We are IntechOpen, the world’s leading publisher of Open Access books
Built by scientists, for scientists

3,800
Open access books available

116,000
International authors and editors

120M
Downloads

154
Countries delivered to

TOP 1%
Our authors are among the
most cited scientists

12.2%
Contributors from top 500 universities

WEB OF SCIENCE™
Selection of our books indexed in the Book Citation Index
in Web of Science™ Core Collection (BKCI)

Interested in publishing with us?
Contact book.department@intechopen.com

Numbers displayed above are based on latest data collected.
For more information visit www.intechopen.com
1. Introduction

The development of advanced technologies for pancreatic beta-cell imaging intended for medical practice, preclinical testing and experimental diabetes research has become a field of intense study over the last decade. Insulin deficiency and hyperglycemia in type 1 diabetes (T1D) occurs as a result of selective T-cell-mediated autoimmune destruction of pancreatic beta-cells. During the first stage of T1D, known as insulitis, the islets of Langerhans are subjected to a massive invasion of a mixed population of leukocytes, followed by a selective destruction of pancreatic beta-cells. During the second stage of T1D, hyperglycemia develops as a result of impaired insulin production by damaged or disabled beta-cells (Mathis & Gaglia, 2010). In patients with T1D immune infiltration, the destruction of beta-cells and reduction in beta-cell mass (BCM) precede clinical manifestation of the disease. Furthermore, dynamic changes in BCM correlate with the time course of diabetes progression and the efficiency of anti-diabetic treatment. In clinical practice, the evaluation of islet inflammation is currently based on monitoring serum titers of antibodies directed against certain beta-cell antigens (Eisenbarth et al., 2002). The assessment of BCM is limited primarily to functional tests of insulin secretion in response to secretagogues (Robertson, 2007), the results of which reflect the specific mechanisms of beta-cell function. These diagnoses may however be affected by anti-diabetic treatments as well as other factors. Histological analyses provide the most accurate BCM determination in humans and are achieved by an examination of pancreas specimens obtained from patients undergoing pancreatic surgery. Due to the heterogeneous distribution of pancreatic islets within the pancreas, this procedure can provide BCM estimations within a specific pancreatic area rather than the whole organ (Meier et al., 2009). The analysis of BCM in whole pancreas samples, obtained during autopsy, is impractical. Hence, the development of non-invasive diagnostic techniques that enable detection of pancreatic islet inflammation in humans at risk for T1D and to estimate BCM would become powerful tools for both the early diagnosis and effective treatment of T1D.

Existing imaging technologies differ in terms of the type of energy that is used to generate visual information (e.g. positrons, photons, X-rays, sound and radiofrequency waves), the depth of penetration, spatial and temporal resolution, sensitivity, as well as the category of information that can be obtained using the technique (e.g., anatomical, physiological, cellular, or molecular). Extensive efforts are ongoing to create a non-invasive clinical imaging modality for beta-cell imaging based on the magnetic resonance imaging (MRI), positron emission tomography (PET) and single photon emission computed tomography (SPECT) platforms. Limited employment of beta-cell imaging in clinical practice has
Type 1 Diabetes – Pathogenesis, Genetics and Immunotherapy


This book is a compilation of reviews about the pathogenesis of Type 1 Diabetes. T1D is a classic autoimmune disease. Genetic factors are clearly determinant but cannot explain the rapid, even overwhelming expanse of this disease. Understanding etiology and pathogenesis of this disease is essential. A number of experts in the field have covered a range of topics for consideration that are applicable to researcher and clinician alike. This book provides apt descriptions of cutting edge technologies and applications in the ever going search for treatments and cure for diabetes. Areas including T cell development, innate immune responses, imaging of pancreata, potential viral initiators, etc. are considered.

How to reference
In order to correctly reference this scholarly work, feel free to copy and paste the following:
