

OPTIMAL GROWTH CONDITIONS FOR TRACHEAL EPITHELIAL STEM CELLS

ABSTRACT:

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The use of stem cells and their progenitors is a promising strategy in cellular and genetic therapies for multiple degenerative disorders, as well as adjuvant immunotherapy for diverse aggressive cancer types (Mimeault & Batra, 2006). There are many obstacles standing in the way of the clinical use of stem cells, however, among them the establishment of optimal conditions for stem cell culture (Mannello & Tonti, 2007). This study is focused on optimizing the conditions to obtain rat tracheal epithelial stem cells. As is the case for most tissues, the stem cells were in low representation in the in vivo population. The study started with optimal preliminary growth medium (OPGM), which is the minimum essential medium required for the epithelial stem cells to grow from rat tracheal tissue. My experiments were directed at adding metallic/trace elements, lipid-soluble vitamins, and lipid nutrients to OPGM, to determine whether additional increments in growth rate would be achieved. The amount of growth per week was measured from tracings on the culture dishes over a three-week period. In those cultures maintained in high vitamin and low metal supplements to OPGM, a higher growth rate was attained than in all other combinations of supplements. This can be attributed to the importance of vitamins A, D, E, and K to the cells and to the toxicity of metallic/trace elements when present in high concentrations. Also in regard to the importance of lipoidal nutrients, I found that the level of essential fatty acids (EFA) could be increased over the levels present in OPGM, with favorable consequences for cell growth and differentiation. Therefore, it was determined that fat-soluble vitamins, metallic/trace

elements, and EFA were capable of enhancing tracheal epithelial stem cell reproductive capacity.

References:

- Mimeault, M., & Batra, S. K. (2006). Concise review: Recent advances on the significance of stem cells in tissue regeneration and cancer therapies. *Stem Cells*, 24(11), 2319-2345.
- Mannello, F., & Tonti, G. A. (2007). Concise review: No breakthroughs for human mesenchymal and embryonic stem cell culture: Conditioned medium, feeder layer, or feeder-free; medium with fetal calf serum, human serum, or enriched plasma; serum-free, serum replacement nonconditioned medium, or ad hoc formula? all that glitters is not gold! *Stem Cells*, 25(7), 1603-1609.