

Novel NMR Technique for In-Vitro Toxicity Testing of a 3D Cancer Model

Mohammad AlWahsh^{1,2,3}, Robert Knitsch¹, Rosemarie Marchan⁴, Jörg Lambert¹, Elen Tolstik¹, Hannes Raschke¹, Dina Mahadaly³, Alexander Marx², Djeda Belharazem², Roland Hergenröder¹

¹ Leibniz-Institut für Analytische Wissenschaften—ISAS-e.V., 44139 Dortmund, Germany.

² Institute of Pathology and Medical Research Center (ZMF), University Medical Center Mannheim, Heidelberg University, Germany.

³ Department of Pharmacy, Faculty of Pharmacy, Al-Zaytoonah University of Jordan, Jordan.

⁴ Department of Toxicology, Leibniz Research Center for Working Environment and Human Factors at the TU Dortmund (IfADo), Germany.

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ABSTRACT

The metabolic pathogenesis of thymic carcinomas (TCs) is poorly understood and adjuvant therapy has limited success in metastatic disease and tumor recurrence. Most studies on TCs use two-dimensional (2D) cell culture models, which are not considered as physiologically relevant, and consequently translation to the in-vivo situation remains challenging. Tissue-specific architecture, based in part on interactions with the microenvironment is an essential component of tumors and may be better recapitulated in three-dimensional (3D) cell culture models. Therefore, our goal is to establish 3D thymoma models which will then be used to understand the pharmacokinetics and pharmacodynamics of anticancer drug therapy via metabolic profiling of living cells. Our novel approach using NMR allows for the measurement of small tissue-like models, which are normally not feasible with standard analytical techniques. The currently-available methods only provide a “snap-shot” of the measured time point and tend to be destructive, e.g. dissecting or optical cleaning of the specimen to gain 3D information – a limitation we overcome with our current method using NMR spectroscopy. In addition, anticancer therapy is only partially effective, mainly due to inherent or drug-induced resistance of tumor cells to standard chemotherapeutics and radiotherapy. Therefore, novel therapeutic strategies are urgently needed.