平成 30 年 7 月 20 日

大学院学生各位
To All Graduate Students

平成 30 年度
基盤医学特論　開講通知
Information on Special Lecture Tokuron AY2018

Title:：Cortical nNOS/NK1R Neurons: Orchestrators of EEG Slow Wave Activity?

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日時：平成 30 年 7 月 30 日（月）13:30 ~ 15:00
Time and Date: 30th July (Mon), 2018　13:30~15:00

場所：名古屋大学 環境医学研究所　南館大会議室（東山）
Room:　Research Institute of Environmental Medicine, South Building, S204 (Higashiyama Campus)

＊関係講座部門等の連絡担当者：環境医学研究所・神経性調節学 山中章弘（3864）
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使用言語：　英語　＊事前連絡は不要です。Lecture in English.　No registration required.

Cortical nNOS neurons are a rare and unique GABAergic cells that also express Somatostatin and NPY. These cells are characterized as either Type I or Type II based on soma size, shape and intensity of staining for nNOS and NADPH diaphorase. The larger, more intensely staining Type I neurons comprise about 7% of the nNOS population, express NK1R, and are intracortical projection neurons rather than local circuit neurons: the presence of nNOS has been demonstrated in long range-projecting GABAergic neurons in mice, cats, and monkeys. RNAseq studies have noted the unique molecular signature of these cells; a recent paper compared 3 cortical interneuron RNAseq studies and concluded that nNOS/NK1R neurons are the most distinct and replicable interneuron type in the mouse cortex. In studies in three different species, we have found that, in contrast to other cortical neurons, cortical nNOS/NK1R cells are sleep-active: they accumulate c-FOS during sleep but not during wake. Moreover, the proportion of Fos+/nNOS neurons is proportional to prior wake duration; thus, these cells seem to track the homeostatic sleep drive that accumulates during wakefulness. nNOS knockout mice have disrupted sleep and are objectively “sleepier” yet fail to respond to a sleep debt with an increase in EEG slow wave activity (SWA). Despite this impairment in sleep homeostasis, cortical NK1R neurons in nNOS KO mice accumulate c-FOS in proportion to time kept awake, which suggests that it is the neural circuit in which these cells are located rather than the presence of nNOS per se that is important for activation/Fos accumulation of these cells during sleep. Consequently, we have proposed that cortical nNOS/NK1R neurons are critical for orchestrating EEG SWA during sleep through their widespread intracortical projections and the release of GABA, somatostatin, NPY and/or NO. I will discuss our recent observations on afferent input to these cells by acetylcholine, hypocretin and adenosine. We propose that cortical nNOS/NK1R neurons may be part of the long-sought neuroanatomical pathway underlying the sleep-dependent “Process S” and may provide insight into the neural circuitry underlying homeostatic sleep regulation.

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2. Morairty SR, Dittrich L, Pasumarthi RK, Valladao D, Heiss JE, Gerashchenko D, Kilduff TS (2013). Proc Natl Acad Sci USA 110:20,272-20,777.
3. Williams RH, Vazquez-DeRose J, Thomas AM, Piquet J, Cauli B, Kilduff TS (2018). Cerebral Cortex 28(6):1959-1979.
4. Williams RH, Black SW, Thomas AM, Piquet J, Cauli B, Kilduff TS (2018). Cerebral Cortex. Feb 16. doi: 10.1093/cercor/bhy015.