number of employees required to run the plant.

The United States–Mexico Joint Commission for the Eradication of Screwworm has been working since 1972 to eradicate screwworm from Mexico and the countries of Central America. The sterile fly plant at Tuxtla Gutierrez has been at the center of this effort and, as a result, Mexico was officially declared free of screwworm in 1991.

"The next leg of our strategy is to establish a new sterile-fly rearing facility in Panama to replace the one at Tuxtla Gutierrez," said Angel Cielo, deputy administrator for international services with the Animal and Plant Health Inspection Service, a part of the USDA's marketing and regulatory programs mission area. "Locating the new facility in Panama, an area where screwworm still exists, will reduce the risk of reinfesting Mexico or the United States through accidental release of fertile flies."

Three of the four Hussman irradiators at the Tuxtla Guttierez plant

The plant at Tuxtla Gutierrez will remain operational until the Panama plant is completed in approximately three to five years, according to Bailey. The future of the plant, which is staffed by 11 U.S. citizens and approximately 350 Mexican nationals, has not yet been decided.

Currently, screwworm program officials are focusing their efforts on eradicating the pest from Nicaragua and Costa Rica. The Commission's overall goal is ultimately to establish and maintain a permanent sterile fly barrier at the Darien Gap between Panama and Colombia. The Darien Gap is the narrowest geographical region in southern Panama; the region is mainly jungle and has no roads, so there is minimal risk of infested animals' being transported by land from South America into Panama.

RADIOTHERAPY

High doses of radiation can treat aggressive cancer

Patients who have localized prostate cancer and poor prognoses can live longer when treated with higher doses of radiation, a new study shows. Conversely, patients with better prognoses do not benefit from higher-than-normal doses of radiation, according to the study that was presented May 16 at the annual meeting of the American Society of Clinical Oncology.

"We were happy to see improvement of local control with higher radiation doses," said research team member Richard Valicenti, M.D., assistant professor of radiation oncology at Thomas Jefferson University, in Philadelphia, Pa.. "This would suggest in part that the disease-free survival advantage is attributed to improved tumor control."

Researchers retrospectively studied the results of 1560 patients who had received only radiation therapy for prostate cancer between 1975 and 1995. They divided the men into four categories according to Gleason scores, which grades cancer cell pathology on a scale between 2 and 10 (the higher the number, the poorer the patient's prognosis). After adjusting statistically for disease severity and age, they found that the patients who received higher-than-usual radiation doses were 32 percent less likely to die from prostate cancer. "Radiation therapy provides an overall survival benefit for clinically localized prostate cancer for those with a Gleason score between 8 and 10," Valicenti said. "Those less than eight didn't experience an observable advantage."

Valicenti said he believes the results will change how doctors evaluate the use of higher radiation doses for treating prostate cancer. NN