訂正版

Program・Abstracts

アジア国際シンポジウム

Asian Symposium on Chemoreception

共催　味の素株式会社
花王株式会社
高砂香料工業株式会社

第 1 日目　10 月 2 日(木)

10 月 2 日(木) 15:30-17:30

第 7 回アジア国際シンポジウム

Asian Symposium on Chemoreception

座長　上田 宏（北海道大学北方生物圏フィールド科学センター・大学院環境科学院）
　　脇坂 聡（大阪大学大学院歯学研究科）
主催　日本味と匂学会運営委員会、国際交流委員会
共催　味の素株式会社、花王株式会社、高砂香料工業株式会社

SY-A1

Biological studies on the dissolved free amino acids of the Ishikari River watershed as potential homing cues for adult chum salmon (*Oncorhynchus keta*)

Ernest Y. Chen and Hiroshi Ueda
Division of Biosphere Science, Graduate School of Environmental Science, Hokkaido University, Japan

SY-A2

Central effect of metformin on food intake and glucose regulation in mice

Hyun-Ju Kim, Mi-Jeong Oh, Sang-Hyun Choi, Boe-Gwun Chun and Dong-Hoon Kim
Department of Pharmacology, Korea University College of Medicine, Seoul, Republic of Korea

SY-A3

Sensing Fear Through The Olfactory System: The Role of Habenular Kisspeptin

Ishwar Parhar
Brain Research Institute, School of Medicine and Health Sciences, Monash University Malaysia, Malaysia

SY-A1

Biological studies on the dissolved free amino acids of the Ishikari River watershed as potential homing cues for adult chum salmon (*Oncorhynchus keta*)

Ernest Y. Chen and Hiroshi Ueda

Division of Biosphere Science, Graduate School of Environmental Science
Hokkaido University

The unique anadromous lifecycle of chum salmon is rooted on the fish's phenomenal ability to locate their natal streams after residing for years in the open ocean. Shortly after emergence as juveniles, the fish are known to imprint to natal stream olfactory chemicals in the form of dissolved free amino acids (DFAA) while initiating downstream migration into the ocean. As returning adults, the upstream migrants recall these stream-specific cues for homing navigation. Over the course of this study, DFAA were analyzed for fluctuations and stability in the Ishikari River watershed, Hokkaido, Japan, and two of its tributaries: the Chitose and Toyohira rivers. The riverine DFAA during the homing season were utilized to determine behavioral homing preferences for adult chum salmon by way of a Y-maze 2-choice test tank.

Monthly water samples were taken from strategically chosen sites in the three waterways. Statistical comparisons between the vital imprinting and homing months for each specific DFAA revealed substantial annual variations between the imprinting months. However, only a few significant differences were detected for individual DFAA between the imprinting and homing months for the Toyohira and Chitose rivers. Total DFAA levels were positively correlated with discharge rates in the Toyohira and Ishikari rivers.

For homing behavioral analyses, adult male chum salmon from the Chitose River were exposed to artificial stream water (ASW) reconstituted with DFAA compositions identical to those of the Toyohira and Chitose rivers. The majority of the fish showed a preference for Chitose ASW over Toyohira ASW on initial first choice entry and tended to stay in the choice arm for a longer duration. The total number of entries into each Y-maze arm, however, varied as the fish did not exhibit any unequivocal inclinations for either arm.

Although this study discovered substantial seasonal fluctuations between the three waterways, a previous study showed that only a few stable compositions of DFAA in the Teshio River, Hokkaido, may be sufficient for chum salmon natal river recognition. DFAA appear to be influenced by discharge levels during the snowmelt season, which likely induced bedload transfer, scouring, and fluvial erosion. During the Y-maze tests, the chum salmon from the Chitose River appeared to be able to discriminate DFAA from their natal river as they showed a preference for Chitose ASW, thus suggesting that natal stream DFAA act as potential waypoints for upstream navigation.

SY-A2

Central effect of metformin on food intake and glucose regulation in mice

Hyun-Ju Kim, Mi-Jeong Oh, Sang-Hyun Choi, Boe-Gwun Chun, and Dong-Hoon Kim

Department of Pharmacology, Korea University College of Medicine, Seoul, Republic of Korea

Metformin, a widely prescribed anti-diabetic drug, reduces body weight and food intake in humans and animals. However, the mechanisms underlying the metformin-induced anorexia remain unclear. In this study, we sought to determine the central and peripheral action of metformin on energy balance and body weight, as well as the potential role of key hypothalamic energy sensors, including adenosine monophosphate-activated protein kinase (AMPK) and S6 kinase (S6K) in the metformin-induced anorexia. Furthermore, we investigated the central action of metformin in glucose regulation in mice.

To address these, we performed meal pattern analyses and conditioned taste aversion (CTA) tests in obese C57BL/6 mice orally administered metformin and lean mice administered metformin into the third ventricle (I3V). We compared energy expenditure, the levels of c-Fos expression in the brain and the phosphorylation of hypothalamic AMPK and S6K in the mice. In addition, we performed glucose, pyruvate, and insulin tolerance tests in mice I3V administered metformin.

Oral administration of metformin resulted in weight loss and anorexia accompanied by transient decrease in meal size and persistent reduction in meal number in obese mice, and produced a CTA. It increased neuronal activation in the nucleus tractus solitarius and central amygdala compared to the pair-fed mice. I3V administration of metformin caused weight loss and anorexia accompanied by reduction in both nocturnal meal size and number compared to the control, and did not induce CTA. I3V administration of metformin increased phosphorylation of S6K at Thr389 and AMPK at Ser485/491 in the mediobasal hypothalamus compared to the control, while AMPK phosphorylation at Thr172 was not changed. I3V rapamycin pretreatment reinstated the metformin-induced weight loss and anorexia. Interestingly, I3V administration of metformin lowered glucose levels only in oral glucose tolerance test (GTT), but not intraperitoneal GTT compared to the control. Moreover, it increased glucose levels in pyruvate tolerance test.

These results suggest that the activated neurons in multiple brain regions may be involved in the metformin-induced anorexia, and that the anorexia induced by central metformin may be mediated by activation of hypothalamic S6K pathway. In addition, the central metformin may play a critical role in the alteration of glucose regulation.

SY-A3

Sensing Fear Through The Olfactory System: The Role of Habenular Kisspeptin

Ishwar Parhar

Brain Research Institute, School of Medicine and Health Sciences, Monash University Malaysia, Malaysia

Predator-derived odors can be highly effective stimuli for eliciting defensive behaviors including fear response in many vertebrates. Fear arises in stressful situations that are subjectively perceived as threatening, which is a conserved innate emotion expressed throughout the phyla within the vertebrates. Zebrafish (Danio rerio) are known to respond to alarm substances (AS) with antipredatory or alarm reactions. Our recent study has demonstrated the role of habenular kisspeptin (Kiss1) neurons in the modulation of AS-evoked fear response in the zebrafish. We found that inactivation of the Kiss1 receptor (Kiss-R1)-expressing neurons significantly decreased Kiss1-immunoreactivity in the habenula and the median raphe as well as AS-evoked fear response. Furthermore, the inactivation caused a reduction in the expression of the serotonin (5-HT) transporter (slc614a), transcription factor (pet1) and the enzyme involved in 5-HT synthesis (tph2). These results indicate that habenular Kiss1 neurons modulate AS-evoked fear responses via the 5-HT system. However, it is still unknown how the habenular Kiss1 neurons receive odorant cues to modulate fear response. We mapped neural activity in the brain during AS-evoked fear response using a novel neural activity marker (npas4a), which is required for new and reactivated fear memories. During AS-evoked fear response, npas4a expressing cells were seen in the olfactory bulb, telencephalon, habenula, hypothalamus, cerebellum, and the spinal cord. Furthermore, we noticed an increase number of npas4a expressing cells in the ventral telencephalic region during AS-evoked fear response in comparison with controls. These results indicate that AS-signals from the olfactory sensory neurons are delivered to the habenular Kiss1 neurons via npas4a positive cells in the ventral telencephalon to modulate fear response in the zebrafish.