



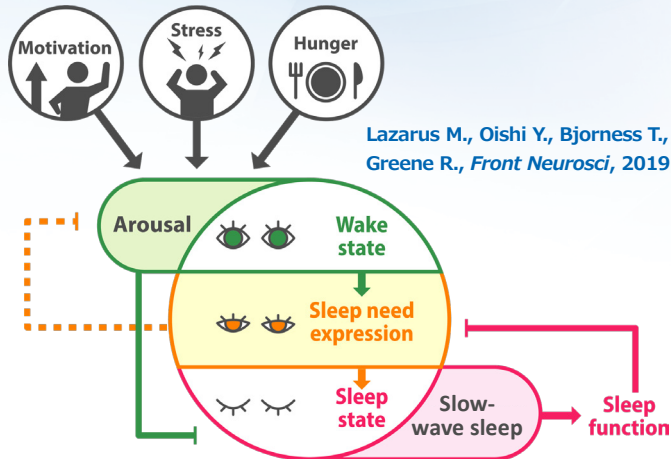
Sleepiness and Motivation

The Lazarus/Oishi Lab

International Institute for Integrative Sleep Medicine (WPI-IIIS)



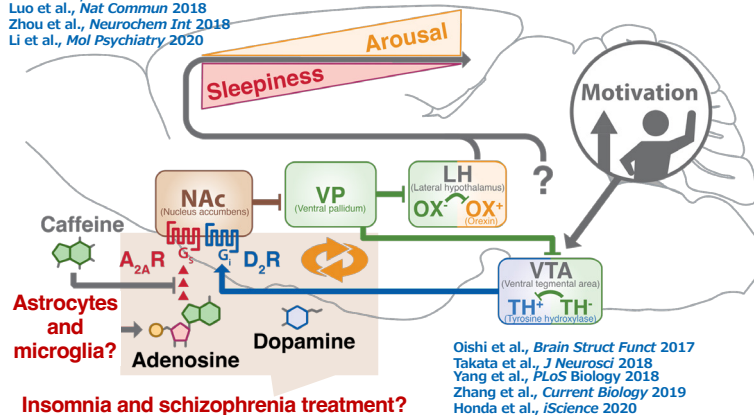
Regulation of sleep homeostasis by arousal



The neural mechanisms of sleepiness are widely unknown. Sleep is established in the absence of arousing inputs, for example, motivation.

Nucleus accumbens (NAc)/midbrain is a sleep/reward circuit

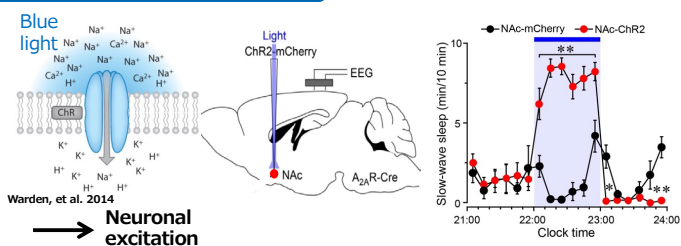
Lazarus et al., *J Neurosci* 2011
Oishi et al., *Nat Commun* 2017
Luo et al., *Nat Commun* 2018
Zhou et al., *Neurochem Int* 2018
Li et al., *Mol Psychiatry* 2020



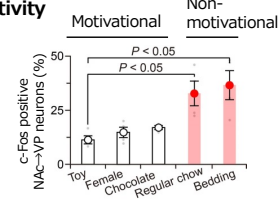
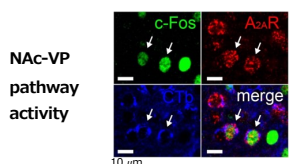
Insomnia and schizophrenia treatment?

Adenosine A_{2A} receptors ($A_{2A}R$) are co-expressed with dopamine D_2 receptors (D_2R)

Sleep control by the NAc



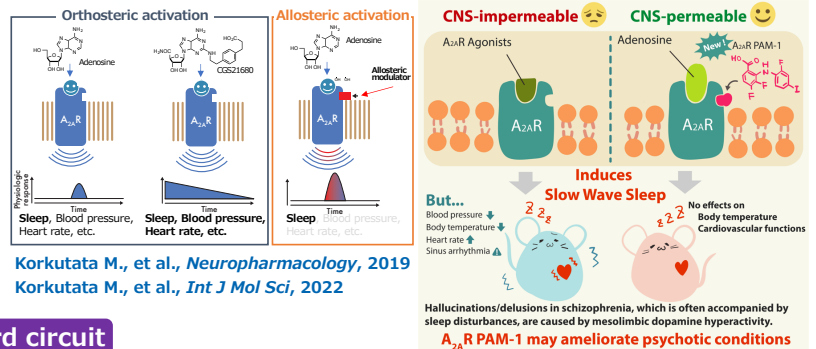
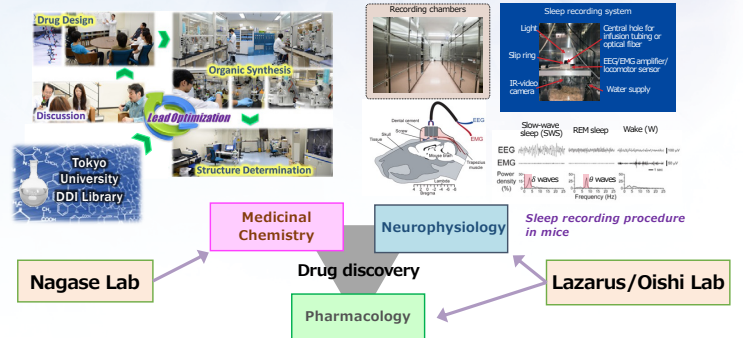
Motivational stimuli regulate NAc activity



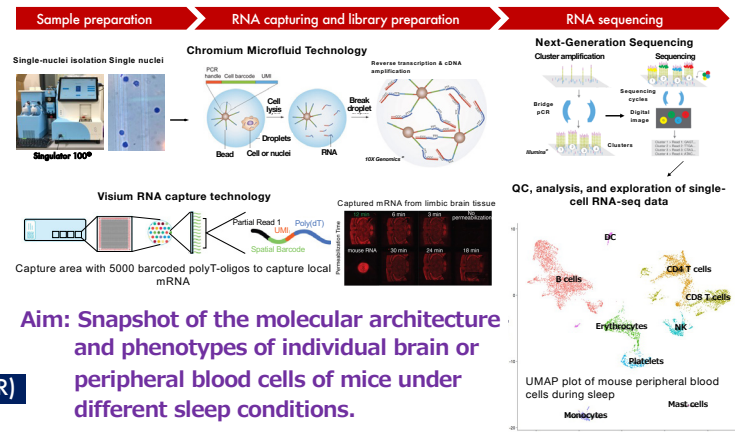
Oishi et al. *Nat Commun* 2017

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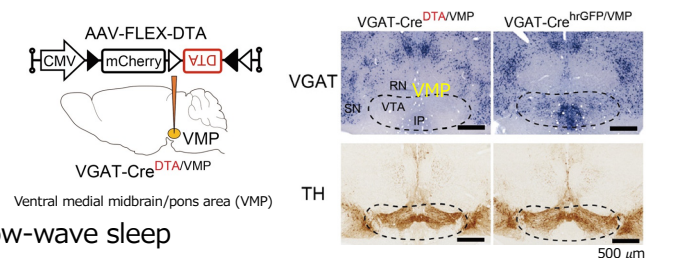
Drug discovery to treat insomnia and schizophrenia



Hot Science: Single-cell and spatial transcriptomics



"Short-sleeper" mice by neuronal ablation



Slow-wave sleep

