

LETTER TO THE EDITOR

Case of anaphylaxis to maltose solution

Dear Editor,

Anaphylaxis may be triggered by various medications. Antibiotics and non-steroidal anti-inflammatory drugs are major causes but anaphylactic reactions to infusion fluids are rare.¹ We herein report a case of anaphylactic reaction to maltose solution, a widely-used infusion fluid as a carbohydrate source in Japan.

A 23-year-old man developed a reddish skin rash, pruritus and difficulty in breathing immediately after receiving i.v. infusion of 5% maltose lactated Ringer's solution (maltose lactated solution) with sodium salicylate and methylmethionine sulfonium chloride for influenza. No additives were contained in the Ringer's solution. He received i.m. epinephrine and recovered without further complications. He had a previous history of two events of anaphylaxis due to uncertain causes.

He was referred to our department for further examination. We first performed prick testing using 5% sodium salicylate, 4% methylmethionine sulfonium chloride, maltose lactated solution and 10% maltose in saline, but no skin reactions were observed. Then, we carried out intradermal testing with the same reagents, resulting in positive reactions to maltose lactated solution and 10% maltose (Fig. 1a).

A month later, we performed a histamine-release test (HRT) with various concentrations of maltose lactated solution and

maltose diluted in assay buffer.² The release of histamine was observed by maltose lactated solution (Fig. 1b) and maltose (Fig. 1c) from the patient's basophils in the presence of 10% serum of the patient, but not from basophils of a healthy control (data not shown). No or only a marginal amount of histamine release was induced by maltose in the absence of the serum (data not shown). These results suggest that the infused maltose obtained antigenicity with molecules in the patient's serum and induced anaphylaxis through type I hypersensitivity. A careful review of his medical history revealed two previous incidents of anaphylaxis upon receiving an infusion of maltose solution.

Maltose is a naturally occurring disaccharide consisting of two glucose molecules, and is present in human blood. Maltose administrated i.v. migrates into cells in a non-insulin-dependent manner, and is hydrolyzed to two molecules of glucose by α -glucosidase (maltase) in the cells. It is further metabolized through the anaerobic glycolysis system and tricarboxylic acid cycle.

The size of maltose itself is too small to cross-link multiple immunoglobulin (Ig)E as an antigen. However, there are reports of anaphylaxis induced by dextran which also consists of glucose³ and by icodextrin which can be decomposed into maltose.⁴ These results suggest the presence of IgE that recognize maltose as (a part of) the antigen. Moreover, cefotiam,

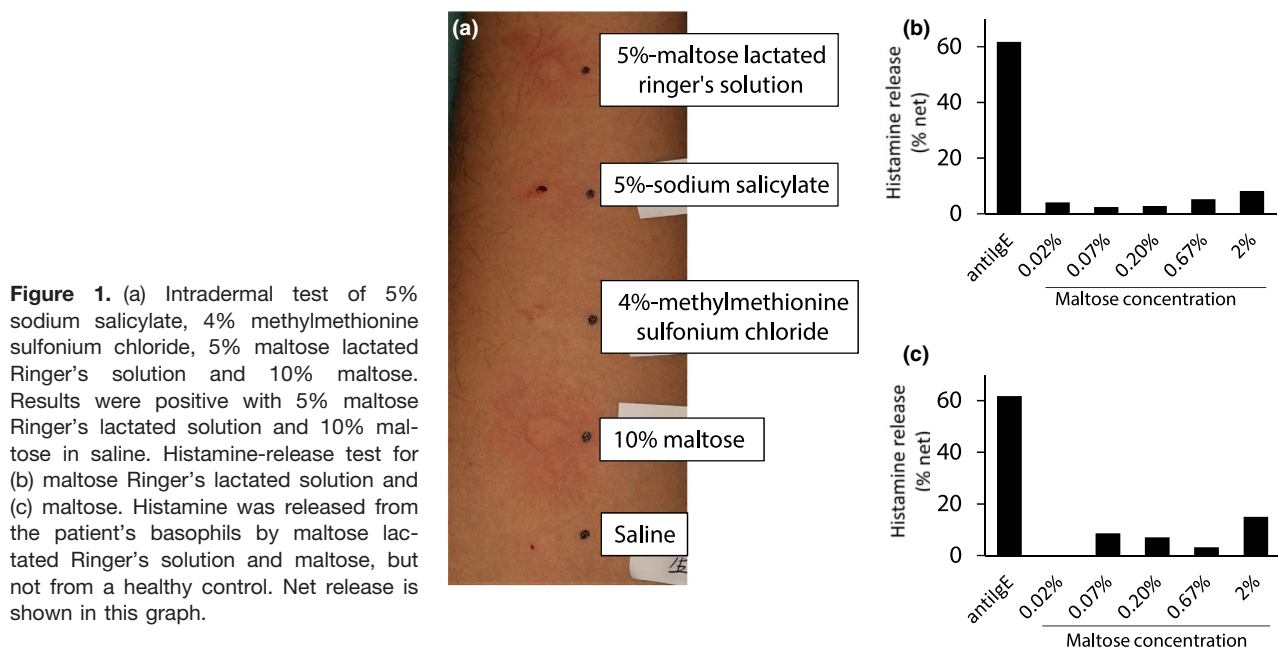


Figure 1. (a) Intradermal test of 5% sodium salicylate, 4% methylmethionine sulfonium chloride, 5% maltose lactated Ringer's solution and 10% maltose. Results were positive with 5% maltose Ringer's lactated solution and 10% maltose in saline. Histamine-release test for (b) maltose Ringer's lactated solution and (c) maltose. Histamine was released from the patient's basophils by maltose lactated Ringer's solution and maltose, but not from a healthy control. Net release is shown in this graph.

an antibiotic with small molecular weight of less than 600, is known to become an antigen with human serum albumin.² Therefore, maltose may also bind to serum protein, forming an antigen recognized by antibodies in the patient.

There are a few other reports of anaphylactic reactions induced by maltose solution.⁵ In some cases, patients repetitively received infusion of maltose solution many times, because physicians could not conceive that an infusion fluid could cause anaphylaxis. Therefore, it is important to note that maltose solution can induce anaphylaxis.

CONFLICT OF INTEREST: None declared.

Masaya MORIWAKI,^{1,2}  Naoki UMEDA,¹ Kaori ISHII,² Hirofumi MORIKAWA,¹ Shunsuke TAKAHAGI,²  Michihiro HIDE² 

¹Department of Dermatology, Hiroshima General Hospital, and ²Department of Dermatology, Graduate School of Biomedical and Health Sciences, Hiroshima University, Hiroshima, Japan

REFERENCES

- 1 Simons FE. Anaphylaxis. *J Allergy Clin Immunol* 2010; **125**: S161–S181.
- 2 Takahagi S, Tanaka A, Iwamoto K, Ishii K, Hide M. Contact urticaria syndrome with IgE antibody against a cefotiam-unique structure, evoked by nonapparent exposure to cefotiam. *Clin Exp Dermatol* 2017; **42**: 527–531.
- 3 Shiratori T, Sato A, Fukuzawa M, Kondo N, Tanno S. Severe dextran-induced anaphylactic shock during induction of hypertension-hypervolemia-hemodilution therapy following subarachnoid hemorrhage. *Case Rep Crit Care*. 2015; **2015**: 967560.
- 4 Cevher ŞK, Ozkayar N, Dede F. A case report on allergic rash caused by icodextrin. *Case Rep Nephrol Dial* 2014; **5**: 26–29.
- 5 Enokibori M, Kuge M, Mori K. Anaphylactoid reaction to maltose 5% solution during spinal anesthesia. *Can J Anaesth* 1998; **45**: 52–55.