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General Summary

We have 9 subspeciality research groups: (1) the Medical Genetics, Congenital Metabolic Diseases, Endocrinology, Gastroenterology and Hepatology group; (2) the Allergy and Immunology group; (3) the Neurology group; (4) the Hematology and Oncology group; (5) the Cardiology group; (6) the Infectious Diseases group; (7) the Neonatology group; (8) the Nephrology group; and (9) the Pediatric Psychiatry group. The ultimate goal of these subspeciality groups is to supply practical benefits to patients and their families through basic and clinical research. To accomplish this goal, cooperation and a high degree of motivation for research are need.

Research Activities

Medical Genetics, Congenital Metabolic Diseases, Endocrinology, Gastroenterology, and Hepatology group

We focused on research concerning medical genetics, congenital metabolic diseases, endocrinology, gastroenterology, and hepatology. Accomplishments of our group this year are as follows.

1. In enzyme replacement therapy for lysosomal storage diseases, we developed a novel immune tolerance induction method for enzymes.
2. We developed a novel gene therapy for lysosomal storage diseases using a murine model.
3. In the field of endocrinology, we surgically prepared rats with left ventricular heart failure by banding the aorta, and analyzed the expression patterns of urocortin 2, urocortin 3, and corticotropin releasing factor receptor 2α in their brains.
4. We evaluated the usefulness of a new diagnostic kit for norovirus infection and complications of norovirus infection. We also updated safety information regarding tumor necrosis factor blockers for Crohn disease.
5. We reported on a fetus having the sirenomelia sequence with a reciprocal *de novo*

translocation. We refined the breakpoints of each derivative chromosome and analyzed the etiological mechanisms.
6. We are attempting to develop a murine model of malaria infection.

Neurology group
We focused on research activities concerning higher cortical dysfunction in acquired brain injury (ABI) rehabilitation during childhood. Higher cortical dysfunction is an important aspect in pediatric ABI rehabilitation. Recently, higher cortical dysfunction has attracted attention, and many trials have been performed, but most trials have involved only adults. Higher cortical dysfunction seems to show better recovery in children than in adults because of the plasticity of a child's brain. The main causes of ABI in children are traumatic brain injury (TBI) and acute encephalitis/encephalopathy. The characteristic symptoms are memory disturbance and attention deficit in TBI, and vision problems in acute encephalitis/encephalopathy. It is important for children who have higher cortical dysfunction to be educated with special programs and to be cared for with cooperation among rehabilitation centers, schools, and their families.

Cardiology group
For basic research, a mouse model of right heart failure was created to investigate gene expression and physiological changes in right ventricular remodeling. Because many questions remain regarding the effect of right heart failure upon various organs, we have undertaken joint studies with the Cardiology group and the Pediatric Endocrinology group. We have also studied the growth of the pulmonary artery using a model mouse of pulmonary artery stenosis created by pulmonary artery banding. Our clinical research has examined: 1) magnesium kinetics in pediatric cardiology, 2) the treatment of pediatric arrhythmia using magnesium, 3) the secretion and kinetics of atrial natriuretic peptide and brain natriuretic peptide in pediatric cardiac diseases, 4) cardiac lesions of Fabry disease, 5) hemodynamics after the Fontan operation, and 6) postoperative antithrombotic therapy for congenital heart disease.

Infectious disease group
In an effort to respond to advances in the field of infection and immunology, the Research Group of Infection and Immunity carefully evaluates clinical cases from affiliated hospitals to incorporate present needs in clinical practice into individual research projects. Our research includes 3 main fields: 1) pediatric rheumatoid disease, 2) immunology and immunodeficiency, and 3) bacterial and viral infectious diseases. In recent years, diagnostics and therapeutics in pediatric rheumatology have improved significantly. More-detailed follow-up has become possible by combining various markers of disease activity, allowing normal growth and development to be maintained while disease activity remains well controlled.
For research on immunodeficiency, we aim to develop the most advanced forms of therapy, such as gene therapy, using our extensive clinical experience, including many cases of bone marrow transplantation.
For research on infectious diseases, we have substantial data on bacterial meningitis,

sepsis, and other diseases collected in this department for use in clinical research. Recently, we have focused on the species-specific diversity of bacterial 16S ribosomal RNA sequences. We believe that examining the sequences of bacterial RNA in the blood of patients with diseases of unknown etiology will pave the way to the identification of bacterial species and assist in the investigation of the causes of disease. We are also evaluating the in vivo kinetics of antibiotics specific for children. Each member of our group has their particular areas of expertise and continuously aims to gain a wider range of knowledge in the field of infection and immunology.

Nephrology group

We have focused on research concerning intractable nephrotic syndrome, urinary tract infection, and acute dialysis. In urinary tract infection, we analyzed the clinical manifestations and frequency of breakthrough infection in patients with high-grade vesicouteric reflux (grade≥III). We demonstrated the efficacy of prophylaxis with cefaclor.

Publications

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