Researchers uncover the process by which gender is determined in the silkworm

May 15 2014, by Bob Yirka

An adult female silkmoth. Credit: Munetaka Kawamoto, Laboratory of Insect Genetics and Bioscience, Graduate School of Agricultural and Life Sciences, The University of Tokyo

(Phys.org) —A team of researchers working at the University of Tokyo has at long last uncovered the mysterious mechanism by which gender is determined in the silkworm (and other lepidoterans). In their paper published in the journal *Nature*, the team describes how they performed in-depth sequencing of RNA transcripts and found differences that

account for gender development. Frantisek Marec offers a perspective on the research findings in a News & Views piece in the same issue.

Prior research has shown that lepidoterans have WZ gender chromosomes, rather than the familiar XY found in humans and other animals. Females have WZ, males ZZ. The W chromosome, the researchers found, doesn't have protein coding genes, and is thus mainly a transposon—genetic material that is able to move around the genome and in many cases cause mutations. There was one exception though, the researchers found, a transcript produced that interacts with piRNA's, which are small RNA's that stop the creation of gonads—this the researchers found, is the feminizing factor. To come to such a conclusion they performed in-depth sequencing of RNA transcripts of both male and female silkworm embryos. In so doing they were able to identify a single transcript expressed in females, but not males. The transcript was identified as a precursor to piRNA which the team has named Fem piRNA.

To ascertain the true nature of the transcript, the team inhibited Fem piRNA in silkworm embryos and found that it was necessary for the development of female silkworm traits. They also found that Fem piRNA played a role in encoding the zinc-finger protein masculinizer, which implied a role in determining male gender traits. W chromosomes, the researchers note, are only transmitted via females, and cannot undergo recombination, with means that mutations are prevented from becoming a fixed trait in future generations.

The work done by the team in Japan represents the first example of gender determining pathways being controlled by piRNA (due either to its presence or absence). Their work also offers some insight into some of the ways that some bacteria influence the gender of their host, and also opens up the possibility of controlling gender in silkworm, to allow for more males for example, as they produce more of the silk so prized

by us humans.

More information: Paper: A single female-specific piRNA is the primary determiner of sex in the silkworm, *Nature*, dx.doi.org/10.1038/nature13315