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Cell Lines

A cell line is a permanently established cell culture that will proliferate indefinitely given appropriate fresh medium and space. Viruses are obligate intracellular parasites that require living cells in order to replicate. Cultured cells, eggs and laboratory animals may be used for virus isolation. Although embroyonated eggs and laboratory animals are very useful for the isolation of certain viruses, cell cultures are the sole system for virus isolation in most laboratories. The development of methods for cultivating animal cells has been essential to the progress of animal virology. To prepare cell cultures, tissue fragments are first dissociated, usually with the aid of trypsin or collagenase. The cell suspension is then placed in a flat-bottomed glass or plastic container (petri dish, a flask, a bottle, test tube) together with a suitable liquid medium. e.g. Eagle's, and an animal serum. After a variable lag, the cells will attach and spread on the bottom of the container and then start dividing, giving rise to a primary culture. Attachment to a solid support is essential for the growth of normal cells. Primary cultures are maintained by changing the fluid 2 or 3 times a week. When the cultures become too crowded, the cells are detached from the vessel wall by either trypsin or EDTA, and portions are used to initiate secondary cultures. In both primary and secondary cultures, the cells retain some of the characteristics of the tissue from which they are derived. Cells from primary cultures can often be transferred serially a number of times. The cells may then continue to multiply at a constant rate over many successive transfers. Eventually, after a number of transfers, the cells undergo culture senescence and cannot be transferred any longer. For human diploid cell cultures, the growth rate declines after about 50 duplications. During the multiplication of the cell strain, some cells become altered in that they acquire a different morphology, grow faster, and become able to start a cell culture from a smaller number of cells. These cells are immortalized and have an unlimited life-span. However, they retain contact inhibition and are known as cell lines.

Types

1. Finite Cell Lines : The cells in culture divide only a limited number of times, before their growth rate declines and they eventually die. The cell lines with limited culture life spans are referred to as finite cell lines. The cells normally divide 20 to 100 times (i.e. is 20-100 population doublings) before extinction. The actual number of doublings depends on the species, cell lineage differences, culture conditions etc. The human cells generally divide 50-100 times, while murine cells divide 30-50 times before dying.

2. Continuous Cell Lines : A few cells in culture may acquire a different morphology and get altered. Such cells are capable of growing faster resulting in an independent culture. The progeny derived from these altered cells has unlimited life (unlike the cell strains from which they originated). They are designated as continuous cell lines.

The continuous cell lines are transformed, immortal and tumorigenic. The transformed cells for continuous cell lines may be obtained from normal primary cell cultures (or cells strains) by treating them with chemical carcinogens or by infecting with oncogenic viruses. In the Table. 36.1, the different properties of finite cell lines and continuous cell lines are compared.