Development of a Cancer Therapy Targeting Cell Membrane Tension

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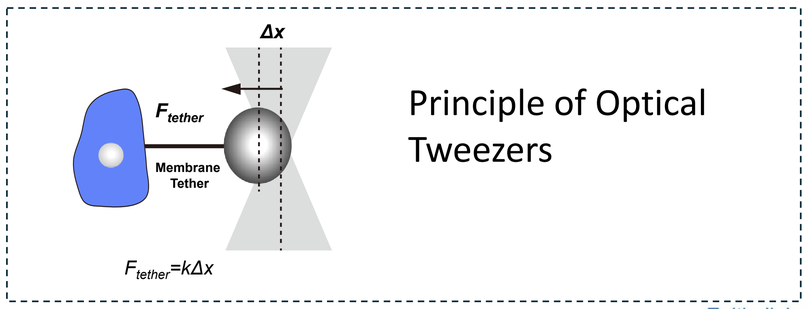
Background Cancer is the leading cause of death in Japan. Recent studies have highlighted the importance of physical properties in cancer malignancy. However, therapeutic strategies targeting these properties remain largely unexplored. This study aims to develop a new cancer therapy by targeting membrane tension in cancer cells.

Previously Technology Conventional anticancer drugs and molecularly targeted therapies can result in treatment resistance and recurrence. Although immunotherapy is highly effective in some cancers, its applicability remains limited. Therefore, new therapeutic targets are needed to overcome the limitations of existing cancer treatments.

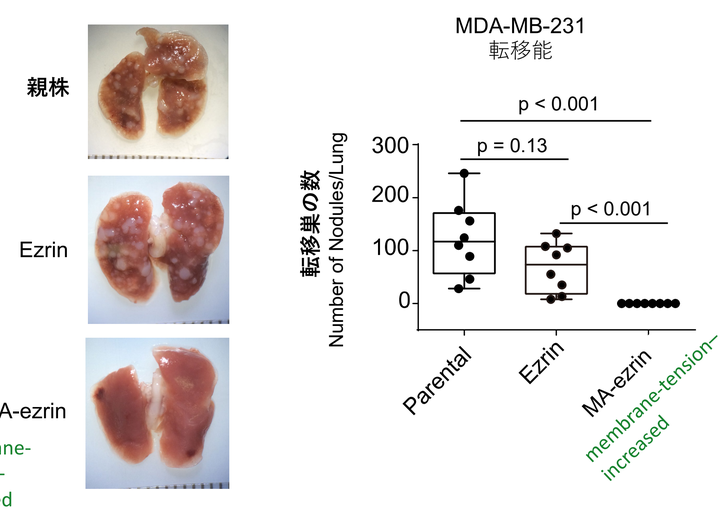
Technical Significance

1 . Using optical tweezers, we found that membrane tension in highly malignant cancer cells was significantly lower than that in normal cells and less malignant cancer cells.



Tsujita. *et al. Nat Commun* 12, 5930 (2021).

2. Artificially increasing membrane tension effectively suppressed tumor formation and metastasis of breast cancer cells.



Significance

- **Membrane tension is a fundamental physical parameter underlying cancer malignancy.**
- **Manipulating membrane tension alone can suppress cancer malignancy.**

Future Prospective

Possible Applications

- A therapeutic strategy targeting the physical properties of cancer cells may represent a novel approach distinct from conventional cancer treatments. We are currently screening compounds that increase membrane tension, and candidate compounds showing efficacy at the cellular level have been identified. Such compounds may contribute to the realization of a new therapeutic concept, “mechanics-targeted therapeutics,” which aims to target the physical properties of cancer cells.

Possible Collaboration

- Pharmaceutical companies / Biotech startups

Publications & IP

- Tsujita. *et al. Nat Commun* 12, 5930 (2021)
- Patent Pending (JP 2024-510010 A, US 2024-0167037 A)

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