Beyond insulin: exploring the role of immune modulation in type 1 diabetes.

Michael Bezu*

Department of Surgery, Division of Plastic Surgery, Dalhousie University, Halifax, Nova Scotia, Canada

Introduction

Type 1 diabetes (T1D) is an autoimmune disorder where the body's immune system mistakenly attacks and destroys insulin-producing beta cells in the pancreas. Traditionally, the treatment for T1D has focused on insulin replacement to manage blood sugar levels. However, as the understanding of the disease has evolved, researchers are exploring immune modulation as a promising approach to not only manage but potentially cure T1D [1].

At its core, T1D is driven by an abnormal immune response. The immune system, which typically protects the body from harmful pathogens, erroneously targets the insulin-producing beta cells in the pancreas. This destruction of beta cells leads to insulin deficiency, and as a result, individuals with T1D are unable to regulate their blood glucose levels without external insulin administration [2].

While insulin therapy has been a life-saving treatment for people with T1D, it does not address the underlying cause of the disease—the autoimmune attack on beta cells. Insulin injections or pumps help control blood sugar levels, but they do not halt the immune system's destruction of pancreatic cells. Furthermore, over time, even with careful insulin management, blood glucose levels may become harder to control, leading to complications such as cardiovascular disease, kidney damage, and neuropathy [3].

One of the most exciting areas of research in T1D is the concept of inducing immune tolerance. This approach aims to "teach" the immune system not to attack the beta cells. Researchers are investigating methods like oral tolerance (administering small amounts of insulin to the immune system via oral intake) or the use of nanoparticles that deliver insulin to the immune system in a controlled manner. The hope is that these strategies will induce a tolerogenic immune response, whereby the immune system becomes less aggressive toward the pancreas [4].

Advances in immunology have also led to the development of more targeted therapies, which focus on specific immune cells involved in the disease process. For example, monoclonal antibodies that target particular T-cell subsets have been studied for their ability to prevent beta cell destruction without broadly suppressing the immune system. These therapies are still in the experimental phase but hold significant promise for selectively controlling the autoimmune response in T1D [5].

Another approach being explored is the use of stem cells to regenerate insulin-producing beta cells. While not directly immune modulation, this strategy aims to repair the damage caused by the immune system's attack on the pancreas. Researchers are working on techniques to either transplant insulin-producing cells into the body or coax the remaining beta cells to regenerate. Coupled with immune modulation, this approach could restore normal insulin production in T1D patients [6].

While immune modulation therapies for T1D are promising, several challenges remain. The immune system is incredibly complex, and interventions must be carefully balanced. Over-modulating the immune system could increase the risk of infections or even other autoimmune diseases. Additionally, because T1D often involves a progressive loss of beta cells, even if immune modulation is successful in halting the autoimmune attack, patients may still need to rely on insulin therapy unless beta cell regeneration is also achieved [7].

Ethical concerns also arise, particularly with the use of stem cell therapies and the potential for long-term immunosuppression. Ensuring the safety of these treatments and determining their long-term efficacy will be crucial as research progresses [8].

The exploration of immune modulation in T1D offers hope for a future where people with the disease may not only manage their blood glucose levels more effectively but may even be able to avoid insulin therapy altogether. With continued research, the day when T1D can be prevented or reversed may be closer than ever before. For now, ongoing clinical trials and advancements in immunology and regenerative medicine offer a glimpse of what the future holds for T1D patients [9].

As we look beyond insulin and toward immune modulation, the fight against Type 1 diabetes is evolving, offering hope for more personalized, effective, and sustainable treatments [10].

Conclusion

While immune modulation therapies for T1D are promising, several challenges remain. The immune system is incredibly complex, and interventions must be carefully balanced. Over-modulating the immune system could increase the risk of infections or even other autoimmune diseases. Additionally, because T1D often involves a progressive loss of beta cells,

***Correspondence to : **Michael Bezu,** Department of Surgery, Division of Plastic Surgery, Dalhousie University, Halifax, Nova Scotia, Canada. E-mail: mchel@bzu

***Received:** 30-Aug-2024, Manuscript No. AADY-25-158378; **Editor assigned:** 02- Sep -2024, PreQC No. AADY-25-158378 (PQ); **Reviewed:** 11- Sep -2024, QC No. AADY-25-168378;**Revised:** 16-Sep-2024, Manuscript No. AADY-25-158378; **Published:** 25- Sep -2024, DOI: 10.36841/aady-8.5.224*

***Citation:** Bezu M: Beyond insulin: exploring the role of immune modulation in type 1 diabetes. J Diabetol. 2024;8(5):224*

even if immune modulation is successful in halting the autoimmune attack, patients may still need to rely on insulin therapy unless beta cell regeneration is also achieved.

References

1. Adams OP. The impact of brief high-intensity exercise on blood glucose levels. Diabetes, metabolic syndrome and obesity: targets and therapy. 2013:113-22.
2. Güemes M, Rahman SA, Hussain K. What is a normal blood glucose?. Archives of disease in childhood. 2016;101(6):569-74.
3. Bruno A, Biller J, Adams Jr HP, Clarke WR, Woolson RF, Williams LS, Hansen MD. Acute blood glucose level and outcome from ischemic stroke. Neurology. 1999;52(2):280-.
4. Gupta S, Nayak MT, Sunitha JD, Dawar G, Sinha N, Rallan NS. Correlation of salivary glucose level with blood glucose level in diabetes mellitus. Journal of Oral and Maxillofacial Pathology. 2017;21(3):334-9.
5. Karter AJ, Ackerson LM, Darbinian JA, D'Agostino Jr RB, Ferrara A, Liu J, Selby JV. Self-monitoring of blood glucose levels and glycemic control: the Northern California Kaiser Permanente Diabetes registry□. The American journal of medicine. 2001;111(1):1-9.
6. Lösche W, Karapetow F, Pohl A, Pohl C, Kocher T. Plasma lipid and blood glucose levels in patients with destructive periodontal disease. Journal of clinical periodontology. 2000 (8):537-41.
7. Donohoe RT, Benton D. Cognitive functioning is susceptible to the level of blood glucose. Psychopharmacology. 1999;145:378-85.
8. Ripsin CM, Kang H, Urban RJ. Management of blood glucose in type 2 diabetes mellitus. American family physician. 2009;79(1):29-36.
9. Ajabnoor MA. Effect of aloes on blood glucose levels in normal and alloxan diabetic mice. Journal of ethnopharmacology. 1990;28(2):215-20.
10. Hoseth E, Joergensen A, Ebbesen F, Moeller M. Blood glucose levels in a population of healthy, breast fed, term infants of appropriate size for gestational age. Archives of Disease in Childhood-Fetal and Neonatal Edition. 2000;83(2):F117-9.

Citation: *Bezu M: Beyond insulin: exploring the role of immune modulation in type 1 diabetes. J Diabetol. 2024;8(5):224*