VIA MEDICA

LETTER TO THE EDITOR

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Glucagon — new formulations as a chance for more effective treatment of severe hypoglycaemia

To the Editor

In this letter, we would like to present new formulations of glucagon administration for the treatment of severe episodes of hypoglycaemia, which, in our opinion, may contribute to a significant improvement in the effectiveness and comfort of treatment and solve problems related to the difficulty of using standard emergency kits.

Glucagon plays an important role in regulating blood glucose levels. This hormone acts in the opposite direction to insulin, causing the release of glucose from glycogen stored in the liver, thereby increasing its level in the blood [1]. A person must have a store of glycogen in the liver for the effects of glucagon to result in an increase in glucose levels. In addition to its effect on glucose metabolism, glucagon is a pleiotropic hormone. Its multidirectional action involves stimulating lipolysis, inhibiting lipid synthesis, slowing down gastric emptying, and reducing food consumption, which ultimately results in lower body weight. It also affects the circulatory system by increasing cardiac output [2].

In healthy people, glucagon prevents episodes of hypoglycaemia. When the glucose concentration drops below 80 mg/dL, insulin secretion by pancreatic beta cells is inhibited, while at levels below 70 mg/dL, pancreatic alpha cells are activated to secrete glucagon. A further decrease in blood glucose concentration results in the activation of the sympathetic nervous system and the secretion of cortisol and growth hormone [3]. It is considered that in people with diabetes, this regulation is impaired secondary to progressive failure of pancreatic beta cells. Therefore, they are at risk of severe hypoglycaemia, which may lead to death [4]. Additionally, diabetes treatment involves the use of medications that increase this risk.

Glucagon is an emergency drug used in diabetic patients who are unconscious and cannot consume glucose due to their serious condition. Commonly used injectable glucagon rescue kits have significant limitations in their use in the treatment of severe hypoglycaemia. Preparing a solution from lyophilized glucagon in the form of powder and a special solvent, and then injecting it, is a very complicated and stressful process that often results in incorrect or interrupted drug administration [5].

To facilitate drug administration, intranasal glucagon was created, which allows for one-step and needle-free administration of the drug to a person with severe hypoglycaemia. Studies have shown that the effectiveness of an intranasal preparation in correcting hypoglycaemia in people with type 1 diabetes is equal to that of injectable preparations. The advantage of

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Medical Research Journal 2023; Volume 8, Number 4, 328–329, DOI: 10.5603/mrj.97466, Copyright © 2023 Via Medica, ISSN 2451-2591, e-ISSN 2451-4101

intranasal glucagon is its simplicity of use and its less traumatic form, which is very important for most often untrained people who need to administer glucagon on an ad hoc basis [6].

Another solution that facilitates the process of administering glucagon is a ready-to-use, automatic injector that does not require glucagon reconstitution and is stable at room temperature. The applicator mechanism is similar to pens used in cases of severe anaphylactic reactions. Its advantage over a standard emergency kit is the lack of need to prepare a solution for injection, which is a significant convenience for untrained personnel in stressful situations [1].

In conclusion, new glucagon formulations may contribute to increasing the chance of helping a diabetic patient with severe hypoglycaemia by inexperienced and non-medical people, as well as shortening the duration of a hypoglycaemia episode, which results in better treatment results.

Article information

Conflict of interest: *None.*
Funding: *None.*

References

1. Schaumleffel C. Pharmacology update: emergency medications for hypoglycemia in diabetes. NASN Sch Nurse. 2021; 36(3): 149–154, doi: 10.1177/1942602X20981643, indexed in Pubmed: 33487097.
2. Zeigerer A, Sekar R, Kleinert M, et al. Glucagon's metabolic action in health and disease. Compr Physiol. 2021; 11(2): 1759–1783, doi: 10.1002/cphy.c200013, indexed in Pubmed: 33792899.
3. Hawkes CP, De Leon DD, Rickels MR. Novel preparations of glucagon for the prevention and treatment of hypoglycemia. Curr Diab Rep. 2019; 19(10): 97, doi: 10.1007/s11892-019-1216-4, indexed in Pubmed: 31493043.
4. Cryer PE. Minireview: Glucagon in the pathogenesis of hypoglycemia and hyperglycemia in diabetes. Endocrinology. 2012; 153(3): 1039–1048, doi: 10.1210/en.2011-1499, indexed in Pubmed: 22166985.
5. Story LH, Wilson LM. New developments in glucagon treatment for hypoglycemia. Drugs. 2022; 82(11): 1179–1191, doi: 10.1007/s40265-022-01754-8, indexed in Pubmed: 35932416.
6. Rickels MR, Ruedy KJ, Foster NC, et al. T1D Exchange Intranasal Glucagon Investigators. Intranasal glucagon for treatment of insulin-induced hypoglycemia in adults with type 1 diabetes: a randomized crossover noninferiority study. Diabetes Care. 2016; 39(2): 264–270, doi: 10.2337/dc15-1498, indexed in Pubmed: 26681725.