Press Release 2014/08

Tsetse Fly Genome Breakthrough Brings Hope for African Farmers

24 April 2014

| *Rome and Vienna* -- Scientists have cracked the genetic code of the bloodsucking tsetse fly, prompting hope that the breakthrough will help future efforts to control one of the most devastating livestock diseases in sub-Saharan Africa spread by the insect.

The tsetse genome was sequenced and annotated during a 10-year international collaborative effort that involved the Insect Pest Control Laboratory run jointly by the United Nations Food and Agriculture Organization (FAO) and the International Atomic Energy Agency (IAEA) in Vienna. The achievement allows scientists to better study the fly's genes and their functions, knowledge that should open the door for researching ways to control the insect.

Found only in Africa, tsetse flies are vectors for the single-cell parasites that cause trypanosomiasis, or nagana, an often-lethal disease that affects some 3 million animals in the region each year at massive costs to farmers' livelihoods and food security.

The disease leads to a debilitating chronic condition that reduces fertility, weight gain, meat and milk production, and makes livestock too weak to be used for ploughing or transport, which in turn affects crop production.

Humans bitten by carrier flies can develop African sleeping sickness, which can be fatal without treatment. No vaccine against the disease exists for livestock or humans because the parasite is able to evade mammalian immune systems, so control methods primarily involve targeting tsetse flies through trapping, pesticide treatments and sterile male release strategies.

"Decoding the tsetse fly's DNA is a major scientific breakthrough that opens the way for more effective control of trypanosomiasis, which is good news for millions of herders and farmers in sub-Saharan Africa", said Kostas Bourtzis of the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture.

"Detection and treatment of trypanosomiasis is currently expensive, difficult and dangerous for the livestock as it often involves toxic drugs, but this new knowledge will accelerate research on tsetse control methods and help scientists develop new and complementary strategies to reduce the use of costly drugs and insecticides," he said.

Unique Biology

In their contribution to decoding the genome, scientists from the FAO/IAEA Insect Pest Control Laboratory focused on the tsetse fly's relationship with a symbiotic bacterium, *Wolbachia*, which in many insect species affects its host's biology and physiology, including reproduction, mating behaviour and capacity as a vector.

"Our group was involved in the discovery of the horizontal transfer of large stretches of genomic sequence from the Wolbachia bacteria into the tsetse genome," Bourtzis said. "How these gene insertions affect the biology of the tsetse is currently being investigated."

The tsetse fly's complex relationship with *Wolbachia* and two other symbiotic bacteria are part of its unique biology, which also involves feeding exclusively on vertebrate blood, giving birth to live young, and feeding young by lactation.

A first set of findings on the tsetse fly genome will be published in the journal Science on Friday in a paper entitled *Genome Sequence of the Tsetse Fly (Glossina Morsitans): Vector of African Trypanosomiasis*.

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Genome Sequence of Tsetse Fly (*Glossina Morsitans*): Vector of African Trypanosomiasis, Science, 25 April 2014

Senegal Nears First Victory in War on Tsetse Fly, Food and Agriculture Organization of United Nations(FAO), 10 January 2014

Suppressing Tsetse Flies to Improve Lives, 4 November 2014

Eradicating Flies to Improve Lives - IAEA Helps Countries in Africa to Combat Tsetse Fly, *Photo Essay*, 4 November 2013

Expert Group Confirms: Tsetse Fly Eradicated on Zanzibar, *Press Release*, 1 December 1997

Insect Pest Control, Joint FAO/IAEA Programme

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Sterile Insect Technique

The Joint FAO/IAEA Division is currently supporting 14 African nations in their efforts to tackle the trypanosomiasis problem by controlling tsetse fly populations by integrating the Sterile Insect Technique (SIT) with other control methods.

A form of insect birth control, the Sterile Insect Technique involves releasing mass-bred male flies that have been sterilized by low doses of radiation into infested areas, where they mate with wild females. These do not produce offspring and, as a result, the technique can suppress and, if applied systematically on an area-wide basis, eventually eradicate populations of wild flies.

Tsetse flies were successfully eradicated from the island of Zanzibar using the Sterile Insect Technique and are currently being suppressed in parts of southern Ethiopia. In January, Senegal reported that it was making significant progress in infested areas in the Niayes with the same method.

Established in 1964, the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture uses the talents and resources of both organizations to broaden cooperation among their Member Countries in applying nuclear technology and related biotechnologies to improve sustainable food security.

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