

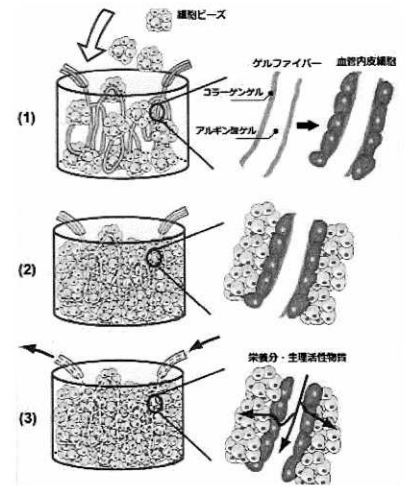
《Artificial Blood Vessel》

<Summary of the invention>

The inventors have succeeded in producing a three-dimensional hollow tubular artificial blood vessel having vascular endothelial cells and vascular smooth muscle cells.

Previously, a technique has been known which three-dimensionally cultures human liver cancer cells in a hollow fiber and which three-dimensionally assembles a tissue by laminating a sheet-like cell culture (e.g., a cell sheet). However, a technique has yet to be developed to form an artificially formed blood-vessel-like flow pass (e.g., a hollow tubular structure composed of vascular endothelial cells, etc.) inside a three-dimensional cell culture.

The present invention enables an artificial blood-vessel-like flow pass to be constructed inside a three-dimensional cell and tissue culture. In such a structure, a culture medium and blood can be circulated, and the three-dimensional cell culture can be maintained in a condition similar to *in vivo* conditions. In addition, this technique should be applicable for regenerative medicine (e.g., transplantation) as a method to provide an artificial tissue having blood-vessel-like structures.



■ Method

- (1) A core-shell-type gel fiber having an alginate gel fiber (a core) coated with a collagen gel (a shell) is manufactured. Cells used for the construction of blood vessels are cultured with the above fiber. Then, a core-shell-type gel fiber filled with the cells in the shell portion is prepared. When the alginate gel of the core portion is removed by treating with alginate lyase, a hollow blood-vessel-like structure including the cells used for the blood vessel construction can be obtained.
- (2) When the above gel fiber is embedded with cells used for a tissue construction (e.g., cell beads and spheroids) to culture them, a three-dimensional tissue-like cell culture including a blood-vessel-like structure inside the culture can be obtained.
- (3) A culture liquid which passes through an inner cavity can provide nutrients to the surrounding cells for the tissue construction.

■ Examples

- ◆ The resulting artificial blood vessel was connected to a perfusion device and a culture liquid was passed through the vessel by a syringe pump. The perfusion of the culture liquid was demonstrated.
 - ⇒ The artificial blood vessel can supply nutrients and oxygen. There is a possibility to induce new generation of capillary vessels.
- ◆ It was verified that a culture liquid was perfused through the artificial blood vessel.
 - ⇒ A long term culture may be achieved.

■ Applications

- ◆ A tool for culturing cells
 - Example: The present invention can be used for forming a desired tissue from stem cells (e.g., iPS cells).
- ◆ Regenerative medicine
 - Example: The present invention can be applied to transplantation.

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