STEM CELLS IN DIABETES – WILL IMPLEMENTING INTERDISCIPLINARY ONLINE COLLABORATION HELP TO DISPEL ETHICAL RESISTANCE?

EWA KOZŁOWSKA[1]*, ANNA GRABOWSKA[2], NELLIE DEUTSCH[3]

[1] INSTITUTE OF MACHINES AND MATERIALS TECHNOLOGY, FACULTY OF MECHANICAL ENGINEERING AND SHIP TECHNOLOGY, GDANSK UNIVERSITY OF TECHNOLOGY, POLAND
[2] PRO-MED SP. Z O.O., POLAND
[3] MOODLE FOR TEACHERS, CANADA
*E-MAIL: EWA.KOZLOWSKA@PG.EDU.PL

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Introduction
According to the World Health Organization's statistics published in 2018 [1], the number of people with diabetes has increased from 108 million in 1980 to 422 million in 2014 and still growing [1]. Only in Poland the number of deaths attributable to high blood glucose in 2016 was estimated at 25 800 [1]. International Diabetes Federation estimates that by the year 2045 the number will reach 629 million [2]. There used to be only 3 types of diabetes, nowadays, 12 different types of diabetes have been distinguished during the past 20 years [3]. Rapid changes and general misinformation may lead to lack of trust and ethical resistance towards new treatment methods.

Materials and Methods
Cell-based therapies for beta-cell replacement are now under intensified investigation. Researchers have been advancing methods to generate insulin-producing beta cells from pluripotent stem cells (PSC) for the clinical treatment of diabetes [4]. However, apart from the stem cell ethical factors [5], physicians and scientists have more moral dilemmas connected with the selection of patients for the treatment and possible risks. Mostly mentioned risks are tumors, the growth of the stem cells into unwanted cell types and taking immunosuppressive drugs that suppress the activity of the immune system. It is also difficult to regulate how much insulin the new beta cells produce [4-7]. Patients' physical and psychological reaction to that treatment could be difficult to predict. Without good collaboration and support stem cell treatment may also become harmful to the good habits worked over the years. In order to monitor patients physical and emotional well being a multidisciplinary collaboration would be set up and carried out through the whole preparation and treatment process, and also afterwards. Establishing cooperation between specific groups of interdisciplinary specialists, such as engineers and physicians, has a significant impact on modern diagnostics and medical treatment development [8-9]. Interdisciplinary med-tech projects have been carried out online before thanks to Moodle for Teachers, ERASMUS+ SP4CE project and keen collaboration between universities and entrepreneurs. One of the projects, carried out fully online and successfully completed was an individual CT-based mandible implant design created by two students from Gdańsk University of Technology, working with students from Medical University of Gdańsk. [8-9].

Results and Discussion
Using stem cells in diabetes should as an attempt to cure the disease brings up many heated discussions. The objective to work on this method is to save patients from having to monitor their glucose level many times a day and release them from insulin injections. However, even if the stem cells method proves to be effective, patients will have to be condemned to immunosuppressive drugs that may cause many side effects, which may lead to the need of additional medical and emotional support [7-8]. Establishing a collaboration platform for bioengineers, physicians, therapists and other necessary specialists could bring many benefits and cause a serious impact in sharing knowledge and discussing individual case studies, which results in faster and more effective development of stem cell treatment, as well as the increase of knowledge about side effects and risks that could be impossible to predict in the pre-treatment studies [8-9].

Conclusions
Stem cells treatment should be provided with a multidisciplinary approach, including the proper collaboration and consistency of the study. Patients undergoing experimental therapy must be provisioned with well-organized during-and-after-care consisting of multidisciplinary specialists. They should be able to receive the necessary support from general practitioners, nurses, physiotherapists, psychotherapists, and social workers. LMS Moodle with the variety of tools allows for many adaptations of the working area that supports online collaboration in multiple ways in order to meet the needs of innovative treatment in diverse disciplines.

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