Regular and Young Investigator Award Abstracts

Biomarkers, Immune Monitoring and Novel Technologies

NILOGEN ONCOSYSTEM’S 3D-EXPRESS PLATFORM ALLOWS RAPID ASSESSMENT OF MONO AND COMBO TARGETED AND IMMUNE THERAPIES USING A BIOREPOSITORY OF FRESH PATIENT TUMOROIDS WITH INTACT TUMOR MICROENVIRONMENT

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Background It has been a significant challenge to select, combine and sequence the multiple FDA-approved IO therapies and pharmaceutical agents, highlighting the need to develop a precision oncology platform to explore novel combination treatments. 3D-EXpress is a unique ex vivo therapeutics testing platform using a biorepository of fresh patient tumoroids that were never dissociated, propagated, or reassembled in order to retain an intact microenvironment. Therefore, these specimens provide an excellent ex vivo platform to investigate the efficacy of therapeutics targeting the tumor microenvironment. Here we employed the 3D-EXpress platform to compare the efficacy of different therapeutic modalities targeting tumor antigens and immune checkpoint ex vivo.

Methods Tumoroids measuring 150 µm in size retaining tumor cell heterogeneity, tumor-resident immune cells, stromal components and extracellular matrix interaction were prepared from human endometrial and colorectal tumors. Tumoroid were cryopreserved and were selected based upon tumor antigen status. Samples were treated for 72 hours ex vivo with antibody-drug conjugates, chimeric antigen receptor (CAR)T cells, or bispecific antibodies alone and in combinations. Treatment-mediated changes in tumor cell killing and tumor immune microenvironment were investigated.

Results Treatment-induced tumor cell killing activity in tumoroids was detected by high throughput confocal imaging and analyzed using Nilogen Oncosystem’s proprietary algorithm. The impact of ex vivo treatment by different modalities in combination with chemotherapeutic agents upon tumor resident immune cell populations was monitored by deep immune phenotyping and multiplex cytokine release assay. Based on the ex vivo responses tumors were assigned to treatment sensitive and resistant groups. Correlative analysis were performed and compared with detailed clinicopathologic data that is readily available for Biorepository tumors.

Conclusions The 3D-EXpress platform using cryopreserved 3D tumoroids with intact tumor microenvironment is an effective tool for the pre-clinical assessment of rational drug combinations for treatment of solid tumors. Furthermore, the 3D-EXpress platform provides unique insight into the microenvironment of both treatment responsive and non-responsive tumors and can aid in the development of patient-centered therapeutic regimens.

Ethics Approval This study was approved by Vanderbilt University Ethics Board; approval number 031078 and Ohio State University Ethics Board: 2014J0130.

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