

# How temperature determines sex in alligators

December 23 2015

---



Eggs and a newborn baby American alligator are shown. Credit: NIBB

Some reptiles such as crocodilians and some turtles are known to display temperature-dependent sex determination (TSD), where the ambient temperature of the developing eggs determines the individual's sex. For example in the American alligator's eggs, incubation at 33 °C produces mostly males, while incubation at 30 °C produces mostly females. An

international joint research team between Japan and the US have determined that the thermosensor protein TRPV4 is associated with TSD in the American alligator. The research has been published in *Scientific Reports*.

The research team headed by Professor Taisen Iguchi of the National Institute for Basic Biology (Okazaki Institute for Integrative Bioscience) and PhD student Ryohei Yatsu of SOKENDAI (The Graduate University for Advanced Studies), in collaboration with Professor Makoto Tominaga of the National Institute for Physiological Sciences (Okazaki Institute for Integrative Bioscience) and Professor Louis J. Guillette Jr. and assistant professor Satomi Kohno of the Medical University of South Carolina, have investigated the molecular mechanism of how temperature determines sex.

In their research using American alligators, they found that a thermosensitive protein called TRPV4 is present within the developing alligator gonad inside the egg. Alligator TRPV4 is responsive to warm temperatures near mid-30s, and can activate cell signaling by inducing calcium ion influx. The current study also demonstrates that by specific pharmacological inhibition of TRPV4 protein function in the developing egg, genes important for male development (for example, genes encoding anti-Müllerian hormone and SOX9) are influenced, and partial feminization at male producing temperatures have been observed. From these results the authors demonstrate that TRPV4 may significantly influence the male gonadal [sex determination](#) pathway at a molecular level during TSD in the alligator.

This is the first demonstrated report of a biomolecule associated with regulation of the very unique temperature-dependent sex determination mechanism.

PhD student Ryohei Yatsu said, "Reptiles can be difficult to study at

times, but we were delighted to obtain such an interesting result and elucidate part of the alligator TSD mechanism. We still have much to research, but we are interested in how our results relate with other TSD species diversity and evolution".

Professor Taisen Iguchi said, "Organisms that have adopted TSD systems may be more susceptible to the risks of environmental change, such as global warming. In future, we would like to know how an unstable environmental factor such as incubation temperature was able to establish itself as a sex determination factor."

**More information:** Ryohei Yatsu et al. TRPV4 associates environmental temperature and sex determination in the American alligator, *Scientific Reports* (2015). [DOI: 10.1038/srep18581](https://doi.org/10.1038/srep18581)

Provided by National Institutes of Natural Sciences

Citation: How temperature determines sex in alligators (2015, December 23) retrieved 25 April 2024 from <https://phys.org/news/2015-12-temperature-sex-alligators.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.