Perfusion

Perfusion is the process of a body delivering blood to a capillary bed in its biological tissue. The word is derived from the French verb “perfuser” meaning to “pour over or through.

Tests verifying that adequate perfusion exists are a part of a patient's assessment process that are performed by medical or emergency personnel. The most common methods include evaluating a body's skin color, temperature, condition and capillary refill.

see Brain perfusion

see CT Perfusion

see Spinal cord perfusion

see Perfusion magnetic resonance imaging.

see Tumor perfusion

Pharmaceutical research requires pre-clinical testing of new therapeutics using both in-vitro and in-vivo models. However, the species specificity of non-human in-vivo models and the inadequate recapitulation of physiological conditions in-vitro are intrinsic weaknesses.

Wan et al. showed that perfusion is a vital factor for engineered human tissues to recapitulate key aspects of the tumour microenvironment. Organotypic culture and human tumour explants were allowed to grow long-term (14-35 days) and phenotypic features of perfused microtumours compared with those in the static culture. Differentiation status and therapeutic responses were significantly different under perfusion, indicating a distinct biological response of cultures grown under static conditions. Furthermore, heterogeneous co-culture of tumour and endothelial cells demonstrated selective cell-killing under therapeutic perfusion versus episodic delivery.

They present a perfused 3D microtumour culture platform that sustains a more physiological tissue state and increased viability for long-term analyses. This system has the potential to tackle the disadvantages inherit of conventional pharmaceutical models and is suitable for precision medicine screening of tumour explants, particularly in hard-to-treat cancer types such as brain cancer which suffer from a lack of clinical samples [1)].

1)
Wan X, Ball S, Willenbrock F, Yeh S, Vlahov N, Koennig D, Green M, Brown G, Jeyaretna S, Li Z, Cui Z, Ye H, O'Neill E. Perfused Three-dimensional Organotypic Culture of Human Cancer Cells for Therapeutic Evaluation. Sci Rep. 2017 Aug 25;7(1):9408. doi: 10.1038/s41598-017-09686-0. PubMed PMID: 28842598.