

## **The green anole as a model organism for understanding neural plasticity and health in humans**

Fields (2005) defines a model organism as a non-human species that researchers will study extensively to better understand biological phenomena in the hopes that discoveries drawn from that model organism can provide a clearer picture of the workings of additional organisms. Despite certain ethical objections, researchers often argue that this type of study is necessary due to the common descent of living organisms and the conservation of developmental and metabolic pathways that occur over the course of evolution (Stamp Dawkins, 1987). Concerning human health, certain model species are thought to aid researchers in better understanding specific disorders, which could potentially lead to treatment.

In addition to being quality models for morphological studies of other reptiles, the green anole (*Anolis carolinensis*) provides a window into the mechanisms responsible for regulating the anatomy and physiology of vertebrate nervous systems, including humans. As such, understanding the biology and life history of green anoles is viewed as beneficial for comparative analysis due to the lower costs associated with laboratory breeding (Lovern, Holmes & Wade, 2004; Losos et al., 2005).

In general, green anoles are small to mid-sized lizards with long heads and ridges located between their nostrils and eyes (Jensen, 2008). Jensen (2008) further describes them as being sexually dimorphic, with males being roughly 15 percent larger than females, and their dewlap (throat fan) being around three times larger and more brightly colored red than the females, which range anywhere between pale pink and white. Males also have the ability of extending their dorsal ridges behind their heads during display rituals or if stressed, while females exhibit a white stripe on the spine (Jensen, 2008). Color for both sexes can range from brown to green and, similar to iguanas, can change (Jensen, 2008).

Native to subtropical southeastern parts of North America, green anoles are typically arboreal, and are highly adaptable to environments ranging from coastal plains and forests to urban and suburban human communities (Jensen, 2008). Known for being territorial, males will vigorously defend their domains from intruders, and have been observed in the company of two to three females (Beane et al., 2010). Their diet consists of small insects and arachnids (Beane et al., 2010), while they themselves are prey for larger predators. To escape predation, green anoles have autotomic tails, which will detach if bitten by a predator, with a new tail forming in its place (Jensen, 2008).

Lovern, Holmes, and Wade (2004) note that understanding the principles that govern neural plasticity in non reptilian vertebrates (including humans) will come from comparative research in model organisms like green anoles. While this may sound far fetched considering the enormity of differences between mammals and reptiles, Losos et al. (2005) observe that green anoles have been used successfully as models for studying their “tic-like repetitive behaviors” associated with obsessive-compulsive disorder (OCD) and Tourette’s syndrome seen in

humans. Concerning OCD, they observed that serotonin receptors in anoles are similar to that of humans with OCD. Further, they note that anoles have been found to have similar dopamine receptors to humans, making them notable candidates for studying neurological disorders such as Parkinson's disease (Losos et al., 2005). Toni et al. (2016) even discovered similar gene-coding expressions in the green anole nervous system and humans with Parkinson's disease. This may help better uncover genetic mutations associated with such neurological disorders.

## References

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