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## TOWARDS THE IMPROVEMENT OF THE DIABETES TREATMENT

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### Abstract

Diabetes is recognized as one of the most severe health problems in the world. It is the main cause of kidney failure, blindness in adults, nervous system damage and amputations, as well as the major risk factor for heart disease, stroke and birth defects. It is currently one of the most costly diseases in both human and economic terms.

Diabetes mellitus affects in average between 5 and 7% of all the highly developed population in the world. It should be stressed that number of people with diabetes is growing very fast. In the year of 2000 the global number of diabetes patients was 175 million and it is estimated that in the year 2012 this population will have exceeded 350 million.

There are several methods, which should substitute efficiently the lost function of the pancreatic  $\beta$ -cells like: biological approach, i.e. pancreas and islets transplantation, bio-technical solutions, so called hybrid artificial pancreas, which are related to application of the *micro and macro-encapsulation* of the pancreatic islets or biochemical implantable insulin delivery systems. However, despite many years of efforts, none of these methods is routinely used for treatment of diabetes.

Currently, as far as the ambulatory insulin-treated diabetics is concerned, only the application of the intensive therapy can effectively delay development and progression of life-threatening future complications of diabetes, which are the most critical for patients. An ideal intensive insulin treatment should imitate the secretion of insulin by  $\beta$ -cells in healthy person, as much as possible. Technical realization of such a treatment should consist of: an effective monitoring of the patient glycemic control and accurate delivery of insulin according to the established algorithm.

In recent years technical support of the diabetes treatment has been focused mainly on: (a) the most crucial issues of the blood glucose measurements, that is *noninvasiveness and continuous monitoring*, (b) the application of the *telematic systems* leading to better education and more frequent contacts between patient and physician and (c) development of the new, less invasive, forms of insulin delivery. Another important technical solutions of the diabetes treatment concern the design and development of the electromechanical artificial pancreas realized as a *portable and fully implantable close loop system*.

The main objective of presentation is to discuss the most interesting and important recent technical developments of the diabetes treatment, stressing the existing problems and reviewing the best applied solutions.