Abstract

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Lymphocyte responses in the assessment of individual metabolic and nutritional status.

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BACKGROUND: Mammalian cell structure has developed as an important method for the study of biochemical, nutritional, and developmental processes. The determination of specific growth requirements for cells in culture has been investigated intensively over the past several decades. A distinction can be made between nutritional requirements for cell growth, hormone requirements, and other variables which require modulation and adjustment (e.g. temperature, pH, O_2, CO_2, etc.) The human peripheral blood lymphocyte and the murine splenocyte provide excellent systems for exploring biochemical and nutritional aspects of cell growth and relating these to the status of the individual/ animal of origin. The advantage of the lymphocyte or splenocyte is that the cells are readily available, are in resting state in terms of cell division, and can be stimulated to proliferate by exposure to mitogen or other suitable stimulus. The immune cells have metabolic pathways in common with cells in the remainder of the organisms and exhibit a wide variety of surface receptors.

OBJECTIVE: The development of minimal media which support short-term growth of lymphocytes/ splenocytes allows assessment of metabolic and nutritional aspects of cell growth in culture. The development of chemically defined media for lymphocyte growth has been reviewed.

METHODS AND RESULTS: The elimination of serum is the single most important condition for producing a chemically definite medium, and the elimination of protein additives provides the second major step toward a defined medium. To determine the amount of each constituent required in the medium for optimal growth response, components were varied individually and adjusted to amounts just sufficient for maximum response. Each adjustment of an individual constituent required reevaluation of the dose-response curves of the remaining components. Only the compounds required for growth of lymphocytes from a substantial portion of the subjects tested were included in the minimal defined medium. The use of the lowest possible concentration of each component minimized potential imbalances that might exert inhibitory effects and ensured the lowest possible level of any trace contaminants in the medium ingredients.

CONCLUSION: This strategy resulted in the chemically defined serum- and protein-free medium for mitogen activated transformation of human peripheral lymphocytes, CFBI 1000. Using CFBI 1000 as a base, all 20 amino acids were included, and the components were varied to produce a medium which supported optimal growth of murine splenocytes; this medium has been designated as CFBI 2000.