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Characterization of Tumor Cell Viability in an In-Vitro Bioreactor System

Hollow-fiber bioreactor systems are being used to simulate drug concentration-time profiles in the human body and aid in analyses of chemotherapeutic drug effects on tumor cells. Antitumor activity of the drug is determined by percent cell death calculation, but this measure is confounded by low cell viability over time within the bioreactor. These studies will determine an optimal time for drug treatment. Our hypothesis was that prolonged cell incubation results in lower cell viability than shorter incubation. However, shorter incubation may result in lower cell proliferation due to insufficient attachment to the fibers by anchorage-dependent cells. Brightfield and scanning electron microscopy were used to analyze non-small cell lung carcinoma cell (H2009) attachment for overnight, two-week and six-week incubations. Lactate assays were used to analyze diffusion of cell waste between the extracapillary space and lumen. Microscopy showed that cells incubated overnight attached to fibers and were rounded. Cells incubated for two weeks appeared flattened and by six weeks, cells detached from the fibers and left residues. Results from lactate measurements were inconclusive due to the inability to duplicate lactate concentration-time profiles in multiple trials. Overnight incubation yields H2009 cells that attach and appear more viable than those of longer incubation. Additional tests of cell viability and chemosensitivity for overnight incubation are underway. Since it is envisioned that multiple cell lines will be assessed for chemosensitivity, more cell lines need to be tested in order to optimize drug administration in the hollow-fiber bioreactor system.

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