Researchers uncover genetic mystery of infertility in fruit flies

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Fruit fly. Credit: John Tann/Wikipedia

Researchers have discovered a novel parasitic gene in fruit flies that is responsible for destroying the eggs in the ovaries of their daughters.

Just like fruit flies, human genomes are filled with mobile parasitic genes called transposons and similar to fruit flies, humans use small RNA molecules to silence these genetic parasites so that they can

generate proper germ cells for reproduction.

The researchers focused on one parent fly that originated from Harwich, Mass., with the mobile parasitic gene called the P-element. They then generated hybrid offspring between the Harwich fly and a "clean" fly called ISO1 to determine which offspring still caused the infertility syndrome in their daughters and which did not.

They then analyzed the DNA genomes between these two different hybrids and found that Harwich fathers and the sons that still cause infertility in their daughters all had a special hyper mobile version of the P-element that they named the Har-P. "Our discovery of the Har-P element showed that it moves around so extensively in fly germ cells that it causes catastrophic ovary collapse," explained corresponding author Nelson Lau, Ph.D., associate professor of biochemistry at Boston University School of Medicine (BUSM).

According to the researchers, human infertility from the incompatibility of two different genomes from the mother and father could be modeled by the infertility syndrome of the Harwich fly fathers mating with ISO1 mothers to cause all their daughters to be infertile. "More than 45 percent of the human genome is made up of remnants of transposons and most of them are properly silenced, but there are still a few active transposons that can move each time a new human is conceived, changing our genomes in a way that is completely different from the general mixing of our fathers and mothers genes during the process of meiosis, when sperm and egg are generated."

By studying the simpler system of fruit flies where genetic manipulations are easier, the researchers hope to achieve a better understanding of how human genomes are shaped by the multitude of transposons lurking in our genomes and the small RNA molecules we depend upon to keep the transposons in check. They also hope to harness

the hyper mobile Har-P element to turn it into a new tool for genetically marking animal cells for developmental biology studies.

Provided by Boston University School of Medicine