Profile Status: Published

Technology Offer

GMP-compatible methods for producing tissue-engineered human heart muscle from stem cells

Summary

Scientists at a German university developed two new and fully defined methods for serum-free production of human engineered heart muscles (EHM) either from pre-differentiated cardiomyocytes or directly from undifferentiated stem cells. This will allow production of human EHM under strict GMP (Good Manufacturing Practices) standards. The University is looking for in-licensing partners for use as drug screening platform and/or for further development into a regenerative medical approach.

Creation Date	07 November 2017
Last Update	09 November 2017
Expiration Date	09 November 2018
Reference	TODE20171107002
Public Link	https://een.ec.europa.eu/tools/services/PRO/Profile/Detail/5976800c-1280-49c9-9225-2456e1cd2032

Details

Description

A major challenge in tissue engineering is the need for methods using clearly defined and GMP (Good Manufacturing Practices)-compatible compounds. Furthermore, laboratory-grown tissue should resemble the natural organ's tissue as closely as possible, especially with respect to its physiological function to qualify as a versatile tool in drug development and/or surrogate tissue for organ repair. Its successful industrial application will require tissue assembly under GMP-compatible protocols.

Scientists at the German university developed two new and fully defined methods for serum-free production of human engineered heart muscles (EHM) either from pre-differentiated cardiomyocytes or directly from undifferentiated stem cells. This will allow production of human EHM under strict GMP standards.
Heart tissue engineering using stem cells is a recently developed technique to construct a three dimensional structure from cardiomyocytes or directly from progenitor cells. Those engineered tissues can be either used for in vitro screenings (e.g. drug or toxicology screenings) or as a therapeutic tool to replace damaged or diseased tissue (regenerative medicine).

The University is looking for in-licensing partners for use as drug screening platform and/or for further development into a regenerative medical approach.

Advantages and Innovations

- Generation of human EHM under GMP conditions using stem cell-derived material.
- Two well-defined protocols for different starting materials:
 a) pre-differentiated myocytes and non-myocytes
 b) homogeneous population of undifferentiated progenitor cells.
- human EHM have similar physiological properties to human myocardium.

The developed methods can be used:
- In vitro for:
 a) Toxicity screening with special emphasis on cardiac side effects such as arrhythmia, muscle damage, fibrosis, atrophy, hypertrophy, apoptosis, and contractile failure.
 b) Drug screening for biological activity of lead compounds and identification of mechanism of action.
- In vivo for:
 a) Regenerative medicine (replacement therapy of damaged heart myocardium).

Stage of Development

Under development/lab tested

IPR Status

Patent(s) applied for but not yet granted

Profile Origin

Other

Keywords

Technology

06001002	Clinical Research, Trials
06001007	Emergency medicine
06002007	In vitro Testing, Trials
06004	Micro- and Nanotechnology related to Biological sciences

Market

05003001	Therapeutic services
05003002	Surgical instrumentation and equipment
05003004	Pacemakers and artificial organs
05007007	Other medical/health related (not elsewhere classified)

NACE

Q.86.1.0	Hospital activities
Q.86.2.2	Specialist medical practice activities
Q.86.9.0	Other human health activities

Network Contact

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Open for EOI : Yes

Dissemination

Send to Sector Group

Bio Chem Tech

Client

Type and Size of Organisation Behind the Profile

University

Year Established

0

Already Engaged in Trans-National Cooperation

Yes

Languages Spoken

English
German

Client Country

Germany

Partner Sought

Type and Role of Partner Sought

- Type of partner sought: Industry.

- Specific area of activity of the partner: Companies active in the field of tissue engineering related to cardiology.

- Task to be performed by the partner sought:
Further use in drug screening and toxicity platforms. Further development into regenerative medicine for human heart patients.

Type of Partnership Considered

License agreement

Attachments

Profile Status: Published

Technology Offer

Graphene-based, point-of-care-testing device that diagnoses microorganism-induced diseases and measures blood glucose levels

Summary

A research team from a Polish university, composed of people active in the fields of nanotechnology, biomaterials, electronic engineering and medicine, has developed an electrochemical testing device with graphene-based sensing electrodes for medical purposes. The device diagnoses various diseases by detecting DNA of microorganism causing them and can be used to monitor health of a patient by measuring blood glucose levels. Licencing agreement is offered to medical device producers.

Creation Date	30 November 2017
Last Update	25 September 2018
Expiration Date	01 December 2018
Reference	TOPL20171107001
Public Link	https://een.ec.europa.eu/tools/services/PRO/Profile/Detail/99e92190-69dc-4426-8d24-75879cff7d7a

Details

Description

If timely and accurately diagnosed, most known diseases can be effectively treated. But laboratory testing, which is accurate, is also time-consuming: a sample taken for an analysis from a patient has to be sent to a laboratory (which often has backlogs), where it waits - with other samples - for its turn, then results are sent back to a doctor, whom patient has to visit for the second time. On the other hand, available point-of-care-testing devices which provide quick results, are often inaccurate and test only for one cause/disease. So, currently there is no method of fast, precise and comprehensive patient's sample testing in order to diagnose the cause of his illness.

A university-based team of scientists (their fields of research: nanotechnologies, biomaterials and electronic engineering) and medical practitioners from the north-west Poland has developed and is offering an electrochemical testing device with graphene-based sensing electrodes (biosensor). The offered solution identifies DNA of various microorganisms, measures level of blood glucose concentration, thus allowing to diagnose a wide range of diseases and to monitor patients' health. Thanks to its size, the device can be installed and used in a doctor's office, hospitals/emergency rooms, pharmacies or even at a patients' house. In contrast to available point-of-care-testing devices (e.g. popular/widespread blood glucose meters) which use only one testing method (chronoamperometry), the device simultaneously conducts multiple

electrochemical tests on a single sample, thus giving more accurate and reliable results.

The authors of the biosensor would like to see their invention introduced to the market. Therefore they are offering it under licensing agreement to manufacturers of medical devices. Besides buying the license, a partner is expected to mass-produce the device, distribute it through his channels, gather a feedback from customers and share it with the creators, so that they can improve their device. In turn, the authors will help adapt the offered technology for mass production.

Advantages and Innovations

The offered device is innovative and better than other existing solutions because it allows testing a single sample for multiple targets (various microorganisms, blood glucose concentration), using multiple electrochemical testing methods, thus it provides - unlike available point-of-care-testing devices - more comprehensive and accurate results. And unlike laboratory testing, the process doesn't take too much time because size of the biosensor allows using it in any place, thus samples don't have to be sent anywhere and wait in queues. In sum, the offered device brings laboratory-grade (accurate) testing to doctors' office, hospitals/emergency rooms and even patients' house.

Other advantages:
- the device can send results of a test to other location, e.g. a patient can make the test at home and send results to his doctor.
- by making slight modifications, the device can be used in fields other than medicine, e.g. in environmental protection (to test water/air/soil for pollutions).

Stage of Development

Prototype available for demonstration

IPR Status

Patent(s) applied for but not yet granted,Patents granted

Comment Regarding IPR status

Polish patent has been granted for some elements of the device, for others - authors are still waiting for the decision.

Profile Origin

National or Regional R&D programme

Keywords

Technology

01003023	Environmental and Biometrics Sensors, Actuators
06001005	Diagnostics, Diagnosis
06005004	Remote diagnostics

Market

05004001	Electromedical and medical equipment
05004003	Laboratory equipment
05004005	Diagnostic equipment

05007006	Computer-aided diagnosis and therapy

NACE

M.72.1.1	Research and experimental development on biotechnology
M.72.1.9	Other research and experimental development on natural sciences and engineering

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Open for EOI : Yes

Dissemination

Send to Sector Group

Bio Chem Tech

Client

Type and Size of Organisation Behind the Profile

University

Year Established

1946

Already Engaged in Trans-National Cooperation

Yes

Languages Spoken

English
Polish

Client Country

Poland

Partner Sought

Type and Role of Partner Sought

Type of Partner Sought: manufacturers of medical devices
Role of Partner Sought: to buy license for the device, start its mass-production, distribute biosensor, gather a feedback from customers and share it with the creators, so that they can improve the device.

Type and Size of Partner Sought

SME 11-50,SME <10,>500 MNE,251-500,SME 51-250,>500

Type of Partnership Considered

License agreement

Attachments

Profile Status: Published

Technology Offer

Targeted anti-cancer drug delivery system.

Summary

A Slovenian research institution has developed a specific bio-molecular drug delivery system using a selective cathepsin inhibitor as a guiding molecule towards cancer sites. The invention solves the problem of safely and accuracy of drug delivery to the cancer target site. The researchers seek research cooperation, license or a joint venture agreements with partners interested in participating with the pre-clinical studies, manufacturing scale-up or phase-1 clinical trials.

Creation Date	01 August 2017
Last Update	20 August 2018
Expiration Date	29 January 2019
Reference	TOSI20170731001
Public Link	https://een.ec.europa.eu/tools/services/PRO/Profile/Detail/20410501-46d4-448b-b898-2e65b5e94422

Details

Description

One of the characteristics of tumour cells and tumour stroma cells is their secretion of the proteolytic enzymes such as cathepsins, which actively promote tumour growth and are therefore amenable as targets for targeted delivery of anti-cancer drugs.

The invention is bio-molecular drug delivery system with a specific cathepsin-B inhibitor linked to a highly bio-compatible liposomal nano-carrier via lipid tail and which enables specific targeting of cathepsins in the tumour microenvironment, and therefore bringing the liposomomal nanocarrier containing the drug payload (eg. doxorubicin), to the target site. Liposome based drug delivery system enables reduction in dosages and systemic toxicity with increased efficiency of anti-cancer drugs which leads to more efficient and less costly treatments. Successful functioning of the system has been demonstrated both in vitro on various cell cultures and in vivo on mouse cancer model. In vitro experiments on cells showed that encapsulated doxorubicin in liposomes with linked cathepsin-B inhibitor was 22 fold more potent in killing cells compared to only liposome encapsulated doxorubicin. While in vivo data confirmed increased accumulation of liposomes with linked cathepsin-B inhibitor in tumours while there was no accumulation in healthy tissue.

The technology is applicable for targeted delivery of both anti-tumour and anti-inflammatory drugs to pathological sites. It enables to deliver both water soluble and insoluble compounds to the target site due to the liposome structure with lipid layer and hydrophilic core.
Apart from treatment, the technology is also applicable for detection purposes (for example, by specific delivery of a fluorescent marker or magnetic resonance imaging (MRI) contrast agent to a tumour site), and was confirmed using encapsulated Gadolinium (Gd) with linked cathepsin-B

inhibitor on tumour bearing mice, which resulted in signal enhancement, prolonged retention and elimination.

The researchers are among the world's leading experts in the field of proteases (primarily cysteine cathepsins) and their regulation of physiological processes in normal and pathological conditions, including cancer, and inflammatory associated diseases, and have extensive knowledge and expertise in cell biology, proteomics, animal cancer models and in-vivo imaging techniques. The researchers filed number of patent on drug delivery systems on international level, have many international collaborations and have participated in several International and EU projects among which, EU project FP7 that was focused on developing drug delivery system for oral and ocular application. They published over a hundred articles in high-impact scientific journals.

Partners are sought to participate with the finalisation of the pre-clinical and/or clinical trials. Most suitable partners are already involved in biotechnology and pharmaceutical industry or are investors.

The types of cooperation preferred are as:
- joint venture for the finalisation of the pre-clinical trials and/or phase-1 clinical trials
- license agreement to implement the proposed technology
- research cooperation agreement for the finalisation of the pre-clinical trials and/or phase-1 clinical trials

Advantages and Innovations

A number of drugs exhibit major harmful side effects or are inefficient because of low bioavailability. This invention solves the problem by safely and accurately delivering the drug to its target site.
Drug toxicity is reduced using a liposome-based delivery system. The drug is guided directly to the tumour tissue using liposomes with bound inhibitors of cathepsins, which are characteristically secreted by tumour cells.
The use of liposomes as drug delivery systems is safe as liposomes are biologically inert, natural occurring particles in the human body and biodegradable; use of liposomes as drug carriers is common, and approved by the U. S. Food and Drug Administration. Using targeted delivery, therapy is made more efficient, thereby reducing the required dosage for the same effect, which leads to reduced treatment costs. Advantage in the production of the invented drug delivery system is that it can be done by standard biochemical procedures and is compatible with most R&D institutions, while it is substantially cheaper compared to the antibody based drug delivery system or drug-conjugates. The invention was tested in-vitro and in-vivo. In-vitro analysis of the system showed 20-fold higher tumour cell killing capacity of encapsulated doxorubicin (i.e. requires 20-fold lower drug quantity for the same effect), compared to passive drug delivery (i.e Doxil). While in-vivo imaging on tumour bearing mice using MRI and encapsulated Gadolinium in liposomes bound with inhibitors showed increased and prolonged signal intensity compared to background as well as excretion from the system without accumulation in healthy tissues. Since liposomes are inert, this drug delivery system enables minimisation of side effects of the drugs and targeted delivery exclusively to tumour cells, increasing drug efficiency and patients' survival.

Stage of Development

Concept stage

IPR Status

Patents granted

Comment Regarding IPR status

US, EU and Brasil patents obtained

Profile Origin

National or Regional R&D programme

Keywords

Technology

03004007	Pharmaceutics
03004010	Special chemicals, intermediates
06001002	Clinical Research, Trials
06001003	Cytology, Cancerology, Oncology
06001015	Pharmaceutical Products / Drugs

Market

04009	In vitro Testing, Trials
05001001	Diagnostic services
05001005	Molecular diagnosis
05003001	Therapeutic services
05005014	Oncology

NACE

M.72.1.1	Research and experimental development on biotechnology
M.72.1.9	Other research and experimental development on natural sciences and engineering

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Open for EOI : Yes

Dissemination

Send to Sector Group

Bio Chem Tech

Client

Type and Size of Organisation Behind the Profile

R&D Institution

Year Established

0

Turnover

10 - 20M

Already Engaged in Trans-National Cooperation

No.

Languages Spoken

English

Client Country

Slovenia

Partner Sought

Type and Role of Partner Sought

Industry partners or investor active in the fields of biotechnology and pharmaceutical industry, with option of own manufacturing capacities are sought for the finalisation of the pre-clinical and clinical trials in case of medicinal implementation of the offered technology.

In case of a
- joint venture agreement the partner is expected to offer knowledge and financing,
- license agreement the partner is expected to purchase rights for the use of the patent-protected solution
- research cooperation agreement with partners with relevant know-how, the capacity, and accreditation to carry out pre-clinical studies and/ or scale-up the manufacturing to the industrial scale.

Type and Size of Partner Sought

University,R&D Institution,>500 MNE,251-500,SME 51-250,>500

Type of Partnership Considered

License agreement
Joint venture agreement

Attachments

Liposomal nanocarrier.jpg

