with MDD (42 depressed and 10 remitted; DSM-IV) and 54 matched controls. Significant differences were found in four amino acid concentrations between the depressed patients and controls. After Bonferroni correction, only ethanolamine (EA) levels remained significantly reduced in depressed patients (nominal P=0.000011). A substantial proportion of the depressed patients (40.5%) showed abnormally low CSF EA levels (<12.1 μM; P=0.000033; OR=11.6, 95% CI: 3.1–43.2). When patients with low EA and those with high EA levels were compared, the former had higher scores for overall depression severity (P=0.0033) and ‘Somatic Anxiety’ symptoms (P=0.0026). In unmedicated subjects, CSF EA levels showed a significant positive correlation with levels of homovanillic acid (P=0.0030) and 5-hydroxyindoleacetic acid (P=0.019). To our knowledge, this is the first study showing that patients with MDD have significantly lower CSF EA concentrations compared with control subjects. CSF EA could be a state-dependent biomarker for a subtype of MDD. Further replication studies are currently under way.

**PS196**

**Alterations of the cortisol and dehydroepiandrosterone in perinatal depression**

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**Abstract**

**Objectives:** The purpose of this study is to investigate the alterations of the hypothalamic-pituitary-adrenal axis hormones, especially salivary cortisol and dehydroepiandrosterone (DHEA) in perinatal depression.

**Methods:** 44 patients with depression and 217 normal subjects in perinatal period were included in this study. Edinburgh Postnatal Depression Scale (EPDS) and Beck Depression Inventory II (BDI-II) were performed. The subjects below 10 points of EPDS score or below 13 points of BDI-II score were classified to normal subjects. Among the subjects more than 11 points of EPDS score or more than 14 points of BDI-II score were diagnosed depression by DSM-IV TR by psychiatrists. All subjects were to collect their saliva in each 4 collecting tubes, immediately upon awakening (IA), 30 minutes after awakening (30A), 60 minutes after awakening (60A) and before bedtime (BB).

**Results:** The number of subjects in antenatal period were 103, and antenatal depression (AD) patients were 21, antenatal normal (AN) subjects were 82. The number of subjects in postnatal period were 114, and postnatal depression (PD) patients were 23, postnatal normal (PN) subjects were 91. Salivary cortisol levels in subjects with AD collected IA, 30A and 60A were lower than with AN subjects significantly except BB. Salivary cortisol levels in subjects with PD collected 60A only were lower than with PN subjects significantly. Salivary DHEA levels in subjects with both AD and PD were lower than with normal subjects significantly. Also cortisol/DHEA ratio (F/D ratio) in subjects with both AD and PD were much higher than with normal subjects significantly.

**Conclusions:** These results suggest that the blunted response was shown in AD, and the characteristics between AD and PD are different. Also the differences of salivary DHEA levels and F/D ratio between subjects with PD and normal subjects are suggested the one of the key points of difference among both groups.

**PS197**

**Low level of perineuronal nets in the medial prefrontal cortex predicts vulnerability to stress**

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**Abstract**

Perineuronal nets (PNNs) are extracellular matrix structures enwrapping parvalbumin-positive γ-aminobutyric acid (GABA)-ergic interneurons which are crucial for modulating anxiety and depressive-like behaviors. Perineuronal nets have recently been implicated in experience-dependent neuroplastic changes in central nervous system, but it is poorly understood that whether PNNs modulates the neural maladaptation after repeated exposure to stress. We found that adolescent rats with vulnerability to chronic unpredictable mild stress (CUMS) showed decreased level of PNNs, tenascin-R and aggrecan in the medial prefrontal cortex (mPFC). Degradation of PNNs in mPFC produced vulnerability to stress in adult rats. Elevating PNNs in the mPFC through environment enrichment prevented CUMS-induced depressive and anxiety-like behavior. Fluoxetine reversed the stress vulnerability in adolescent rats and increased PNNs levels. Lower level of PNNs rendered GABAergic neurons susceptible to CUMS, manifesting as decreases in expression of glutamic acid decarboxylase 67 (GAD 67) and frequency and amplitude of inhibitory postsynaptic current (IPSC) after CUMS. The organization of PNNs coincided with the developmental switch in stress vulnerability to resilience. These findings indicate a role of PNNs in mPFC in predicting and modulating vulnerability to stress-induced depressive-like behavior, and the effect may be produced though regulating GABAergic functions.

**Keywords:** perineuronal nets; stress vulnerability; GABAergic neuron

**PS198**

**Pathological analysis of refractory depression using fetal alcohol and adolescent corticosterone double stress model**

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**Abstract**

The clinical strategy for treatment-resistant depression which includes overlap between bipolar disorder remains inadequate. Establishment of a diagnostic method and understanding of the detailed pathogenesis of those patients are urgently needed. In this study, we performed comparative analysis of depressive-like behaviors and variations of depression-related molecules in the brain and peripheral blood between controls and refractory depression model animals established by the combined stress of fetal period alcohol and adolescent chronic corticosterone (CORT) treatment. With a part of this model animal, we have also administered antidepressants (SSSRI) for the purpose of investigation of possible treatment method and molecular pathogenesis in refractory type of depression. Focusing on the report of region specific BDNF activity in the pathogenesis of...
refractory depression, we have compared BDNF levels in frontal cortex, hippocampus, and amygdala in each group of animals. In addition, we have measured BDNF and BDNF expression related microRNA (miRNA206) contents in all exosome and brain-derived exosome in the peripheral blood, aimed at the identification of peripheral molecular dynamics that specifically reflect the changes in the brain. All experiments have carried out according to the approval of the Sapporo Medical University Animal Care and Use Committee with consideration so as not to give unnecessary pain to the animal.

We have found that blood BDNF levels of refractory depression (7.4 ng/ml ± 1.50) showed significantly higher (p<0.05) than the controls (5.6 ng/ml ± 1.02) and simple depression models (4.5 ng/ml ± 0.84), and antidepressant tended to increase the BDNF levels in depression model (6.2 ng/ml ± 1.54), but reduced in refractory depression models (5.6 ng/ml ± 1.38). Furthermore, interestingly, the variation of blood BDNF levels and the way of the changes in the exosome is different. In considering the clinical report that indicated higher levels of blood BDNF in the refractory depression, we have compared BDNF levels in frontal cortex, hippocampus, and amygdala in each group of animals.

Contrasting expression patterns of inflammation- and immune–related genes in mouse models of depression and psychosis

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Abstract

Previously, we showed the existence of pseudo-immature brain cell states in the dentate gyrus (DG) of mouse models of psychiatric disorders, including schizophrenia and bipolar disorder. It was also demonstrated that some brain cells can undergo rejuvenation in response to the external stimulation, such as treatment with antidepressant (fluoxetine; FLX), pilocarpine-induced seizure, and physiological stimulation. Pseudo-immature brain cell states are often associated with inflammation. Recently, via bioinformatics analysis, we indicated transcriptional “hyper-maturity” in the DG of mice overexpressing the glucocorticoid receptor (GRov mice), which show increased depression-like and anxiety-like behaviors and are considered potential animal models for mood disorders, and the hippocampus of the glutamate dehydrogenase 1 (GluD1) transgenic mice and mice treated with PF-04447943, a selective phosphodiesterase-9 (PDE9) inhibitor. However, it is largely unknown whether there is any common molecular basis for “hypermaturity” and pseudo-immature brains. Here, we compared genome-wide gene expressions in the DG of GRov mice with those in inflammation by using a bioinformatics tool, NextBio. The gene expression patterns in the DG of GRov mice showed statistically significant similarity to those in the inflammation-associated events, such as poly(I:C) infection and colitis. Among genes that were upregulated or downregulated in “hypermature” brains, there were significant enrichments in signal pathways related to inflammation and immune reactions. Both these enrichments were also observed for pseudo-immature brains. Of the inflammation and immune–related genes in the pseudo-immature brains, the number of upregulated genes was significantly greater than that of downregulated genes. In contrast, in the “hypermature” brains, downregulations were dominant to upregulations in the inflammation and immune–related genes. These observations indicate that inflammation is commonly involved in both pseudo-immature and “hypermature” brains, and each of them may represent unique inflammation-related events.

PS200
Effects of p11 on BDNF-induced changes in dendritic outgrowth and spine formation in primary hippocampal cells

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Abstract

Objectives: p11 (S100A10) is a key regulator of depression-like behaviors and antidepressant drug response in rodent models. Recent studies suggest that p11 mediates the behavioral antidepressant action of brain-derived neurotrophic factor (BDNF) in rodents. BDNF improves neural plasticity, which is linked to the cellular actions of antidepressant drugs. In the present study, we investigated whether p11 regulated BDNF action on neural plasticity in vitro.

Methods: We generated primary hippocampal cultures. p11 expression, dendritic outgrowth, and spine formation were investigated under toxic conditions induced by B27 deprivation, which causes hippocampal cell death.

Results: B27 deprivation significantly decreased p11 expression. Treatment with BDNF significantly prevented the B27 deprivation-induced decrease in p11 levels in a concentration-dependent manner, whereas these concentrations had no effect on control cultures. B27 deprivation significantly reduced the total outgrowth of hippocampal dendrites and spine number. BDNF increased dendritic outgrowth and spine number in conditions with or without B27. Furthermore, p11 knockdown through small interfering RNA (siRNA) transfection blocked these effects. Specially, overexpression of p11 in B27-deprived cells increased dendritic outgrowth and spine number, and treatment with BDNF potentiated these effects.

Conclusions: Taken together, our data suggest that BDNF-induced improvement in neural plasticity may depend on the regulation of p11 in hippocampal cells. These results provide evidence to strengthen the theoretical basis of a role for p11 in BDNF-induced antidepressant action.

Keywords: p11, BDNF, hippocampus, dendritic outgrowth, spine formation

PS201
EphB2 in the medial prefrontal cortex regulates vulnerability to stress

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