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5. Research Theme Analysis of sensory mechanism mediated by cytoskeleton and
integrin in gravity response of animal cells
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8. Summary of Research
In animal cultured cells, it has been reported that gravity change affects cell
function and cell proliferation. But, the response mechanism of gravity change has
not been known yet. A point of mechanism is what is sensor for response of gravity
change. We hypothesize that gravity change is sensed by cytoskeleton and
transduced into biochemical signal via integrin, whose cytoplasmic domain is bind
to one of cytoskeleton, actin filament. Integrin is major receptor for extracellular
matrix molecules and is responsible not only for cell-extracellular matrix adhesion,
but also for transducer of mechanical stimulation into biochemical signal as
mechanoreceptor. To verify our hypothesis, we examined a correlation between cell
spreading activity and hypergravity-dependent increase of DNA synthesis in animal
cultured cells using one of extracellular matrix molecule, fibronectin. We used
baby hamster kidney (BHK) cells in our experiments, and cultured BHK cells on
fibronectin-coated dishes. In this system, hypergravity condition (75G, 20 h)
increased 10-50% of DNA synthesis correlated with fibronectin-dependent increase
of cell spreading activity using 0-100 \( \mu \text{g/ml} \) fibronectin. Since integrin and actin
filament play an important role in cell spreading, this result suggested that integrin
and actin filament are involved in hypergravity response. To examine mechanism
of hypergravity response in more detail, we observed hypergravity response in
shorter period (2 h). Hypergravity condition (75G, 2 h) also increased about 50% of
DNA synthesis in BHK cells. Cytochalasin B, which inhibits actin polymerization,
abolished the increase of DNA synthesis, indicating that actin filament plays a role
in hypergravity response. To examine whether signal transduction via integrin is
involved in hypergravity response, amount of phosphorylated tyrosin residue, which
is responsible for signal transduction via integrin, was observed in BHK cells.
This result showed that hypergravity increased the level of phosylated tyrosine
residue and phosphorylation of src and paxillin. In addition, hypergravity promoted the formation of stress fiber in BHK cells. These results demonstrate that hypergravity response is mediated by a cell-adhesive molecule, integrin and cytoskeleton in BHK cells.

9. Publication List

Oral Presentation
1) Yasunori Miyamoto, Kumiko Wakabayashi, Yoshihiro Mogami and Masao Hayashi

2) Yasunori Miyamoto, Kumiko Wakabayashi, Yoshihiro Mogami and Masao Hayashi

3) Yasunori Miyamoto, Kumiko Wakabayashi, Yoshihiro Mogami and Masao Hayashi

4) Kumiko Wakabayashi, Yasunori Miyamoto, Naoko Massaki, Yoshihiro Mogami and Masao Hayashi

5) Yasunori Miyamoto, Kumiko Wakabayashi, Naoko Massaki, Yoshihiro Mogami and Masao Hayashi

Proceedings
1) Yasunori Miyamoto, Kumiko Wakabayashi, Yoshihiro Mogami and Masao Hayashi

2) Yasunori Miyamoto, Kumiko Wakabayashi, Yoshihiro Mogami and Masao Hayashi

3) Yasunori Miyamoto, Kumiko Wakabayashi, Yoshihiro Mogami and Masao Hayashi

4) Kumiko Wakabayashi, Yasunori Miyamoto, Naoko Massaki, Yoshihiro Mogami

5) Yasunori Miyamoto, Kumiko Wakabayashi, Naoko Massaki, Yoshihiro Mogami and Masao Hayashi  

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