Identification of point of passage for cell culture

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Over the past few years there has been much publicity about the possibilities of tissue engineering and regenerative medicine producing new and exciting treatments for a whole range of diseases and injuries. Examples include artificial skin, used to treat burn victims, and the repair of cartilage damage from sporting injuries. However, despite encouraging early results many would agree that for expectations to be met there are still numerous obstacles that must be overcome. One difficulty is scaling up laboratory based cell and tissue culture into high throughput systems that could meet the demands of regenerative therapies.

There is currently much interest in developing automated production systems for the mass manufacture of tissue engineered products. Such systems currently exist for manufacture of well behaved, well defined cell lines with application in the screening of pharmaceutical products. For the manufacture of tissue engineered products, however, cells are typically harvested from a donor or the patient's own body and then cultured. These cells are of variable quality and their growth characteristics are unknown. Thus, it is difficult to predict the behaviour of the cell culture.

One of the main purposes of cell culture is multiplication of cell numbers to produce appropriate quantities for therapy. In practice, there are only a certain number of cells that can be effectively grown in a given flask before they are no longer functional. Thus, once a flask has reached its capacity its cell population is split into multiple flaks and sub-cultured. This process is called passaging and it is important that passaging occurs when the cells are in their most proliferative state.

Currently the point of passage is determined very subjectively. On a laboratory scale culture flasks are visually inspected to assess the area of the plate covered, cell connectivity and cell distribution. In order to move this culture process for uncharacterised cell lines into an automated system it is necessary to have a more quantitative way of determining the correct point for passage.

The problem for the study group is development of a mathematical model to predict cell multiplication during culture with the aim of identification of the point of passage.