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指導教員 承認印	主	副	副
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学位（博士）論文要旨
(Doctoral thesis abstract)

論文提出者 Ph. D. Candidate	生物システム応用科学府 生体機能システム科学 専攻 博士後期課程 第2 専修/グループ(Department Course) 平成 27 年度入学(Your Entrance Fiscal Year) 氏名 川内 聡子 ㊞ (Your Name(Family, First) and Seal)				
主指導教員 氏名 Chief Advisor's Name	西舘 泉	副指導教員 氏名 Vice Advisor's Name	岩井俊昭	副指導教員 氏名 Vice Advisor's Name	
論文題目 Title	拡散反射分光計測に基づくラット中枢神経疾患モデルの病態観察 Observations of pathophysiology in rat models of central nervous system diseases based on diffuse reflectance spectroscopy				

論文要旨 (和文要旨(2000字程度)または英文要旨(500words))
※欧文・和文どちらでもよい。但し、和文の場合は英訳を付すこと。
Write a summary in Japanese (2000 characters) or in English (500words).
If the abstract is written in Japanese, needed to translate into English.

The brain is highly vulnerable to ischemia or hypoxia, and many diseases of central nervous system (CNS) are associated with impairment of cerebral blood flow and oxygen metabolism. Thus, noninvasive, real-time monitoring of lesion progression and cerebral oxygen metabolism is crucial—to understand the pathophysiology and to develop a new therapeutic method for those CNS diseases. In the last two decades, a unique pathophysiological event, cortical spreading depolarization (CSD), has been receiving much attention as a risk factor leading to progression of the CNS diseases, because CSD is accompanied by massive ionic imbalance and imposes metabolic workload to the tissue for restoration of the ions. This dissertation focuses on two major CNS diseases involved with CSD, *i.e.*, ischemic stroke and traumatic brain injury and is aimed at observing pathophysiological events/processes as well as cerebral oxygen metabolism based on diffuse reflectance spectroscopy in the relevant rodent models, by which the disease mechanisms and the potential of optical techniques are discussed.

In the introduction chapter, general discussion of cerebral oxygen metabolism as well as CSD is presented. The importance of ischemic stroke and traumatic brain injury is explained, and then, the basics of diffuse reflectance spectroscopy (DRS) and the author's previous work that used DRS for monitoring loss of brain viability with rat global ischemia/hypoxia models and motivated us to do this work are described.

Chapter 2 is devoted to the fundamental theories and principles for quantitative evaluation of absorption coefficients (hemodynamics parameters) and reduced scattering coefficient of the brain tissue based on measured diffuse reflectance spectra. Experiments with optical phantoms validated this newly proposed method that enables evaluation both absorption and scattering properties.

Chapter 3 describes simultaneous application of charge-coupled-device-based imaging and fiber-based measurement of near-infrared (NIR) diffuse light reflectance for the rat brains during hypoxia. Signals obtained by these two modalities showed unique signatures associated with brain tissue viability but showed different time-dependent behaviors, which was attributable to the different observation depths with these modalities and depth-dependent anatomical changes of the brain.

Chapter 4 presents simultaneous application of NIR diffuse reflectance imaging and laser-speckle cerebral blood flow (CBF) imaging for monitoring CSD and lesion progression in a rat focal cerebral ischemia model. The NIR reflectance signals clearly visualized repetitive occurrence of CSD around an ischemic core. The results suggested that NIR reflectance signals depicted early evolution of tissue damage, which was not seen by CBF imaging, in the present stroke model.

Chapter 5 deals with multispectral imaging of the rat brain exposed to a laser-induced shock wave (LISW) for monitoring cortical vascular and hemodynamic responses to a shock wave. Observations revealed that a shock wave itself impaired cortical hemodynamics, and thereafter propagation of CSD resulted in persistent hypoxemia for more than 1 h even after the recovery of cerebral blood volume. Such a persistent oxygen supply-demand mismatch might be associated with brain damage caused by a shock wave.

Chapter 6 summarizes all the findings obtained in this study and describes future perspectives.
(492 words)

(英訳) ※和文要旨の場合(300 words)
If the abstract is written in Japanese, needed to translate into English.(300 words)