

Department of Laboratory Medicine

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General Summary

Research projects in our department in 2006 were concerned with clinical physiology, clinical microbiology, clinical chemistry, hematology, cardiology, clinical cell biology, clinical psychiatry, laboratory ethics, and cellular physiology. Research achievements in each division are described below.

Research Activities

Clinical physiology

Eight male volunteers performed an exhausting 400-m run twice with a 60-minute interval. After running, the subjects showed markedly decreased urinary Cl^- levels. The marked reduction in Cl^- might play a role in compensating for the increase in the anion gap in urine produced by running. Organic acids produced by running were excreted into tubular (lumen), and then Cl^- was reabsorbed to regulate the ion balance. The decreased Cl^- in the distal tubule might reduce the contraction of the mesangial cells via the macula densa and possibly results in an increase in the glomerular filtration rate and the urine flow rate.

Clinical microbiology

Research on plasma transfusion to extend the expiration date contamination control was performed using *Propionibacterium acnes* (more than 80% of transfusions are for cases of trauma). The result obtained role of *P. acnes* is minor groove estimation by histological and bacteriological study using a mouse intravenous injection model with contaminated human plasma and *Staphylococcus aureus* as a positive control. Chemokine production was induced by contaminated plasma, but this result did not agree with the results of studies in humans.

Clinical chemistry

Structural and glycation site changes of albumin in patients with diabetes and very high levels of glycated albumin

A patient with poor glycemic control had an extremely high level of plasma glycated albumin (94%). Treatment with insulin markedly decreased the blood glucose level. The glycated albumin level decreased almost linearly and reflected the improved glycemic state, whereas hemoglobin A1c was not altered initially.

The fluorometric spectrum of the advanced glycation end-product increased depending

on the glycated albumin level. The glycation sites were extended to 10 lysine (Lys) sites, including Lys-525, as shown by liquid chromatography/mass spectrometry. These results suggest that glycated albumin is a useful indicator for monitoring glycemic control during initial insulin treatment and that other sites of the albumin molecule in addition to Lys-525 are glycated when the blood glycated albumin level is elevated.

Clinical biochemistry

Effects of aerobic exercise on serum lipids were examined with a method of high-performance liquid chromatography we developed; high-density lipoprotein cholesterol was not increased, but very low density lipoprotein (VLDL) cholesterol was significantly decreased. This lowering of VLDL was pronounced in subjects with increased adiponectin (reported at the 14th International Symposium on Atherosclerosis, Rome, June 2006). The agreement between high-performance liquid chromatography and the homogenous method was excellent, but levels of low-density lipoprotein cholesterol, measured with the homogenous assay, increased when samples with increased levels of VLDL cholesterol were measured.

Hematology

Study of a new gene amplification system: the Transcription-Reverse Transcription Concerted Reaction System

We evaluated the efficacy of a new gene amplification method called the Transcription-Reverse Transcription Concerted Reaction (TRC) System. Using this system, we found the first case of multiple myeloma producing carcinoembryonic antigen and reported the system's satisfactory sensitivity and specificity in detecting *Mycobacterium tuberculosis*. The TRC system, which is a simple and rapid test, is a powerful, easy, and rapid method of gene amplification.

Cardiology

Pulmonary veins play an important role in both the initiation and maintenance of atrial fibrillation. Segmental ostial pulmonary vein isolation (PVI) is a new method of catheter ablation of atrial fibrillation. Our clinical studies are intended to assess the effects of PVI in patients with atrial fibrillation. This year we found that elevated plasma concentrations of brain natriuretic peptide decrease after PVI in patients with atrial fibrillation. We also investigated the effect of PVI on P-wave morphology.

Clinical cell biology

Development of implanted bioartificial liver

Immortalized mouse hepatocytes, sinusoidal endothelial cells, and Ito cells were co-cultured, and liver organoids were constructed in a radial-flow bioreactor. The expressions of mRNAs of connexin26, and 32, hepatocyte nuclear factor 4, and glucose-6-phosphatase were increased in transplanted tissues. The mRNAs of albumin and tyrosine aminotransferase were strongly expressed in the group transplanted in omentum.

Clinical psychiatry

1. We reported on the effects of atypical antipsychotics on electroencephalograms (EEGs) from the viewpoint of the glutamate hypothesis.

A retrospective study is under way to clarify the clinical significance of the 6-Hz spike and wave on EEG. We continued our investigation of epileptic seizures and chronological EEG changes in mentally handicapped patients. We reported on the clinical characteristics of epilepsy in the elderly.

2. We studied the correlation between the severity of Alzheimer disease, as determined with the Clinical Dementia Rating, and results of various subscales for assessing cognitive function. We found a strong correlation between visuospatial cognition function and the clinical severity of Alzheimer disease. Alzheimer disease can be diagnosed at an early stage by testing visuospatial cognition function.

Publications

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