

therapy to explore the effective rehabilitation scheme in terms of neurophysiology. The second study focuses on inferior temporal gyrus posterior, where distinguishing activities can be observed between control and dyslexic children performing recitation. As a conclusion, strength and limitations of the MEGs for observing brain activity were discussed along with the field of physiological anthropology.

S-3 Neural Substrates Underlying Different Emotions using fMRI

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The presentation describes what would be benefit of using fMRI for the study of physiological anthropology field, and the main findings from the studies of emotion and cognition using fMRI in my lab. Specifically the following topics will be addressed:

- 1) How does fMRI work?
- 2) Identification of the neural substrates associated with basic emotions (joy, sadness, anger, disgust, fear etc.).
- 3) Identification of the effect of exposure of the forest landscape on human sensibility.
- 4) Application of fMRI for emotion and cognition researches.

In conclusion, brain mapping method with fMRI would be a very useful and strong research method in the field of physiological anthropology, especially for affect and cognition which are mainly genetically determined. The researches done in my lab showed that different neural substrates are involved among different emotions. Between positive emotions (i.e., joy and humor), the function of same brain areas associated with both positive emotions turned out different and the involvement of neural areas in between them was different.

S-4 Significance and Problems of Brain Activity Measurements by using fMRI and MEG

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Recently, the non-invasive brain measurements such as fMRI (functional magnetic resonance imaging), MEG (magnetoencephalography) and NIRS (near-infrared spectroscopy) have been developed and available in a variety of research fields. Among them, the brain regions could be well estimated by using fMRI and MEG which have relative advantage of respectively high spatial resolution and high temporal resolution. By using MEG, we have succeeded in carrying out multi-dipole estimation, with specifically high temporal resolution of 3.6 msec in average, of multiple brain activity related to auditory discrimination. However, the time range covering the brain activity is limited up to 1 sec. In contrast, fMRI including its event-related techniques has a comparatively low temporal resolution (>1000 msec) as compared to MEG. However, it can cover wider time range

(several 10 sec or 1 min), then is effective in wide research fields on usual cognitive and emotional states, compared to MEG. Therefore, we should use or combine these techniques by understanding their characteristics and by constructing the brain model to be clarified.

1-1 Interaction with SNP Allele in Multiple Loci Contributes to Human Skin Color Diversity (1)

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Our study aims to clarify molecular basis of human skin color diversity and investigate environmental adaptability to ultraviolet irradiation in order to predict human health risk influenced by severe environments in the future. Samples obtained from 122 Caucasians living in Toledo, Ohio were used for DNA extraction. DNA was used for SNP genotyping with the technology of Masscode™ system that involves the two-step PCR amplification and comprises a platform chemistry of cleavable mass spectrometry tags. The results of the SNP genotyping show that SNP allele in multiple loci are related and suggest high possibility of linkage disequilibrium. Our study plans to collect data on other ethnic groups in order to analyze correlation between SNP allele in multiple loci and identify loci associated with human skin color diversity. Our final goal is to clarify interactions between atmospheric environments using remote sensing data and SNP allele frequency.

1-2 Diurnal Rhythm of the Lipid Metabolism in Rats

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The present study was undertaken to examine the diurnal rhythm of lipid metabolism in rats. Although the plasma and hepatic cholesterol concentrations in the dark period were similar to those in the light period, the hepatic mRNA expression of HMG-CoA reductase, the rate-limiting enzyme of cholesterol biosynthesis, was significantly higher in the dark period than in the light period. The hepatic mRNA expression of cholesterol 7 α -hydroxylase, the rate-limiting enzyme of bile acids biosynthesis, was also significantly higher in the dark period than in the light period. Changes in the hepatic mRNA expressions of nuclear receptors, liver X receptor (LXR) and farnesoid X receptor (FXR), which are transcriptional factors of cholesterol metabolism, were consistent with those in the hepatic HMG-CoA reductase and cholesterol 7 α -hydroxylase

mRNAs expressions. These findings suggest that the diurnal rhythm of lipid metabolism would be regulated by nuclear receptors like LXR and FXR.

1-3 Observation of Collagen in Biological Tissue by Second-Harmonic Generation Microscopy

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Ultra short pulse laser induces second-harmonic generation (SHG) light specifically from collagen in biological tissue. Thereby we developed a SHG microscope, and observed skin sections and collagen gel, in which fibroblasts were embedded. SHG image of skin sections clearly captured collagen fibers and was similar to histological observation. In reticular dermis, entangled structure of thickly-growing collagen fiber was shown. By contrast, fine collagen fiber was uniformly distributed in papillary dermis. Although SHG light emitted from a fibroblast embedded gel was weaker than that from skin section, SHG light could detect collagen structure of the gel. After 4-week culture, intensity of SHG light was increased in the gel and fibrous pattern was appeared in the SHG image. This change in the SHG image probably indicated remodeling of collagen due to cell culture. Because SHG microscopy provides invasive and non-staining observation, further in vivo measurement of human tissue will be a powerful tool for studies in physiological anthropology.

1-4 Molecular-biological Study on Regulatory Mechanism of Cutaneous Blood Flow

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The purpose of the present study was to investigate the relationship between the hunting reaction due to cold-water exposure and nitric oxide synthase (NOS), which is involved in vasodilation. First, the change in blood flow after immersing a finger into cold water (7°C) was observed in 9 healthy male university students. The involvement of NOS in the hunting reaction was examined by investigating the activity of endothelial nitric-oxide synthase (NOS3) upon temperature stimulation of human microvascular endothelial cells (HMVEC). The hunting reaction was confirmed in all subjects. With regard to NOS activity, although the level of total NOS3 was largely constant regardless of cold-water exposure time, the level of phosphorylated NOS3 decreased as the duration of cold-water exposure increased. The results of the present study suggest that phosphorylated NOS is involved in the hunting reaction.

1-5 Responses in Index Finger Temperature during Cold Exposure

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Cold water immersion test is commonly used in Japan to assess peripheral circulation, where recovery rate of finger temperature is calculated. Cold induced vasodilation (CIVD) has been recognized as a key mechanism in preventing local cold injuries. The purpose of this study was to examine responses in index finger temperature during cold exposure focusing on CIVD. Twenty one healthy males aged 19 to 25 participated in this study. After 10 minutes rest, participants were asked to immerse their right hand in stirred water at 5.0 degrees C for 30 minutes, and the index finger skin temperature was monitored till 15 minutes after the exposure. All participants showed good recovery rates. One to three CIVD reactions were observed during cold exposure. Shorter onset time and greater amplitude of the first CIVD were significantly correlated with higher mean finger skin temperature during cold exposure. Furthermore, higher amplitude was significantly correlated with better recovery rate. CIVD may contribute to maintain finger skin temperature and could be a good measure for assessing peripheral circulation.

1-6 Effects of Maximum Oxygen Uptake and Vascular Endothelial Function on Cold-Induced Vasodilation

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This study aimed to estimate the individual differences of Cold-Induced Vasodilation (CIVD) from the view point of the relationship between CIVD and maximum oxygen uptake and vascular endothelial function. Thirty-five healthy male students volunteered to participate in the study. CIVD was estimated by measurement of skin temperature on finger pad of right index finger before, during, and after immersion into ice water. Individual physical fitness and vascular endothelial function were estimated by the measurements of maximum oxygen uptake during incremental exercise and of blood flow at reactive hyperemia (endothelium-dependent vasodilation) which related with release of nitric oxide, respectively. Significant correlations were seen among CIVD, maximum oxygen uptake, and endothelium-dependent vasodilation. These findings suggested that individuals with higher levels of maximum oxygen uptake had profitable response of CIVD because they had also good function of vascular endothelium, and that release ability of nitric oxide and/or responsiveness to nitric oxide were prominently involved in the individual differences of CIVD.