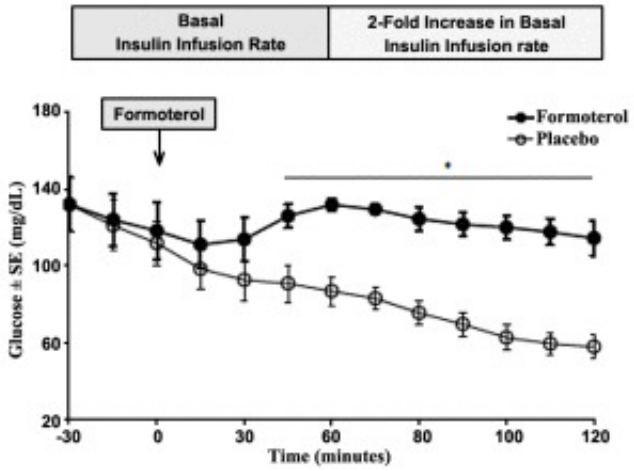
Can inhaled formoterol be used to prevent hypoglycemia?

Patients with type 1 diabetes need insulin treatment for their survival. However insulin can cause low blood sugar (or hypoglycemia); a major limiting factor for good diabetes control. Hypoglycemia occurs when there is an excess of insulin in proportion to the amount of sugar (glucose) available in the blood. The body reaction to hypoglycemia spans from mild (hunger, tremors and increased sweats) to more severe ones, such as confusion, seizures and even death. Therefore avoidance of hypoglycemia is of utmost importance when treating patients with type 1 diabetes.

To avoid hypoglycemia, patients are usually recommended to reduce the amount of their insulin dose or to increase the amount of carbohydrate (sugar) consumption. However these measures can lead to worsening of their diabetes control. Therefore, there is a need for new therapies to avoid and/or treat hypoglycemia without affecting diabetes management.



The beta-2 adrenergic receptor agonist drugs are commonly used for the treatment of asthma. These compounds have also been shown in preliminary studies to prevent nocturnal hypoglycemia in patients with type 1 diabetes. However, it is not well-know if the long acting beta-2 agonist formoterol given through inhalation could also be used to prevent and/or treat hypoglycemia. For this purpose, we gave inhaled formoterol to patients with type 1 diabetes and healthy non-diabetic volunteers. They received inhaled formoterol right before an insulin-induced episode of mild hypoglycemia. These studies were compared to a control study where the participants received inhaled placebo (dummy) treatment. During these episodes of mild hypoglycemia, inhaled formoterol diminished the amount of sugar needed to maintain blood glucose levels stable and to prevent worsening of the hypoglycemia.

In another set of studies, we tried to mimic an acute episode of hypoglycemia secondary to inappropriate insulin dosing. Five participants with type 1 diabetes came to the hospital research unit twice, where they received inhaled formoterol or placebo one hour prior to doubling the patient’s basal insulin dose. On the placebo day, blood glucose levels dropped significantly,

leading to mild hypoglycemia (~58 mg/dL), while on the formoterol day, blood glucose remained stable without developing hypoglycemia. This preliminary study suggested that inhaled formoterol has the potential to be used in patients with type 1 diabetes to prevent hypoglycemia. However further studies will be necessary to determine the best timing to give these compounds and how safe they are outside the research environment.

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