セミナーのご案内

日時：2016 年 12 月 9 日(金)　14:00 - 13:00

場所：京都大学 総合研究 10 号館（工学部 1 号館）211 号室

Neural mechanisms underlying fear generalization

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Abstract:

Fear refers to various metabolic and behavioural changes that occur in animals when they anticipate a potential danger. While prediction of threats is crucial for survival in the natural world, excessive fear can severely compromise other behaviours and may even reduce the evolutionary fitness. Amygdala is crucial for both formation and forgetting of fear memories. Experiments over last the decade have revealed synaptic, neuronal and network level changes in different parts of the amygdala during acquisition and extinction of fear. Relevant for the fear generalisation, two important changes have been reported to occur in the central amygdala (CA). Central amygdala neurons that are positively correlated with fear expression (CA-On) show a decrease in their ongoing activity. At the same time, CA-On neurons show an increase in their tonic inhibition caused by extrasynaptic GABA-receptors. By contrast, neurons that are negatively correlated with fear expression (CA-Off) show opposite changes in both ongoing activity and tonic inhibition. Interestingly, in animals that are more likely to show fear generalisation, the reduction in the CA-On activity is larger.

In my talk I will provide an explanation of how changes in the tonic conductance and ongoing activity may lead to fear generalisation. To understand the neuronal mechanisms underlying fear generalisation we combined a bottom-up spiking neural network model with a high level functional model of the central amygdala. Using these models, we quantified the effect of tonic conductance changes on the processing of incoming stimuli. The model also revealed the functional consequences of recurrent connectivity within the central amygdala in shaping the sensitivity to incoming stimuli. Our results suggest that tonic inhibition controls fear generalization in a manner similar to the process of regularization in regression models. In addition, Together with experimental work relating fear generalization to anxious behavior in mice, our results provide a neuronal mechanism by which the central amygdala may acts as a link between fear learning and the emergence of anxiety disorders.

共催：生命動態システム科学推進拠点事業

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