Anticancer composition comprising in vivo cell introduction chip

Anticancer composition comprising biological cell injection chip

KRIBB Korea Research Institute of Bioscience & Biotechnology

Patent title	Anticancer composition comprising in vivo cell introduction chip as active ingredient	**Inventor**	Korea Research Institute of Bioscience and Biotechnology / Kim Tae-don
Patent application No.	KR 10-2019-0160276 (2019.12.05)	**Authority status**	Published

Technicality

Technology overview

- The technology relates to an anticancer pharmaceutical composition comprising an in vivo cell injection chip as an active ingredient. The composition comprises: a porous three-dimensional cryogel scaffold including a structure in which first and second components of hyaluronic acid derivatives having different chemical structures are crosslinked; and a cell cultured in a chamber of the scaffold.
- A technology which exhibits the effects of reducing cell growth rates, survival rates, cancer cell killing abilities, and cancer metastasis and thus can be used as a composition for cancer treatment, cancer immunotherapy, or cell culture.

Development background and problem to be solved

- Natural killer cells (NK cells) are a type of immune cells. Unlike other immune cells, NK cells can detect cancer cells immediately and remove the same immediately. Cultured NK cells can be a useful and safe tumor therapy, but the handling of NK cells is very difficult. Thus, pure culture is not easy.
- In order to obtain a large number of live NK cells and to obtain NK cells with anticancer activities, culturing of NK cells in a new three-dimensional culture method using a porous scaffold rather than an existing cell culture method is needed.

Excellence and discrimination of technology

▶ Excellence of technology

- A 3D-based NK cell culture and amplification technology is verified.
- In vivo anticancer efficacy is verified through in vivo introduction of a biodegradable-based NK cell culture chip.
- A technology for 3D culture of NK cells and in vivo transplantation of culture chips is proved.

▶ Discrimination of technology

- NK cell activities and anticancer efficacy are enhanced.
- A technology for culturing NK cells in a biodegradable 3D structure based on a hyaluronic acid is provided.
- The proliferation rate of NK cells is amplified, and the cell activities are significantly increased. Thus, the anticancer efficacy of NK cells is enhanced.
- The technology can be used in a variety of ways by co-administration with an antigen-specific CAR-NK therapeutic agent to amplify anticancer efficacy against metastatic cancer after a solid cancer surgery.

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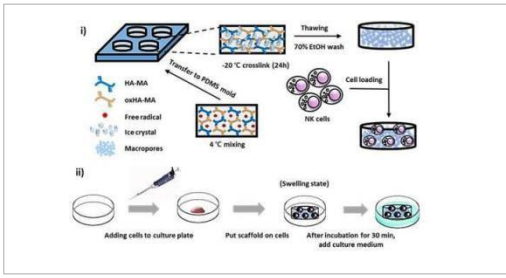
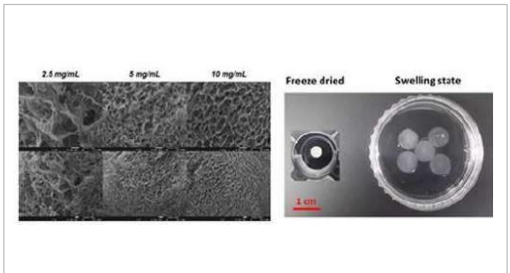
Implementation method

- The technology comprises: a porous three-dimensional cryogel scaffold including a structure in which first and second components of hyaluronic acid derivatives having different chemical structures are cross-linked; and cells cultured in a chamber of the scaffold.
- The first component is hyaluronic acid methacrylate, and the second component is hyaluronic acid aldehyde methacrylate or oxidized hyaluronic acid methacrylate.



Picture 1 Porous 3D cryogel scaffold



Picture 2 3D enhance scaffold

Degree of technology completion (TRL)

Degree of technology completion: TRL4 (Lab Scale prototype development stage)

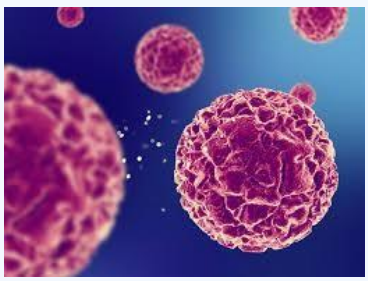
TRL1	TRL2	TRL3	TRL4	TRL5	TRL6	TRL7	TRL8	TRL9
Technical principle presentation	Technology concept setting	Technology concept verification	Lab Scale prototype development	Implementation environment application experiment	Full Scale prototype development	Quasi-commercial product development	Commercial product development	Commercial product implementation

Utilization

Utilization field and applied product

Utilization field

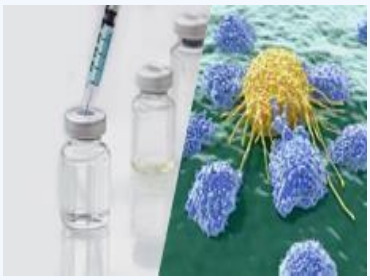
- 3D cell culture
- Antibody treatment agent industry
- Vaccine industry



Picture 3D cell culture
<Data: Regiao de leiria>

Applied product

- 3D culture chip
- Gene treatment agent
- Immunotherapy agent



Picture 2 Immunotherapy agent
<Data: Asan Medical Center>

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Technology trend

- A three-dimensional cell culture technology has been studied steadily from the 1990s to the present because the technology has excellent bio-responsiveness compared to an existing two-dimensional cell culture technology. Recently, the technology is being developed into an organoid culture technology with improved bioreactivity.
- Many three-dimensional cell models using various types of tumor cells have been developed, and the market is expanding as the models are used for anticancer treatment agents, regenerative medicines, and basic researches.
- Corning launched a three-dimensional "U-shape" cell culture container from 2017, spurring the commercialization of a three-dimensional cell culture model.
- Looking at antibody treatment agentss currently being developed for clinical use, most of candidate substances are being developed through humanized antibody and fully human antibody production technologies.

Family patent status

Application nation	Application No. (Application date) / Registration No.	Title of the invention
KOR	KR 10-2019-0160276 (2019.12.05) / -	Anticancer composition comprising in vivo cell introduction chip as active ingredient
PCT	WO 2020-116989 (2020.06.11) / -	ANTI-CANCER COMPOSITION COMPRISING IN VIVO CELL INJECTION CHIP

Market prospect

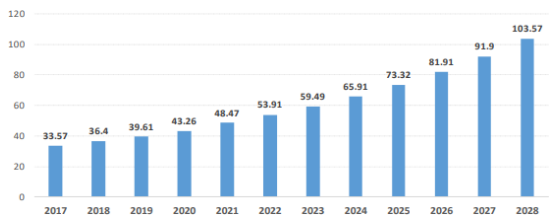
Target market size and prospect

- The three-dimensional cell culture model market size is KRW 500 billion in 2016, and a market of over KRW 1 trillion is expected to be formed in 2021.
- The global vaccine market size is expected to reach USD 103.57 billion by 2028, growing at a CAGR of 11% from USD 33.57 billion in 2017.

Division	Current market size (2016)	Expected market size (2021)
World market size	$466.8 M	$1345.2 M
Domestic market size	$9.4 M	$27 M
Calculation basis	The domestic market size is estimated to be 2% of the global market size.	

Table **Domestic and global market sizes of 3D cell culture technologies**

<Data: BRIC View>



Picture **Global vaccine market status and prospect [billion dollar]**

<Data: Biotechnology Policy Research Center>

Technology transfer query

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Technology transfer process