大学名	徳島大学		
University	Tokushima University		
外国人研究者	ヤウヘン　バンダルク		
Foreign Researcher	Yauhen Bandaruk		
受入研究者	河合　慶親	職名	教授
Research Advisor	Yoshichika Kawai	Position	Professor
受入学部/研究科	大学院医歯薬学研究部		
Faculty/Department	Graduate School of Biomedical Sciences		

＜外国人研究者プロフィール/Profile＞

国　籍	ベラルーシ共和国
Nationality	Republic of Belarus
所属機関	ベラルーシ国立大学
Affiliation	Belarusian State University
現在の職名	准教授
Position	Associate professor
研究期間	2018年7月24日　～　2018年10月15日（84日間）
Period of Stay	84days (July 24, 2018 - October 15, 2018)
専攻分野	食品機能学、神経化学
Major Field	Functional food science, Neurochemistry

Dr. Yauhen Bandaruk / Yauhen Banraduk 博士

＜外国人研究者からの報告/Foreign Researcher Report＞

①研究課題　/　Theme of Research

Analysis of the traffic of luteolin across the blood–brain barrier and distribution in neuronal cells

②研究概要　/　Outline of Research

Luteolin is one of the common flavonoids known as potent neuroprotective agent with antioxidant, anti-inflammatory, antidepressant and anticancer activities. However clinical application of flavonoids is limited due to their low bioavailability. To improve bioavailability of flavonoids and permeability of blood-brain barrier can be used nanostuctures which are perspective carriers and tools for regulation of accumulation of polyphenols in brain tissue. In this study we estimated the accumulation of luteolin in brain tissue of laboratory animals, influence on brain monoamine oxidase-A activity, accumulation of luteolin in brain epithelial cells (model of blood-brain barrier) and effects of nanoparticles on this process.

③研究成果　/　Results of Research

Luteolin was administered per oral daily at 100 mg/kg body weight of male ICR mouse, contents of luteolin in brain tissue were estimated with LC-MS/MS. One week luteolin administration didn't lead to significant increase of luteolin content in the brain tissue comparing to control mouse indicating poor availability of luteolin. Monoamine oxidase-A activity also didn't decreased after one week of luteolin administration. However luteolin easily penetrated and accumulated in cultured rat brain epithelial cells (RBEC1) – model of blood-brain barrier. Nanoparticles of TiO2 and Fe3O4 bound luteolin and significantly improved the accumulation of luteolin in cells as complex.

④今後の計画　/　Further Research Plan

Because flavonoids exist in blood stream mainly as glucuronated, sulfated and methylated derivatives it is significant to estimate amounts of these metabolites in plasma after per oral luteolin administration as well as their binding with nanoparticles and their effects on penetration of model blood-brain barrier and accumulation in brain tissue. Other type of nanoparticles suitable for in vivo administration should be checked as flavonoids carriers.

＜受入研究者からの報告/Research Advisor Report＞

①研究課題　/　Theme of Research

Analisys of the traffic of luteolin across the blood-brain barrier and distribution in neuronal cells

②研究概要　/　Outline of Research

Dr. Bandaruk has focused on the bioavailability of luteolin, one of the common flavonoids known as potent neuroprotective agent with antioxidant, anti-inflammatory, antidepressant and anticancer activities. To improve bioavailability of flavonoids and permeability of blood-brain barrier, he planned to use nanostuctures which are perspective carriers and tools for regulation of accumulation of polyphenols in brain tissue. We provided our protocols for estimation of the accumulation of luteolin in brain tissue of laboratory animals by LC-MS/MS. He also measured influence of flavonoids intake on brain monoamine oxidase-A activity, accumulation of luteolin in brain epithelial cells (model of blood-brain barrier) and effects of nanoparticles on this process.

③研究成果　/　Results of Research

Luteolin was administered per oral daily at 100 mg/kg body weight of male ICR mouse, accumulation of luteolin in brain tissue was estimated with LC-MS/MS. However, Luteolin administration for one week didn't lead to significant increase of luteolin content in the brain tissue comparing to control mouse indicating less availability of luteolin. Monoamine oxidase-A activity also didn't decreased. On the other hand, luteolin easily penetrated and accumulated in cultured rat brain epithelial cells (RBEC1) – model of blood-brain barrier. Nanoparticles of TiO_2 and Fe_3O_4 bound luteolin and significantly improved the accumulation of luteolin in cells as complex. These results may lead to future's application of nanoparticles to enhance the bioavailability of flavonoids in vivo.

④今後の計画　/　Further Research Plan

It has been known that flavonoids in blood stream are present mainly as glucuronidated, sulfated and methylated derivatives. Therefore, it will be essential to estimate amounts of these metabolites in vivo after oral luteolin administration as well as their binding with nanoparticles and their effects on penetration of model blood-brain barrier and accumulation in brain tissue. Due to the limitation of research periods, we could not try measurements of metabolites and the effects of other type of nanoparticles. We should also check suitable nanoparticles as flavonoids carriers for in vivo administration . We will continue the collaboration with Dr. Banraduk for application of nanoparticles to enhance the bioavailability of flavonoids in vivo.

Seminar at Miyazaki University / 宮崎大学訪問時のセミナー風景

HPLC analysis of flavonoids in the cells / HPLC分析による細胞からフラボノイドの検出風景