The 1st Seminar of the seminar series on
Developmental Biology and Regenerative Medicine

第１回　発生・再生医学セミナー

Molecular mechanisms underlying motor neuron survival and regeneration after injury

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■このセミナーは発生・再生医学研究者育成コース「発生・再生医学特論 I」の特別講義として開催されます。

■ This seminar is a part of the Special lecture “Tokuron” on Developmental Biology and Regenerative Medicine I of the Course of Developmental Biology and Regenerative Medicine.

担当：神経分化学分野・田中英明(内線 5292)

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Degeneration of nerve-injured motor neurons in the neonatal rat progresses rapidly (taking about one week), and this neuronal death is gradually suppressed along with postnatal maturation. In matured rat, such nerve-injured motor neuronal death is less marked, and most motor neurons are able to survive and regenerate. However the situation is different in matured mouse, in particular the C57BL/6J strain. Motor neurons in the adult mouse are more susceptible to nerve injury than those in the rat, and motor neuronal death seen in adult mice progresses much slower than in neonatal rats and mice. This slow degeneration of injured motor neurons is particularly intriguing, because the slower progression of death appears similar to that seen in neurodegenerative diseases such as ALS. In this seminar I would like to focus on the molecular mechanisms underlying the slow motor neuron death seen in adult mouse as well as the quick death seen in neonates. To reveal the molecular mechanism, the expression alterations of nerve injury-associated molecules were identified using transcriptomic and proteomic analyses. Among several hundreds of candidate molecules, we concluded that a group of molecules such as a neuronal glutamate transporter EAAC1 and the BH3 only protein Noxa were crucial in determining the fate of motor neurons in matured mouse. For instance, EAAC1 expression was induced in rat, but suppressed in mouse after nerve injury. The axotomy-induced neuronal death was abolished in the EAAC1 transgenic mouse, and accelerated in EAAC1 knockout mouse. The unexpected function of EAAC1 in neuron protection will be discussed. In addition I would like to address novel transcriptional machinery, which regulates gene expression of nerve-injury associated molecules. This transcriptional mechanism would be of crucial for the simultaneous expression of various regeneration-associated genes and increasing their intrinsic regeneration potential.