

Study reveals new female-determining pathway in turtles

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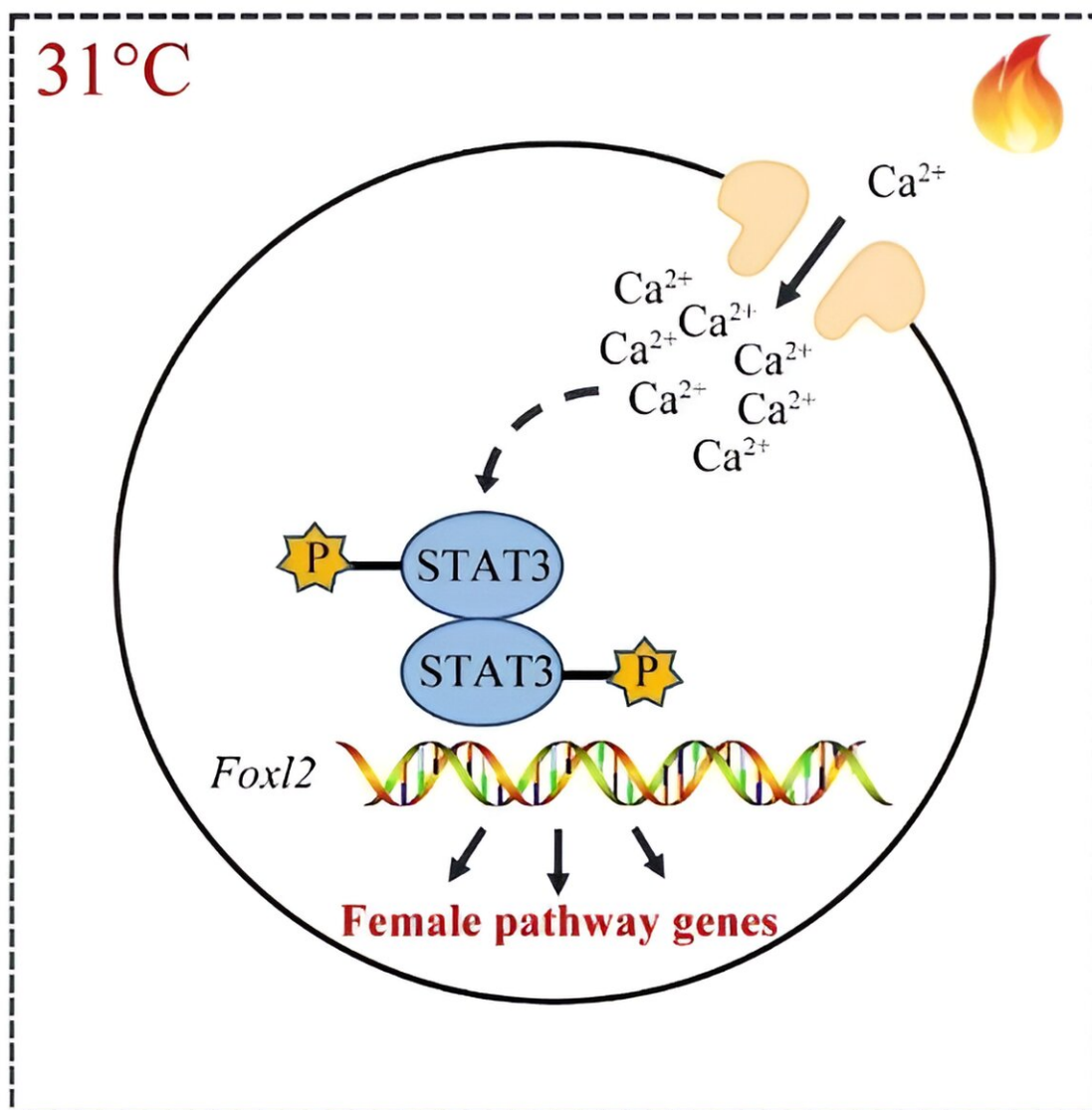


Diagram of temperature-dependent female-determining pathway in *T. scripta*.
Credit: Wu Pengfei

In a [study](#) published in the *Proceedings of the National Academy of Sciences*, a research group led by Prof. Du Weiguo from the Institute of Zoology of the Chinese Academy of Sciences has revealed that the transcription factor pSTAT3 initiates the female pathway in temperature-dependent sex determination.

The signaling pathways leading to female development are not well known in many [animal species](#), probably because development of embryos into females was traditionally considered the default developmental [pathway](#).

For their study, research group studied the molecular mechanisms of sex determination in the red-eared slider turtle, a species with temperature-dependent sex determination (TSD). In this species, embryos develop into males if incubated at 26°C or into females if incubated at 31°C.

Researchers found that the expression level of the transcription factor pSTAT3 and the sex-determining gene FoxI2 were temperature-dependent and differed between the sexes.

Their study revealed that [inhibition](#) and activation of pSTAT3 led to female-to-male or male-to-female sex reversal in embryos at the female-producing temperature of 31°C or male-producing temperature of 26°C, respectively.

Nonetheless, the sex reversal of these [embryos](#) could be rescued by knocking down or overexpressing FoxI2, respectively.

Researchers discovered that pSTAT3 directly binds to the promoter locus of FoxI2 and thereby initiates the female pathway.

"This is the first time that we have established a direct genetic link between warm-temperature-induced STAT3 [phosphorylation](#) and female pathway initiation in a TSD system," said first author Dr. Wu Pengfei.

More importantly, these findings provide a mechanistic explanation of sex determination in fluctuating temperatures, revealing that it results from antagonism between male and female signals, with the female outcome not being the default.

More information: Pengfei Wu et al, pSTAT3 activation of FoxI2 initiates the female pathway underlying temperature-dependent sex determination, *Proceedings of the National Academy of Sciences* (2024). [DOI: 10.1073/pnas.2401752121](https://doi.org/10.1073/pnas.2401752121)

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