

Producing Newborn Synchronous Mammalian Cells

This invention could be used to study aging and cancer.

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A method and bioreactor for the continuous production of synchronous (same age) population of mammalian cells have been invented. The invention involves the attachment and growth of cells on an adhesive-coated porous membrane immersed in a perfused liquid culture medium in a microgravity analog bioreactor. When cells attach to the surface divide, newborn cells are released into the flowing culture medium. The released cells, consisting of a uniform population of synchronous cells are then collected from the effluent culture medium. This invention could be of interest to researchers investigating the effects of the geneotoxic effects of the space environment (microgravity, radiation, chemicals, gases) and to pharmaceutical and biotechnology companies involved in research on aging and cancer, and in new drug development and testing.

The bioreactor includes a horizontal-axis rotating vessel. A screen inside the vessel supports the porous membrane on which the cells are grown. A central

fluid coupler contains an inlet and an outlet port with rotating seals for the circulation of the culture medium. During operation for the growth of cells, a peristaltic pump delivers the culture medium from an external reservoir to the input port. On its way from the inlet to the outlet port, the culture medium flows through the membrane, entraining newly released baby cells in the flow. Once the culture medium has flowed out of the simulated-low-gravity environment of the rotating vessel, the baby cells are collected by allowing them to settle out of the liquid under the influence of normal Earth gravitation.

Prior to operation for the growth of cells, the membrane is coated with a cell adhesive on the side designated to be downstream during operation of the bioreactor. This is done by filtering a solution of adhesive through it in the reverse of the operational flow direction. The membrane is then washed with a similarly reversed flow of water or a phosphate buffered saline solution. Next, growing cells are applied to the

downstream side of the membrane by means of a similarly reverse flow of a medium containing a cell culture. These reverse-flow operations for preparation of the membrane can take place either before or after the membrane is mounted in the vessel: If membrane is mounted in the vessel first, then the adhesive solution, wash solution, and culture medium are simply pumped through the vessel in the reverse of the operational flow direction.

This work was done by Steve R. Gonda of Johnson Space Center and Charles E. Helmstetter and Maureen Thornton of Florida Institute of Technology. Further information is contained in a TSP (see page 1).

In accordance with Public Law 96-517, the contractor has elected to retain title to this invention. Inquiries concerning rights for its commercial use should be addressed to:

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