Scientific Paper:

Journal of Biotechnology 187 (2014), 135 - 138

Measuring dissolved oxygen to track erythroid differentiation of hematopoietic progenitor cells in culture

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Abstract:

As stem cell technologies move from the developmental to the commercial stage strategies must be developed to monitor culture operations. These will ensure consistency of differentiation programs and maintenance of optimum cell viability during production runs. Due to the sensitivity of stem cells to their environment, and their variability in response to external stimuli, accurate monitoring of in vitro conditions will be crucial for effective large-scale culturing of therapeutic stem cells. Here we describe a simple method to monitor the expansion and maturation of adult human haematopoietic stem/progenitor cells into red blood cells in vitro by measuring the oxygen consumption rate of the cultures. Cell cultures followed a characteristic pattern of oxygen consumption that is reflective of in vivo erythroid maturation. This method could be easily developed as an online system to map erythroid differentiation and maturation of cultured cells as effectively as the more time consuming process of flow cytometric analysis of surface marker expression patterns.

Keywords: Haematopoietic stem cells, red blood cell production, stem cell culture, monitoring, oxygen consumption