

Lysulin: Successfully Targeting a New Mechanism for Diabetes Treatment

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Received: 19 November 2018; Accepted: 02 January 2018

Citation: John F. Burd, Vivanne Noetzel. Lysulin: Successfully Targeting a New Mechanism for Diabetes Treatment. *Diabetes Complications*. 2019; 3(1): 1-2.

Keywords

Lysine, Diabetes, Amino acids, Glucose.

Introduction

Lysulin® is a treatment for diabetes that targets a new mechanism of disease, protein glycation. Lysulin was introduced in 2018 and a series of manuscripts have demonstrated that the clinical performance of Lysulin is comparable to or better than the current drugs used for diabetes management. This review will timeline the development of the Lysulin formulation and documents the clinical study results observed to date.

Lysulin uses three well known generally recognized as safe (GRAS) ingredients: lysine (an essential amino acid), zinc (a trace mineral) and vitamin C. Because the foods in our diet are processed, we do not have sufficient blood levels of these three nutrients to provide clinical benefit. Interestingly the usefulness of each on these ingredients in lowering blood glucose and glycated proteins has been known for ten years or more. Nevertheless, the combination of these ingredients in a clinical study was not appreciated until 2018 when a series of papers describing their clinical benefit has been reported [1-6,18]. The usefulness of each of the ingredients is detailed below.

Lysine

In 2008, Jafarnejad, et al. reported that in rats studied for 5 months after being made diabetic, lysine halted the production of Advanced Glycation Endproducts (AGEs) equivalent to non-diabetic rats [7]. In addition the appearance of kidney damage markers was also reduced to more near normal levels compared to the elevation seen in the rats with diabetes [7].

Then in 2009, Kalogeropoulou, et al. studied volunteers given an oral glucose tolerance test with and without lysine. These volunteers were first given just glucose and then at a later date given lysine at the same time that glucose was administered. When

Lysine was added at the beginning of the study, they observed a 25% reduction in blood glucose levels [8]. Notably, the decrease in blood glucose did not raise the blood levels of insulin. The mechanism whereby lysine lowers glucose without raising insulin is not presently understood.

These two studies show that lysine not only immediately can lower blood glucose but, of even greater importance, it can also lower the production of AGEs, presumably by reacting with glucose. When this occurs, the glucose is not available to react with the proteins to form AGEs. Instead, the glycated lysine formed in this reaction is excreted safely in the urine.

Zinc

The second primary ingredient in Lysulin is the trace mineral zinc. It has been observed that many people suffer from a zinc deficiency [9]. In certain regions, South Asia for example, diabetes is epidemic and zinc deficiency is highly prevalent. Zinc is involved in numerous metabolic pathways as a cofactor for more than 300 enzymes [10]. Insulin, which contains a variable number of Zinc atoms, is stored in the β -cells of the pancreas and released into the portal venous system at the time of β -cells de-granulation.

In Korea 44 diabetic patients and 34 normal subjects were supplemented with 50 mg Zinc daily as Zinc gluconate for 4 weeks [11]. The results showed that significant improvement of fasting glucose as well as HbA1c was observed in the zinc supplemented patients [11]. A similar study in Saudi Arabia noted that receiving 30 mg of Zinc per day for three months for type 2 diabetics has beneficial effects in elevating their serum Zinc level, and in improving their glycemic control as shown by decreasing their HbA1c concentration [12]. Zinc was shown to slow the progression to type 2 diabetes and improve the glycemic control and the lipid profile in a double-blind placebo-controlled study of 200 patients with prediabetes [13]. A summary of all of the information related to zinc and diabetes has been compiled and reported [14].

Vitamin C

Ascorbic acid (vitamin C), an antioxidant vitamin, plays an important role in protecting free radical-induced damage [15]. Randomized controlled trials have shown that supplementation of Vitamin C reduces blood glucose, serum lipids and improves HbA1c in patients with type 2 diabetes [16,17].

In 2018 a nutritional supplement, Lysulin®, was introduced which contains the ideal amounts of lysine, zinc and vitamin C, and patents are pending for this formulation [1]. Several publications have been written describing the improvement of glycemic control and the lowering of HbA1c in patients taking Lysulin [2-6]. An average HbA1c improvement of 1.45% was observed in the double-blind placebo-controlled study of 67 patients with type 2 diabetes [5]. For the 60% of patients in this study who responded to Lysulin treatment, the average HbA1c drop was 1.91% [5].

In addition, changes in HbA1c were observed in as little as one month from initiation of treatment with Lysulin [1,3,6,8,18]. One patient using a continuous glucose monitor showed an improvement in his daily glucose readings after only 8 days of Lysulin treatment [3].

Conclusion

The powerful combination of lysine, zinc and vitamin C into a single tablet has been clearly shown to improve glycemic control and lower the production of AGEs equal to or better than the current drugs for the treatment of type 2 diabetes [2]. Lysulin uniquely targets a new mechanism in diabetes control which is the inhibition of protein glycation. Since glycation of insulin and the insulin receptor are thought by many to be the cause of insulin resistance [19] and diabetes complications [20,21], this new treatment is a promising addition to the many Type 2 drug treatments available today. Further studies are planned [5] to validate this promise even as the global diabetes epidemic spreads.

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