Microlaser technology for better organ- and organoid-on-chip models

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Since their invention in the 1960s, lasers have been widely applied in optical communications, imaging, high-precision manufacturing, and high-quality displays. In the past decade, microscale lasers, or "microlasers," have gained increasing importance in biomedical applications, driven by advancements in miniaturization[1].

Organ- and organoid-on-chip models play a crucial role in disease modeling and drug screening[2]. Recently, we have integrated microlaser technology into this field to enhance model development and analysis[3]. We developed microlaser-based mechano-probes that can be embedded within organoids to characterize cellular mechanics. By leveraging the microlaser's spectrum, we achieved a detection resolution for compressive stress as low as ~10 Pa. Using this tool, we demonstrated *in situ* mechanical tracking in tumoroids and measured the contraction forces of human cardiac organoids. Furthermore, we showcased the potential of microlasers in mechano-guided drug screening when combined with organoid-on-chip platforms. The mechano-probes can be mass-produced, making them well-suited for high-throughput screening. We believe that microlaser technology has the potential to significantly advance organ- and organoid-on-chip models, facilitating more effective drug screening and biomedical research.

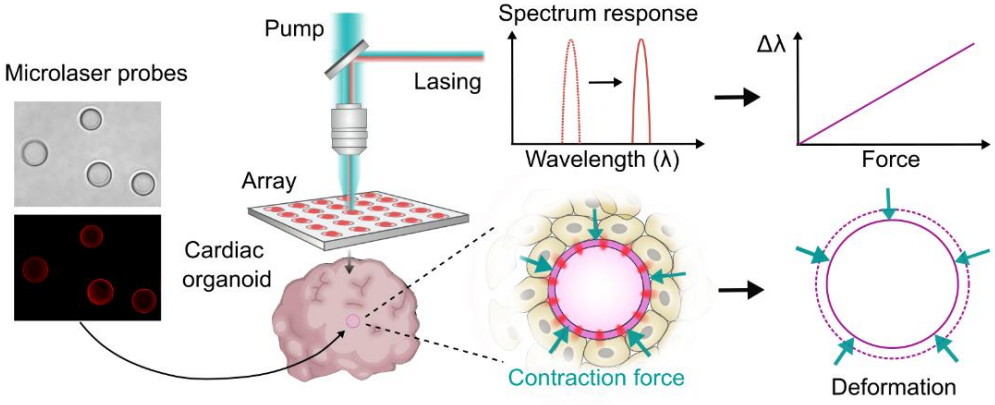

Figure 1. Schematic of microlasers embedded into the organoids for high-throughput mechanical analysis.

References:

1. Titze, V. M.; et al, Nat Protoc **2024**, *19 (3), 928-959*.
2. Fang, G.; et al, Advanced Functional Materials **2023**, *33 (19), 2215043*.
3. Fang, G. et al.,. ACS Nano **2024**, *18 (38), 26338-26349*.