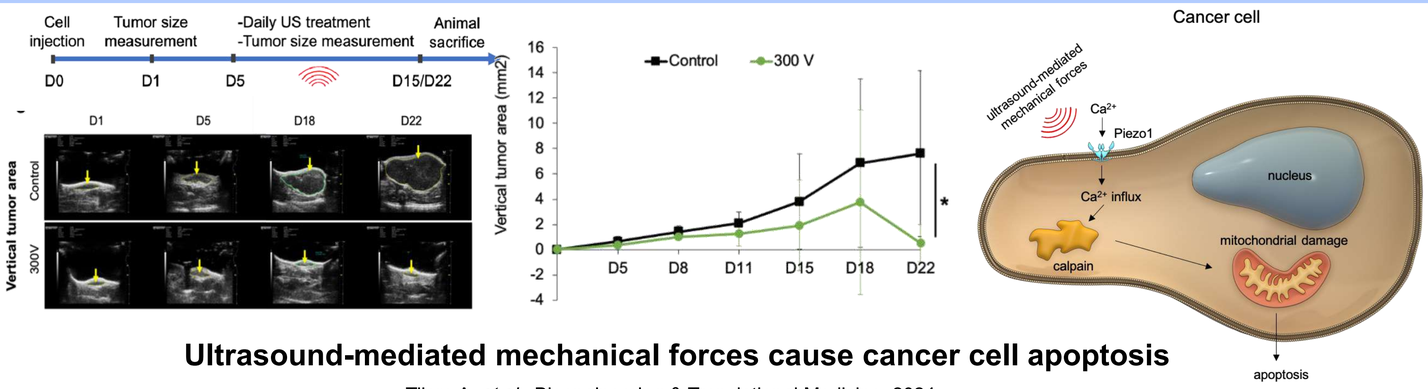
Biomechanical Vulnerability of Oral Cancer Cells Enables Low-Frequency Ultrasound Treatment

Rashmita Luha[1], Gomathi Sankar[1], Akshay Kumar[2], Alka Kumari[1], Ketan Kulkarni[1], Rudra Pratap[2], Aravind Kapali[3], Ajay Tijore[1]

[1]Department of Bioengineering, Indian Institute of Science, Bangalore, India, [2]Centre for Nano Science and Engineering, Indian Institute of Science, [3]Department of Surgical Oncology, M. S. Ramaiah Medical College & Hospitals
Email: rashmitaluha@iisc.ac.in

Introduction



Ultrasound-mediated mechanical forces cause cancer cell apoptosis

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Key features of low-frequency ultrasound for cancer therapy

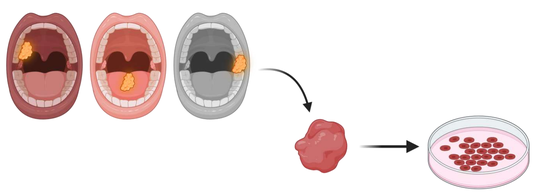
- Personalised
- Selectively induces apoptosis in cancer cells without damaging normal cells
- No thermal ablation

Research Aims

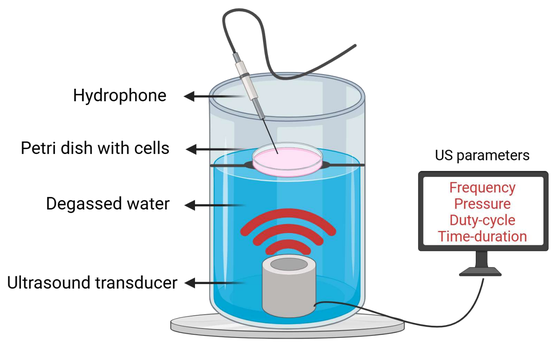
1. Investigate the effect of low-frequency ultrasound (LFU) on patient-derived oral cancer cell survivability and invasion.
2. Develop a biomaterial-engineered 3D coculture platform to evaluate the effect of LFU.

Methodology

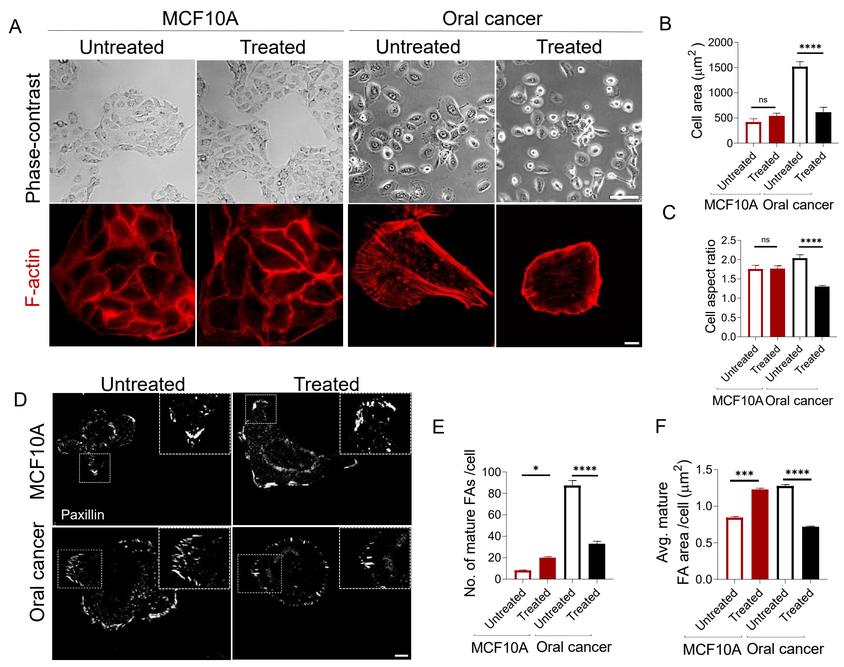
Isolation of patient-derived oral cancer cells from multiple samples and cancer stages



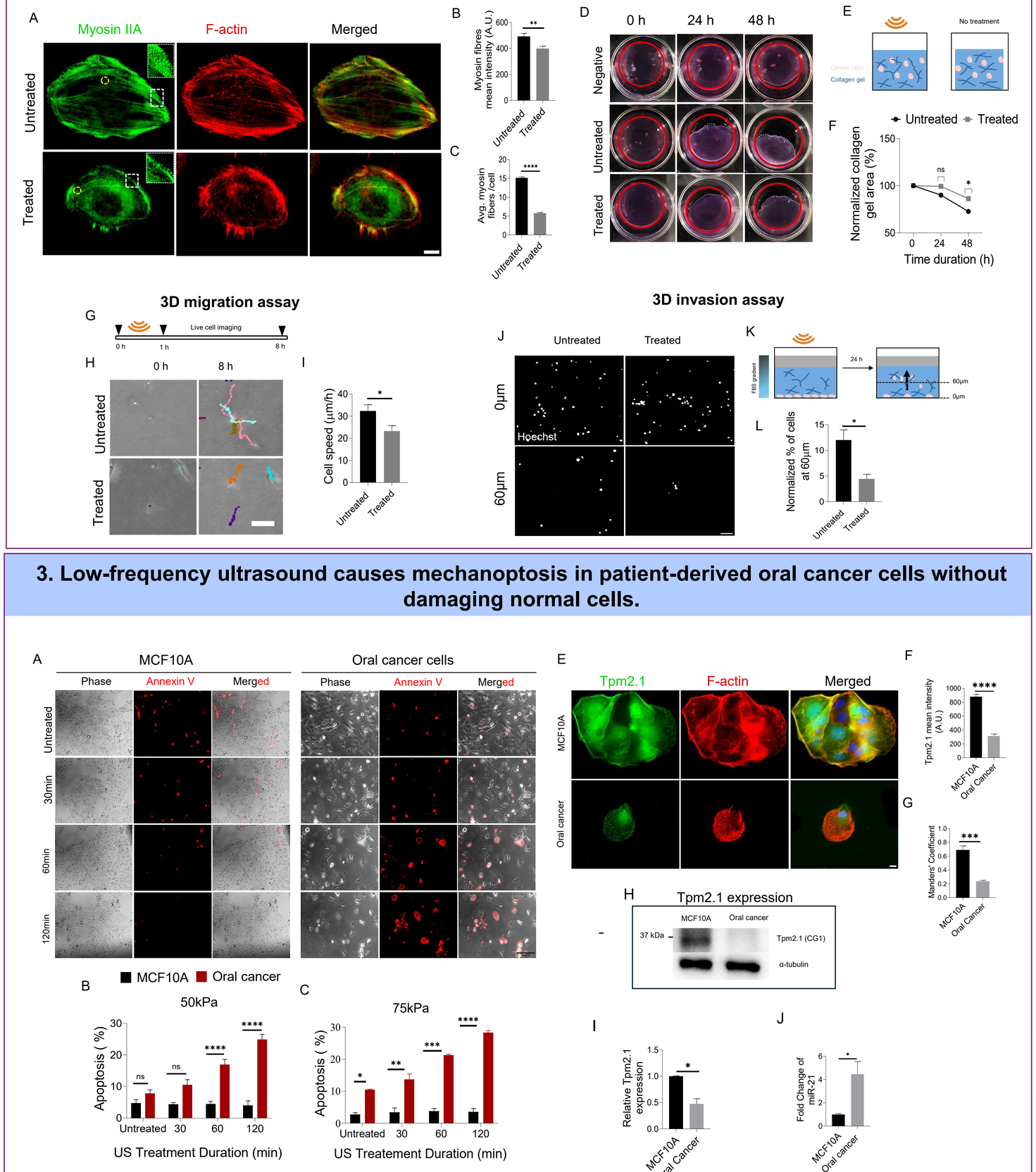
Low-frequency ultrasound treatment on patient-derived oral cancer cells



1. Low-frequency ultrasound reduces cancer cell spreading by disassembling focal adhesions

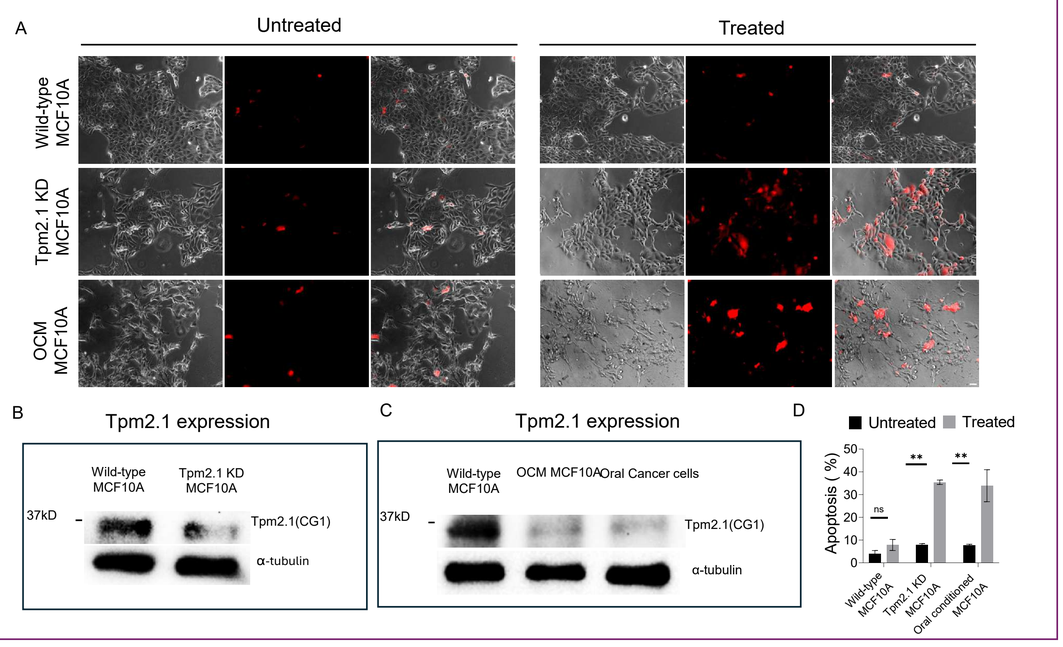


2. Low-frequency ultrasound suppresses oral cancer cell migration and invasion by disrupting contractility

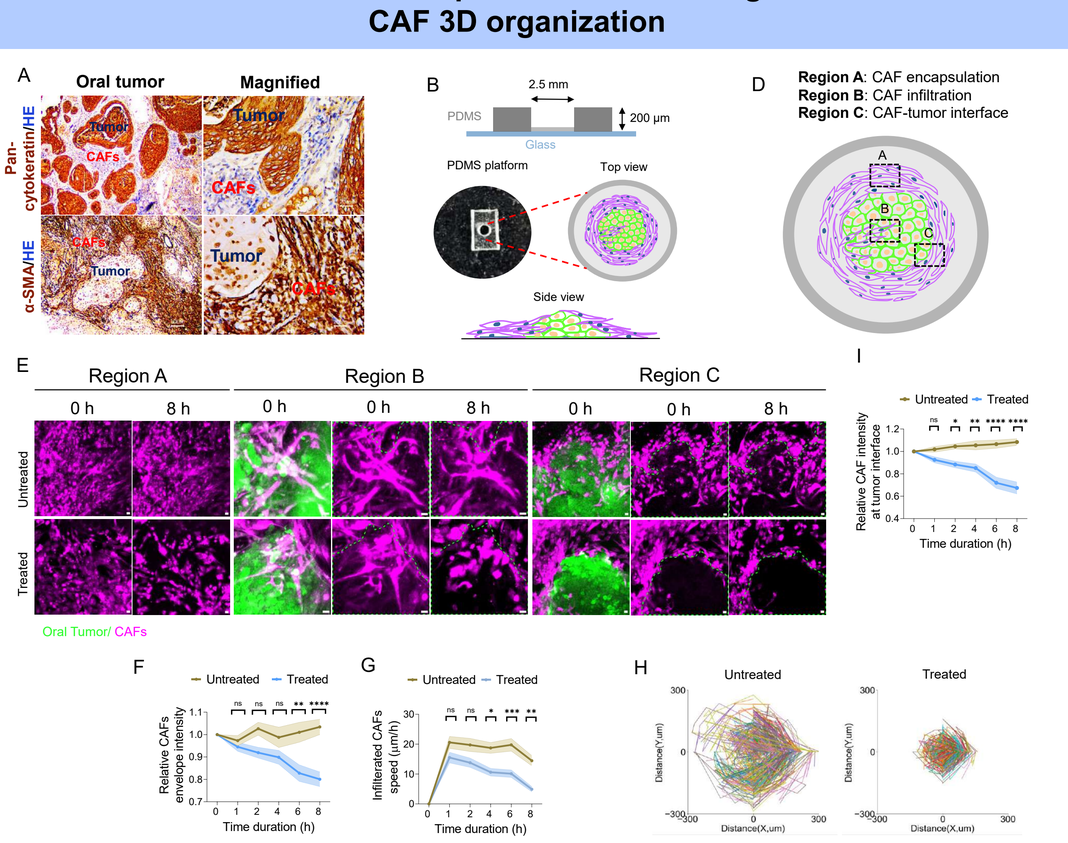


3. Low-frequency ultrasound causes mechanoptosis in patient-derived oral cancer cells without damaging normal cells.

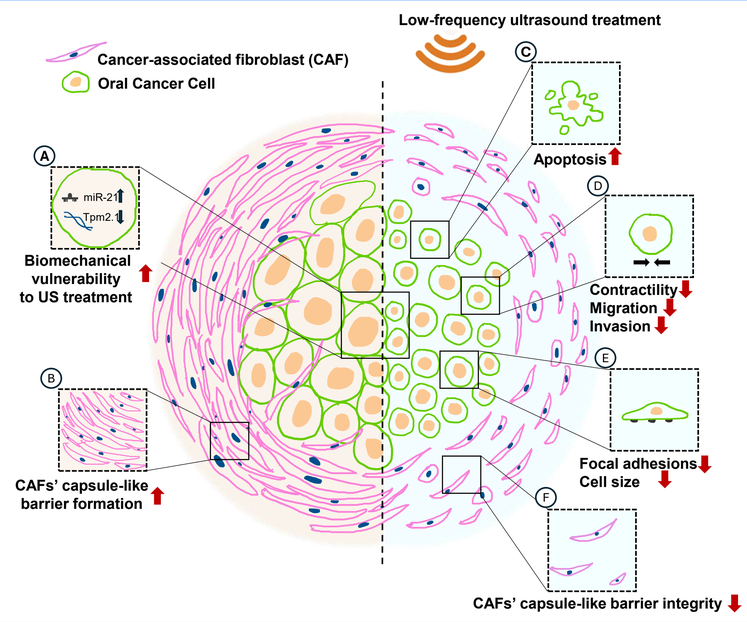
4. The biomechanical vulnerability of oral cancer cells to US treatment is due to the mechanosensory protein Tropomyosin 2.1 (Tpm2.1)



5. Ultrasound treatment disrupts *in vivo* mimicking oral cancer cell-CAF 3D organization



Summary



Significance: The selective killing of cancer cells without damaging normal cells, along with the disruption of the stromal barrier surrounding the tumor core, compromises the CAF's capsule-like barrier integrity, highlight the potential of developing novel US-mediated therapies

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