SF05-S3 Recent Studies of Therapeutic Ultrasound

16:40-17:00 Room 203

Chairperson(s): **Jae Young Lee** *(Seoul National University Hospital, Korea)*
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Sonodynamic Therapy for Remote Cancer Treatment

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Current standard cancer treatments, such as surgery, radiation therapy, and chemotherapy, have inherent limitations due to their invasive nature and systemic toxicity. Developing a new therapeutic modality capable of generating reactive oxygen species (ROS) in a spatiotemporal way can circumvent this issue. For example, photodynamic therapy (PDT) has shown its capability to yield ROS in a spatially resolved area, thus, clinical success in local cancer treatment. Nevertheless, the low penetration depth of light limits its effectiveness to only shallow areas like skin. This talk introduces a noble method called sonodynamic therapy (SDT) that combines focused ultrasound (FU) and mechanophores (force-responsive moieties) to generate the spatiotemporally controlled ROS. In the proposed SDT method, HIFU delivers mechanical energy (i.e., radiation forces) to remotely activate azo mechanophores crosslinked with polyethylene glycol (PEG) hydrogel. The activated azo mechanophores generate free radicals (FRs), which later convert to ROS. Using two sets of mice cancer models, melanoma (B16F10) and breast cancer (E0771), cell proliferation is monitored for three days at 24-hour intervals. The results confirm tumor growth inhibition in response to ROS release by mechanophore activation, comparable to lethal doses of H2O2. In addition, sonication of control gels exhibits no cytotoxicity, validating the biocompatibility of azo mechanophores. This paper validates the potential of the proposed SDT method as a new ROS generation platform that overcomes the issues in existing anticancer modalities. Furthermore, this preliminary study can lay the foundation for new biomedical applications of HIFU, such as metal ion detection, optogenetics, and other drug leases.