For the fruit fly, everything changes after sex

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The females of many insect species change their behavior right after mating: mosquitoes look for a meal of fresh blood and flies begin to lay eggs. Researchers at the IMP managed to identify the molecular switches that are responsible for these behavioral changes. This could open up new possibilities to control agricultural pests or disease carriers. The science journal *Nature* reports on the discovery in its current online release.

IMP Director Barry Dickson and his group are interested in the genetic basis of innate behaviour. They focus on the reproductive behaviour of the fruit fly Drosophila melanogaster. Two years ago, the team was able to identify the fruitless gene as a key regulator of mating behaviour.

For 20 years, scientists have been trying to identify another molecular switch which changes the behaviour of female insects after mating. It makes them lose interest in further sexual contact and start laying eggs. Mosquitoes, once fertilized, look out for a meal of blood and may transmit the malaria parasite along the way.

The trigger for the behavioral switch is a factor present in the seminal fluid of male insects. This sex peptide (SP), as it is called in Drosophila, has been known to scientists for quite a while. Nilay Yapici, a PhD student in Barry Dickson's team, has now identified the receptor (SPR) responsible for the effect of SP and thus revealed the underlying molecular mechanism. She also showed that the gene for SPR is active in the reproductive organs as well as the brain of the flies.

To get this far, it took two years of painstaking work and a scientific tool which was developed over the past few years by the Dickson group. This "Drosophila RNAi Library" is a collection of 22,000 fly strains and has recently been made available to researchers worldwide. Due to this collection, it is now possible to switch off any chosen gene in the fly. By doing so, neurobiologists are able to identify genes that influence behaviour.

Nilay Yapici studied 22,000 female flies and observed how they behaved after mating. In 130 cases, she found flies which continued to mate and laid very few or no eggs. Further evaluation of these genes and subsequent experiments with cell cultures led to the identification of the long-sought receptor, SPR. By activating or disrupting SPR in specific neurons, the receptor could be localized in the central nervous system of the fly.

Apart from the benefit to basic research, the discovery might offer new approaches for controlling the reproductive or host-seeking behaviours of various agricultural pests and human disease carriers. The molecular mechanism has remained remarkably stable in the course of evolution and SPR-like receptors can be found in many insect species. Ms. Yapici thinks that "It might be possible to develop a substance that blocks the receptor SPR. This inhibitor would work as a kind of 'birth control pill': female insects would continue to mate but would not lay eggs."

Source: Research Institute of Molecular Pathology