1. Title
FY2005 Ground - based Research Program for Space Utilization Research Report

2. Research Term
FY2005—2006

3. Research Fields
Life Science

4. Research Categories
Exploratory Research for Space Utilization

5. Research Theme
Cardioprotective effect by gravity-induced COX-2 expression

6. Investigators
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8. Summary of Research
We have previously demonstrated that short-term exposure to hypergravity at 2G for 4 hours induces COX-2 expression in the heart. COX-2 is a rate-limiting enzyme for prostaglandin biosynthesis, which plays important roles in variety of pathological responses. Moreover, we have shown that hypergravity at 2G for 4 hours induces VEGF expression in the heart in COX-2 a dependent manner. However, implication of VEGF induction in the heart by gravitational force has not been elucidated.

To further investigate the role of COX-2 and VEGF in the heart under hypergravity, mice were exposed to long-term hypergravity at 2G for 24 hours using Centrifugal Acceleration Test Facility JAXA. As shown in Fig. 1A, expression of COX-2 was not found in the heart of 2G (24H)-exposed mice as well as that of the 1G-control mice. This is sharp contrast to induction of COX-2 in the heart by short-term exposure to 2G (4H) (Fig. 1B).
In the heart of the 2G (24H)-exposed mice, we did not find any ischemic changes, such as necrosis or infarction. These results, taken together, suggest that long-term exposure to hypergravity does not cause stress in the heart, and thus induction of COX-2 and VEGF are not required for heart function under hypergravity.

Importantly, however, we found significantly increased serum VEGF level in the 2G (24H)-exposed mice in a COX-2-independent manner (Fig. 2).

On the earth, normal gravity at 1G continuously stimulates our body. Accordingly, 1G-gravity may also contribute to the basal level of serum VEGF. Therefore, our results provide a possibility that serum VEGF level is decreased by long-term exposure to microgravity like in the space station.

9. Publication List


10. URL