Institute of SCIENCE TOKYO

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When Ultrasound Meets Nanotechnology: Enhancing Cancer Therapy Through Nanotheranostics

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講演概要

Ultrasound is a type of mechanical wave that can non-invasively penetrate biological tissues and produce a variety of complex biological effects. It serves different purposes in both diagnostics and treatments, and its functional applications are continually expanding. When combined with adaptable micro and nanoparticles, ultrasound can facilitate cancer theranostics, a compelling area of research within precision medicine. The interaction between the mechanical forces of ultrasound and nanosized drug carriers results in several physicochemical and biophysical effects, including cavitation, sonoporation, and thermal effects. These interactions enhance the control of drug release and boost the efficacy of cancer therapies. Furthermore, ultrasound-responsive materials, such as traditional ultrasound contrast agents, function as energy sensors. Their co-administration with other medications significantly enhances both the quality of diagnostic imaging and the effectiveness of drug delivery. The use of stable nanomaterials supports advancements in ultrasound theranostics, although innovative strategies are still necessary to ensure that adequate amounts of medication are effectively delivered into tumors. The combination of non-invasive ultrasound and nanotechnology is anticipated to result in significant advancements in future clinical applications.

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