

Laboratories

Aerospace Medicine

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General Summary

Our main research interests are gravitational physiology and aerospace medicine.

Research Activities

Phenotypic analysis of juvenile onset dilated cardiomyopathy mouse model

Dilated cardiomyopathy (DCM) is characterized by cardiac dilation and pump failure. However, a fundamental therapy for DCM has not been established. In particular, the DCM that develops in young persons has a poor prognosis. Troponin T amino acid mutation (Δ K210) knock-in mouse (Δ K 210-KI) generated by Morimoto et al., is considered to have a phenotype similar to that of human juvenile DCM. However, neither the neonatal period nor the weaning period was examined in detail. The purpose of this study was to investigate cardiac pathology and changes in gene expression in Δ K210-KI during the neonatal and weaning periods and to identify early progression factors of DCM. We found that the homozygous Δ K210-KI mice have already developed cardiac hypertrophy at birth. Furthermore, we are researching for the development of gene therapy by replacing mutant troponin T with normal troponin T overexpression.

Molecular mechanisms of intracellular Ca^{2+} mediated muscle atrophy

Induced muscle atrophy by tail-suspension and denervation increased the expression of sarcolipin, which negatively regulates intracellular Ca^{2+} dynamics in muscle cells. To clarify the relationship of intracellular Ca^{2+} dynamics to muscle atrophy, we analyzed the changes in gene expression in denervated sarcolipin KO mice and denervated wild type mice. Muscle atrophy in denervated sarcolipin KO mice was less than that in denervated wild type mice. We are now examining these molecular mechanisms.

The effect of microgravity on the morphology of the stomach tissue of mice

For people to live in space, nutritional mechanisms in space must be understood. We analyzed the histological changes that occurred in the fundus gland of tissues of the stomach of mice that were on the International Space Station for 35 days. We found that the cytoplasmic and nucleic areas of parietal cells were reduced after spaceflight. Currently, we are examining this intracellular ultrastructure.

Morphological analysis in transplantation strategy of machine perfusion preservation

The use of marginal donors and donors after circulatory death is an important way of resolving the critical shortage of the donor organ pool. We aim to develop new preservation technology of machine perfusion preservation for marginal grafts. We are analyzing

the ultrastructural characteristics of porcine livers donated after cardiac death and preserved with machine perfusion preservation.

Publications

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