THz Imaging Comparison of Xenograft and Transgenic Murine Breast Cancer Tumors

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Terahertz (THz) imaging has shown a potential for distinguishing between breast cancer tissue and healthy tissue. However, freshly excised tissue from humans is challenging to obtain without being integrated into a hospital setting. Therefore, in order to develop THz imaging methodology and tissue handling protocols, murine breast cancer tumors are used as a controlled and easy to access source of freshly excised tumors. This work investigates and compares THz imaging of two kinds of murine breast cancer tumors: xenograft tumors and spontaneously generated tumors from transgenic mice. While xenograft tumors are more cost effective to obtain and easier to control, tumors from transgenic mice have more heterogeneity and are therefore a more accurate representation to human fresh tissue.

For xenograft breast cancer tumors, C57BL/6 black laboratory mice purchased from Jackson Labs are maintained on a high fat diet (D12492 from Research Diets, Inc.) to promote fat deposit growth. Once mice reach a weight of 35 g, generally after 10 weeks, they are injected with E0771 mouse-derived breast cancer cells. The xenograft tumor then grows for 3-4 weeks until they reach 1 cm in diameter and are excised with adjacent fat. Spontaneously generated tumors are obtained from MMTV-PyMT transgenic mice obtained from Jackson Labs. The transgenic mice are maintained on standard chow and tumors are excised at 5-8 weeks of age when tumors reach 1 cm in diameter. Following excision, both tumor types are placed in phosphate-buffered saline (PBS) to be imaged on the THz imaging system at the University of Arkansas less than one hour from excision. The freshly excised tumors are then placed in formalin and sealed for shipment to the Oklahoma Animal Disease Diagnostic Laboratory, where pathology assessment is performed. The THz images of both fresh tissue and the tissue embedded in paraffin blocks are then compared to the subsequent pathology. The results of this comparison show the favorable application of THz imaging for breast cancer differentiation in the future.