

Comparing Mesenchymal Stem Cell Media with Supplements on the PATsmart™ REBEL® System

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Background

Mesenchymal stem cells (MSCs) are multipotent adult stem cells, which can differentiate into specialized cell types such as bone (osteoblasts), cartilage (chondrocytes), and fat (adipocytes). In addition to differentiation, MSCs have the capacity for self-renewal, so their therapeutic potential is a topic of high interest for tissue engineering and regenerative medicine. In the lab, cultures of MSCs are fed cell media that has been specifically designed to maximize the MSC growth potential, and the media commonly includes serum. However, due to the variability in serum compositions and the risk associated with animal component-containing media, many research groups have adopted serum-free culturing practices to grow MSCs. This practice allows groups to have more consistency between experiments while meeting regulatory requirements for clinical studies. In the absence of serum, proprietary supplements are added to the MSC cultures and provide growth factors for both expansion and differentiation.

Technical Note

The Experiment

Two different commercial serum-free MSC media without glutamine were tested. The MSC media were tested both with and without the supplied supplements to evaluate the change in the amino acid profile between the two formulations. All media samples were prepared following the manufacturers' protocols and diluted 10X before analysis on the PATsmart™ REBEL® System with no additional sample preparation.

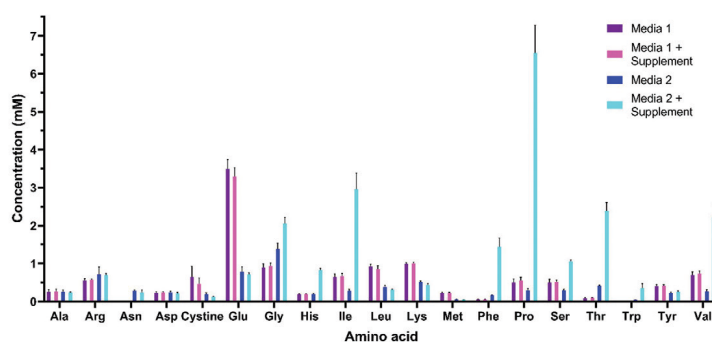


Figure 1. Media amino acid profile from chemically-defined MSC media with and without the supplied supplements. Error bars are from the standard deviation of n = 5 replicates.

Discussion

There was no detected difference in the amino acid levels of Medium 1 when the supplement was added, indicating that the supplement did not contain additional amino acids in the formulation. However, in Medium 2, there was a significant increase in the concentration of nine amino acids: glycine (Gly), histidine (His), isoleucine (Ile), phenylalanine (Phe), proline (Pro), serine (Ser), threonine (Thr), tryptophan (Trp), and valine (Val). Of these amino acids, Gly showed the lowest increase after the supplement was added (1.5X increase). On the other end, Ile (10.4X higher) and Pro (22.4X higher) had the most substantial increases in concentration after the supplement was added. The levels of the other six amino acids increased from 3X to 8.5X with the supplement added compared to the base media alone. To ensure consistency when culturing MSCs, researchers should understand what is being added to their media. The REBEL Analyzer is a simple tool for analyzing MSC media both as it is freshly prepared and during the culturing process to probe the nutrient uptake of the cells.