Scientists identify how development of different species uses same genes with distinct features

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Biologists at New York University have identified how different species use common genes to control their early development and alter how these genes are used to accommodate their own features. The findings, which were discovered by researchers in Professor Claude Desplan's and Steve Small's laboratories in NYU's Center for Developmental Genetics, offer new insight into the workings of developmental pathways across species. The study is published in the latest issue of the journal *Science*.

The researchers examined the fruit fly Drosophila and the wasp Nasonia as genetic model systems. Fruit flies' development is well-understood by biologists and therefore serves as an appropriate focus for genetic analyses. In this study, the researchers sought to explore the generality of developmental mechanisms by comparing Drosophila with Nasonia, a distant species that diverged over 250 million years ago but one that presents many morphological similarities with flies in terms of development.

The research team's results showed that flies and wasps employ most of the same genes and similar interactions among these genes, but some events are changed to adjust to the developmental constraints.

Flies rely on a gene called bicoid to pattern their early embryo. The bicoid gene product, a messenger RNA (mRNA), is localized at the anterior of the embryo where it is required both to promote anterior

development and to repress posterior development. However, bicoid is unique to flies and does not exist in wasps or other species: The study's findings show that it takes several mRNAs localized in the egg to achieve the same functions in wasps as bicoid does in flies. Two of these genes, which are found in most species of insects, are orthodenticle. Orthodenticle performs the anterior promoting function of bicoid while anterior localization of giant mRNA represses posterior development.

"This comparison of the molecular mechanisms employed by two independently evolved species not only uncovers those features essential to this portion of development, but also shows that we are now in a position to understand another species—in this case, the wasp—other than flies in the same depth," explained Desplan.

Source: New York University