IN-VITRO EVALUATION OF VANADIUM HYBRID MATERIALS IN 2D AND 3D HEPATOCELLULAR CARCINOMA MODELS

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ABSTRACT

Vanadium is a first-row transition metal, found both in abiotic and biological systems. The variety of vanadium applications derive from the various oxidation states, that it can attain, with the most common ones being V(III), V(IV), and V(V). From the biological point of view, V(III) can only be found in ascidians and fan worms, whereas in higher organisms, an important redox process exists between V(IV) and V(V). Besides the different oxidation states, the ability of vanadium to coordinate various ligands of high biological importance, such as glutathione and different amino acids, leading to distinct coordination geometries, provides flexibility and specificity toward pathophysiologies. Furthermore, resemblance between V(V) vanadate and phosphate ions in aqueous solutions and the ability of vanadium to form polyoxovanadates provide various opportunities to increase the biological potency of the hybrid materials [1].

Hepatocellular carcinoma represents the majority (approximately 90%) of primary liver cancers, which is the second leading cause of cancer-related deaths. There are several well-known risk factors associated with the development of hepatocellular carcinomas, such as virus infections and alcohol intake, but still there are only limited examples of drugs proven to be effective [2]. Consequently, research was launched in our Lab to develop alternative efficient metallodrugs and determine in vitro the potency of two well-characterized V(V)-peroxido-betaine coordination compounds, as potential metallodrugs against cancer. The cell lines chosen for the investigation were two commonly used hepatocellular carcinoma models (HepG2 and Huh7). To determine the toxicity of the materials, viability, morphology, and chemotacticity were studied in a dose-/time-/cell line-dependent fashion. Furthermore, 3D spheroids were cultivated (**Fig. 1**), using scaffold-free methods and studied under similar conditions, providing a biotoxicity profile of higher bio-significance, since 3D spheroids resemble an in vivo environment better than 2D monolayer cultures [3]. The results show potency for the materials studied, at low dosage and short timeframe, justifying further inquiry into mechanisms of cancer tissue toxicity and meriting development of efficient metallodrugs.

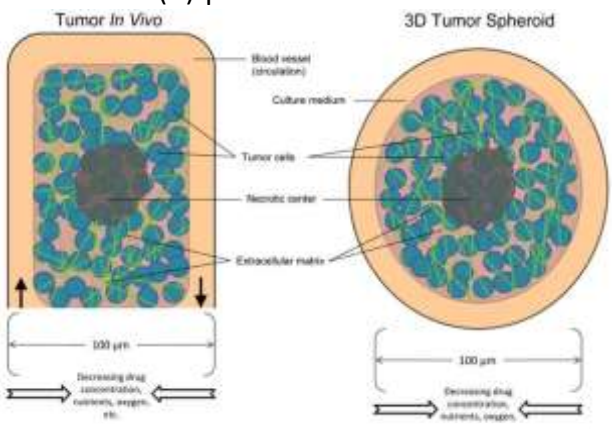

Fig. 1: In vitro 3D spheroids vs in vivo tumors

KEYWORDS: Scaffold-less 3D, In-vitro cell cultures, Vanadium, Hepatocellular carcinoma, metal complex

REFERENCES

[1] Kioseoglou E, Petanidis S, Gabriel C, Salifoglou A. (2015). *Coord. Chem. Rev.,*301-302*,* 87-105.

[2] Llovet JM, Kelley RK, Villanueva A, Singal AG, Pikarsky E, Roayaie S, Lencioni R, Koike K, Zucman-Rossi J, Finn RS. (2021). *Nat. Rev. Dis. Primers*, 7(1), 6.

[3] Phung YT, Barbone D, Broaddus VC, Ho M. (2011). *J. Cancer*, 2, 507-514.