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## Lysulin and Testing HbA1c in the Pharmacy or at Home - How the Pharmacist can help their Customers with Diabetes to Better Health

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### Abstract

Pharmacists can be part of the healthcare team to help people with diabetes and prediabetes to better health. Obesity and type 2 diabetes are a worldwide epidemic and a problem that can be helped dramatically with lifestyle changes (diet and exercise) combined with treatment with drugs and supplements. Lysulin is a patent-pending nutritional supplement that contains lysine, zinc and vitamin C and has been shown in double blind placebo controlled studies to help people with prediabetes and type 2 diabetes to better glycemic control and lower their HbA1c. The pharmacist needs to be aware of this breakthrough and inform his customers of the availability of this new product for improving their health. In addition, HbA1c testing at the pharmacy or at home can be very useful in helping people with diabetes know how well their diabetes management program is working.

**Keywords:** Lysulin, Type 2 diabetes, Obesity.

### Main Text

Glucose is essential in providing the human body its energy needs. Glucose relies upon the hormone, insulin, to enter our cells thereby producing the energy we need for everyday living. However, while everyone needs a certain amount of glucose for daily energy production, excessive glucose is dangerously toxic to the body (primarily as a result of protein glycation). In addition, fructose (from High Fructose Corn Syrup) does not utilize insulin to enter the liver or our cells, and thus enters them easily and immediately turns into fat [1-6].

Poor diet and the consumption of High Fructose Corn Syrup (HFCS) leads to the obesity and diabetes that we see all around us today. The pandemic of type 2 diabetes – expected to affect at least 250 million people worldwide by 2020 and 642 million by 2040 [1] - is the result of our excessive carbohydrate, High Fructose Corn Syrup and sugar-infused diet (and the lack of commensurate exercise). This leads to insulin resistance, caused by the glycation of insulin and insulin receptors [7], thereby resulting in high concentrations of glucose in the bloodstream.

The therapy for type 2 diabetes starts with attempts to control glucose through diet and exercise. If this fails, oral drugs are prescribed. If oral drugs do not work, insulin injections are used. Over 30% of people with type 2 diabetes are using insulin injections to control their blood Glucose levels [8]. There is a vast literature documenting the role of nutraceuticals in the management of alterations in metabolism [9].

### Protein glycation

Glucose is toxic, like a poison, because it is a reactive chemical. Glucose is an aldehyde which reacts with the amino groups found on the amino acids of all proteins. When glucose reacts with these amino groups, it forms a fructosamine bond, and the protein is said to be “glycated”. These glycated proteins progress through a series of reactions to become Advanced Glycation End products or AGEs [10].

AGEs are believed to be responsible for many (and perhaps all) of the disease complications associated with diabetes. These include retinopathy, nephropathy and neuropathy (which lead to blindness, kidney failure, organ degradation, and amputations) [11].

The glycation of insulin and the insulin receptors on our cells leads to insulin resistance and, in turn, insulin depletion [7] (**Figure 1**). This logically leads to this observation: If protein glycation could be slowed or halted, the complications of diabetes would be reduced or stopped and the progression of prediabetes to type 2 diabetes would also be slowed or halted. Because lysine has been shown in animal models of diabetes to halt the production of AGEs [12], it is one of the remedies that could slow or halt the complications of type 2 diabetes.

### Insulin depletion

In normal individuals, insulin production can respond to the insulin needs for the length of a person's lifetime. With chronic hyperglycemia, the pancreas makes more insulin in an attempt to normalize blood glucose. When burdened with insulin resistance, our

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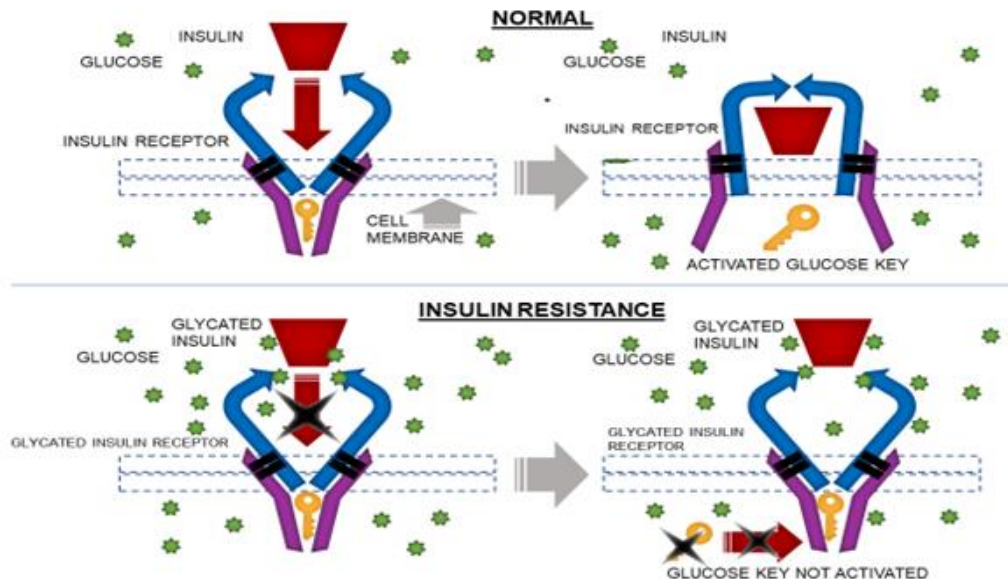


Figure 1: Glycation of Insulin and Insulin Receptors. Top panel-normal situation. Bottom panel-insulin resistance.

pancreas is called upon continuously to make more and more insulin in a heroic attempt to lower blood glucose. Constantly high levels of glucose in the blood-i.e., glucose toxicity-eventually exhaust the ability of the pancreas to make more insulin. When the pancreas gives up and can no longer make insulin, or adequate amounts of insulin, it becomes necessary to take insulin shots to make up the shortfall. This calls into question the use of sulfonylurea drugs which demand that the pancreas produce more insulin, even though the patient's cell cannot properly recognize the insulin that is produced, because of insulin resistance.

Addressing glucose toxicity should be a high priority in preventing and treating type 2 diabetes, its complications and associated diseases. A promising approach to inhibiting protein glycation is through consumption of a nutritional supplement with the tradename Lysulin®. Lysulin contains lysine, zinc and vitamin C [1]. Lysine is an amino acid (a building block of protein) and has long been used in medicine to treat and even prevents cold sores (caused by the virus called herpes simplex labialis). Lysulin has been shown to halt AGE production in diabetic rat studies [12]. Now, recent double-blind placebo controlled studies have shown that Lysulin can lower HbA1c in as little as two weeks [13,14]. Because Lysulin contains a safe, but relatively large dosage of the amino acid lysine, it blocks protein glycation as illustrated in (Figure 2).

**The all-natural solution to the problem of glucose toxicity**

**Why Lysulin Works**

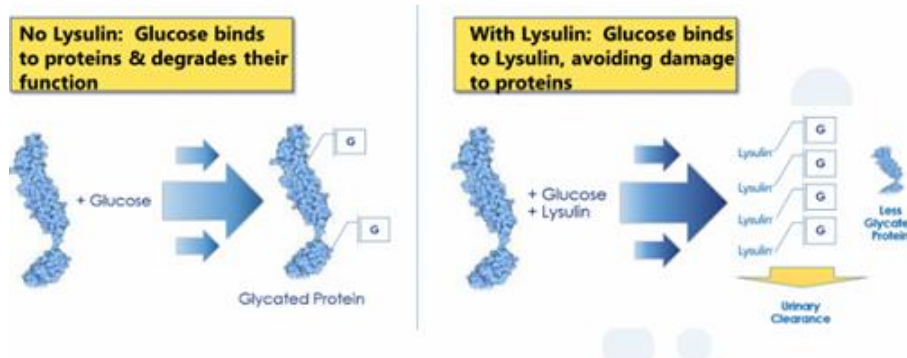


Figure 2: Mechanism for Inhibition of Protein Glycation by Lysulin.

The lysine in Lysulin reacts with glucose and thus protects your proteins from this reaction. The glycated lysine is then safely excreted in the urine. Lysulin also contains zinc and vitamin C, both of which have been shown to lower blood glucose and prevent the progression of prediabetes to Type 2 diabetes and improve insulin resistance and the lipid profile [15,16]. The combination of zinc and vitamin C with

lysine creates the results being reported in the lowering of HbA1c for patients with prediabetes [3] and type 2 diabetes [4].

**HbA1c testing in the pharmacy or at home**

An important blood test for measuring the effectiveness of diabetes management is the Hemoglobin A1c test (also called HbA1c, A1C and

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glycated hemoglobin) [5]. This test is firmly established as the gold standard for people with diabetes, along with glucose self-testing using either test strips or the newer continuous glucose monitoring testing products [17]. While the HbA1c test is normally conducted in a clinical laboratory, newer tests are now available for testing at the pharmacy and even at home [5].

### The pharmacist is an essential link if helping people with diabetes to better health

Because the Pharmacist sees people with diabetes every month when they receive their medication, it is important for them to be aware of new products that can help these people to better health. Many pharmacists are becoming Certified Diabetes Educators to achieve success in their role as an information source in healthcare.

### Summary and Conclusion

The world is undergoing a pandemic of obesity and type 2 diabetes related largely to poor diet and nutritional deficiencies. A surplus of glucose in our bloodstream, stemming from chronic and excessive carbohydrate and HFCS consumption, is proving to be highly toxic to millions of people. This has led to excessive protein glycation, AGE production, insulin resistance, insulin depletion and potentially-fatal disease complications. An all-natural nutritional supplement, Lysulin, now offers a unique, effective, and affordable way to combat glucose toxicity and the diabetes pandemic. In addition, HbA1c testing can now be performed in the pharmacy and at home to help people with diabetes achieve better disease management in a more timely fashion.

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