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Title	Case of anaphylaxis to maltose solution
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Relation	



1 A case of anaphylaxis to maltose solution

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25 Anaphylaxis may be triggered by various medications. Antibiotics and nonsteroidal anti-
26 inflammatory drugs (NSAIDs) are major causes but anaphylactic reactions to infusion fluids are
27 rare¹⁾. We here report a case of anaphylactic reaction to maltose solution, a widely-used infusion
28 fluid as a carbohydrate source in Japan.

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

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

40 A month later, we performed a histamine release test (HRT) with various concentrations
41 of maltose lactated solution and maltose diluted in assay buffer²⁾. The release of histamine was
42 observed by maltose lactated solution (Fig. 1B) and maltose (Fig. 1C) from the patient's
43 basophils in the presence of 10% serum of the patient, but not from basophils of a healthy
44 control (data not shown). No or only a marginal amount of histamine release was induced by
45 maltose in the absence of the serum (data not shown). These results suggest that the infused
46 maltose obtained antigenicity with molecules in the patient's serum and induced anaphylaxis
47 via type I hypersensitivity. A careful review of his medical history revealed two previous
48 incidents of anaphylaxis upon receiving an infusion of maltose solution.

49 Maltose is a naturally occurring disaccharide consisting of two glucose molecules, and is
50 present in human blood. Intravenously administered maltose migrates into cells in a non-
51 insulin-dependent manner, and is hydrolysed to two molecules of glucose by α -glucosidase
52 (maltase) in the cells. It is further metabolized via anaerobic glycolysis system and a TCA cycle.

53 The size of maltose itself is too small to cross-link multiple IgE as an antigen. However,
54 there are reports of anaphylaxis induced by dextran which also consists of glucose³⁾ and by
55 icodextrin which can be decomposed into maltose⁴⁾. These results suggest the presence of IgE
56 that recognize maltose as (a part of) the antigen. Moreover, cefotiam, an antibiotics with small
57 molecular weight less than 600, is known to become an antigen with human serum albumin²⁾.
58 Therefore, maltose may also bind to serum protein, forming into an antigen recognized by
59 antibodies in the patient.

60 There are a few other reports of anaphylactic reactions induced by maltose solution⁵⁾.
61 In some cases, patients repetitively received infusion of maltose solution many times, because
62 physicians could not conceive that an infusion fluid would cause anaphylaxis. Therefore, it is
63 important to note that maltose solution can induce anaphylaxis.

64

65 Figure Legend:

66 (A) Intradermal test of 5%-sodium salicylate, 4%-methylmethionine sulfonium chloride, 5%-
67 maltose lactated ringer's solution and 10% maltose. Results were positive with 5%-maltose
68 ringer's lactated solution and 10% maltose in saline.

69 (B) Histamine release test for maltose Ringer's lactated solution and (C) maltose. Histamine was
70 released from the patient's basophils by maltose lactated Ringer's solution and maltose, but not
71 from healthy control. Net release is shown in this graph.

72

73 Conflict of interest: none declared.

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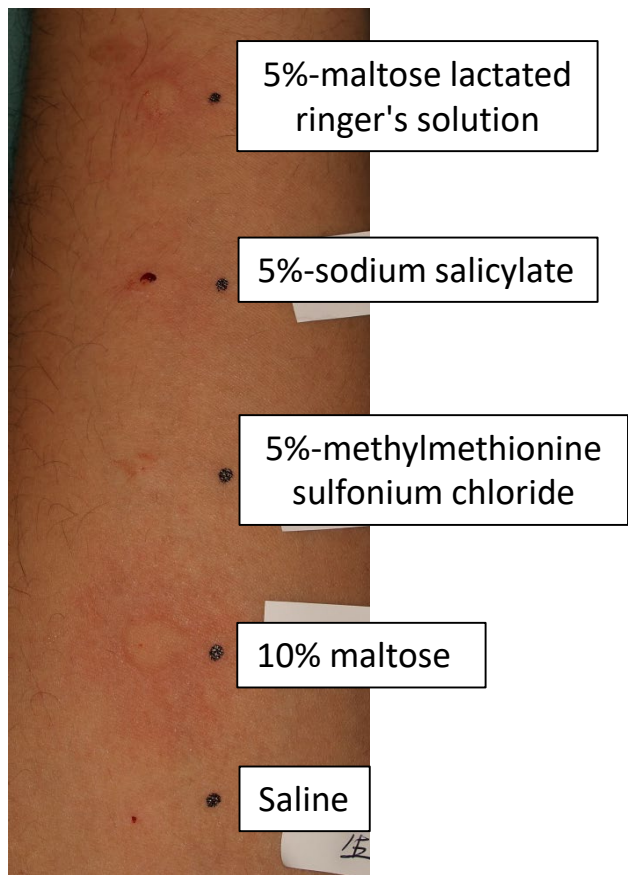
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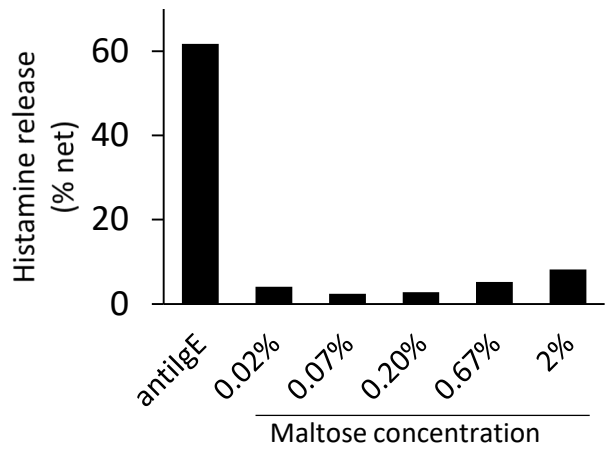
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(A)



(B)



(C)

