Running Away From Cancer: An Investigation Into the Dynamic Metabolism of Cancer Cells Under an Increase in Extracellular Lactate Concentration

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Over the last century, there has been an unparalleled focus on genomic techniques in cancer research which has resulted in a neglected understanding of cancer metabolics. Despite being discovered over 100 years ago, a scarcely understood metabolic hallmark of cancer cells is a high glucose uptake and lactate production, regardless of oxygen availability, known as the Warburg Effect. Emerging studies suggest the Warburg Effect could be counteracted by increasing extracellular lactate concentration. It is evidently known that during anaerobic exercise, lactate is produced as a byproduct, however literature is limited linking the effect of lactate produced by exercise with cancer cell behavior. This experiment aimed to investigate how a cumulative increase in extracellular lactate affected the ability of a cancer cell line to switch from aerobic glycolysis to oxidative phosphorylation (OXPHOS) through measuring extracellular acidification rate (ECAR) and oxygen consumption rate (OCR) respectively. The author's experimental regime of treating cancer cells with increasing lactate concentration assays in vitro, was performed on a Seahorse XF24 bioanalyzer by a designated supervisor at a research institute. It was found when the lactate concentration injected into the cancerous cell line was 15mM and 20mM, there was a significant increase in OCR compared to basal measurements, where $p=0.00301$ and $p=0.000686$ respectively. This suggests an increase in extracellular lactate does cause cancer cells to shift to an oxidative phenotype in vitro, however further investigations and in vivo models will be critical in assessing the role of lactate, and potentially exercise, in the metabolic processes of cancer.