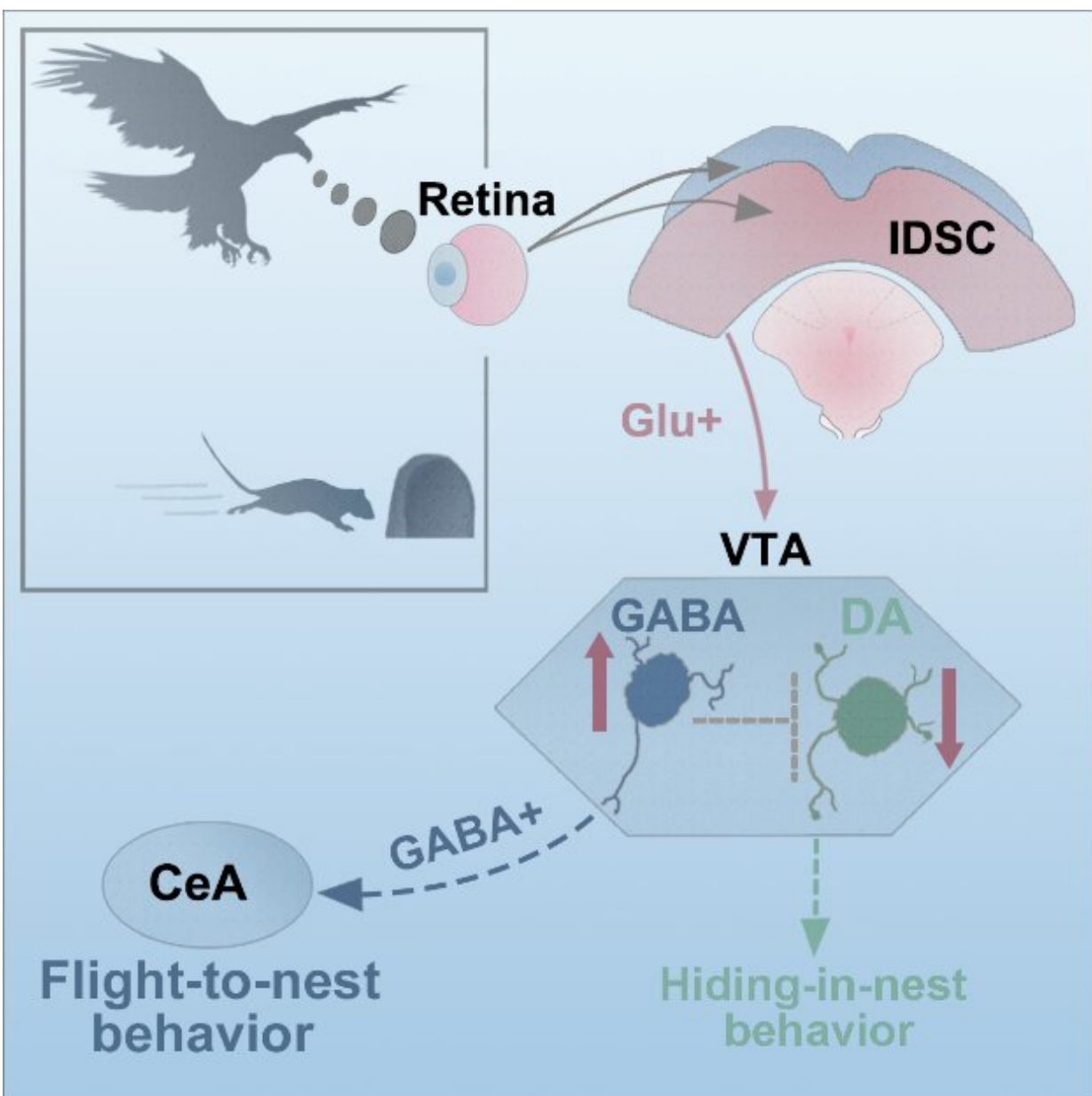


Scientists identify a novel neural circuit mediating visually evoked innate defensive responses

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VTA^{GABA+} neurons that mediate visually evoked innate defensive responses, involving the SC Glut+ - VTAGABA+ - CeA (central nucleus of the amygdala).
Credit: LIU Xuemei

Fear overgeneralization, a condition that limits the ability to discriminate between safety and threat, is an important pathological characteristic of anxiety-related syndromes such as post-traumatic stress disorder (PTSD), generalized anxiety disorder (GAD) and panic disorder. However, unlike traditional conditioned fear, the mechanism of processing innate fear is largely unknown.

Prof. Wang Liping and his colleagues Zhou Zheng and Liu Xuemei at the Shenzhen Institutes of Advanced Technology (SIAT) of the Chinese Academy of Sciences revealed that the VTA ([ventral tegmental area](#)) GABAergic neural circuit mediates visually evoked innate defensive responses.

In this study, the research group identified for the first time a neural circuit related to the VTA^{GABA+} neurons that mediate visually evoked innate defensive responses involving the SC Glut+ - VTA^{GABA+}-CeA (central nucleus of the amygdala) pathway.

It has been confirmed by neuroscientists that the VTA plays an important role in learned appetitive and aversive behaviors. Interestingly, the researchers revealed that the GABA neurons in VTA were activated by visual threats via fiber photometry. Through viral tracing and both in vivo and in vitro electrophysiological recordings, they showed that VTA^{GABA+} neurons received direct excitatory inputs from the superior colliculus (SC).

The researchers revealed that VTA^{GABA+} neurons mediated looming-evoked innate defensive behaviors. These findings demonstrated that SC glutamatergic inputs activated VTA^{GABA+} [neurons](#) and mediated looming-evoked innate defensive behaviors. They further showed that CeA was a downstream target of the SC-VTA^{GABA} ergic pathway, and that it was involved in innate defensive behavior.

This study provides new insights into potential mechanisms of survival across species, as well as the maladaptive behavior in fear- and anxiety-related mental disorders.

The team has been working on the dissection of the neural circuits mediating instinctive emotions for years. In their previous work, they have resolved a novel brain circuit controlling visually evoked innate freezing behaviors via the SC-LP-LA subcortical pathway. They also had pioneering work which first reported that the accelerated innate defensive response to visual threats induced by stress is mediated by the Locus Coeruleus (LC) directed TH+ projections to the SC.

The current study published in *Neuron* is another key milestone in their systematic work.

More information: *Neuron* (2019). [DOI: 10.1016/j.neuron.2019.05.027](https://doi.org/10.1016/j.neuron.2019.05.027)

Zheng Zhou et al. A VTA GABAergic neural circuit mediates visually evoked innate defensive responses, (2018). [DOI: 10.1101/493007](https://doi.org/10.1101/493007)

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