

DC-SIGN receptors. Thus, the posttransplant use of rituximab might be effective to prevent an exacerbation of preexisting autoimmunity by repopulating Treg cells in addition to depleting B cells.

Further studies are necessary to evaluate the Treg-cell function after rituximab treatment in patients with WAS, and the exact molecular role of WAS protein in Treg-cell function should be further elucidated.

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Is cooked whole egg really less allergenic than pasteurized raw whole egg powder?

To the Editor:

We read with interest the recent study of Palmer et al¹ addressing the problem of induction of immune tolerance in infants with eczema. In this study children received 1 teaspoon (0.9 g) of pasteurized raw whole egg powder (equivalent to one sixth of an egg, n = 49) or rice powder (control, n = 37) daily from 4 to 8 months of age; 15 children had allergic reactions to raw egg powder and therefore did not continue powder ingestion. Cooked egg (one sixth of a mashed, hard-boiled whole egg) was given to both groups at 8 months in an oral food challenge. Six of 40 children in the egg-exposed group had allergic reactions to the cooked egg. Table II shows that 4 of these children also had allergic reactions to pasteurized raw egg powder. However, this means that 2 children had allergic reactions to cooked egg, even though they had no reaction to a 4-month intake of pasteurized raw egg powder. Does this mean that some children are allergic to cooked but not raw egg?

Cooking the egg reduces its allergenicity²; tolerance to cooked egg usually develops before tolerance to raw egg.³ It has been proposed that pasteurized dehydrated egg white has the same allergenic properties of raw egg.^{4,5} Therefore it is surprising that infants could experience an allergic reaction to whole cooked

egg after a prolonged intake of pasteurized, dehydrated raw whole egg.

Therefore cooked whole egg might not be less allergenic than pasteurized raw whole egg powder. Alternatively, processing might have different effects on food allergens.⁶ Therefore because Palmer et al¹ observed that some of the children had allergic reactions to cooked egg even though they had no reactions to pasteurized raw egg powder, we propose exercising caution in giving whole cooked egg for the first time to infants who have only eaten pasteurized raw whole eggs.

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Reply

To the Editor:

Calvani et al¹ have raised an interesting question with regard to our recent randomized controlled trial on the effects of early regular egg exposure in infants with eczema.² The protocol for this trial included a medically supervised cooked egg exposure at 8 months of age during which infants in both groups were given 2 teaspoons of mashed, hard-boiled whole egg. The dose equated to one sixth of an egg, which was equivalent to the amount of pasteurized raw egg the infants in the intervention group had been consuming daily. Twelve (16%) of the 75 infants who had the cooked egg exposure had an allergic reaction, 6 (15%) of 40 in the egg group and 6 (17%) of 35 in the control group (relative risk, 0.88; 95% CI, 0.31-2.47; *P* = .80). Table I details some of the characteristics of these 12 infants.

Four of the infants in the intervention (egg) group who had an allergic reaction to the cooked egg exposure also had a previous allergic reaction to the pasteurized raw egg powder, and hence the study powder use was stopped. However, it was of particular interest that 2 infants who had an allergic reaction to the cooked egg exposure had regularly consumed the pasteurized raw egg powder. Both of these infants showed increased egg-specific IgG₄ levels between the ages of 4 and 8 months, as described in Table I.

TABLE I. Characteristics of infants (n = 12) with an allergic reaction to cooked egg on the day of cooked egg exposure

Infant's sex	Study powder (ceased because of allergic reaction)	Parent with allergic disease	Objective SCORAD score	Breast-fed at cooked egg exposure	Symptoms after cooked egg exposure	Egg-specific IgG ₄ levels at 4 mo old (mg _A /L)	Egg-specific IgG ₄ levels at 8 mo old (mg _A /L)	Egg-specific IgE levels at 4 mo of age (kU _A /L)	Egg-specific IgE levels at 8 mo of age (kU _A /L)
Male	Egg (no)	Mother + Father	10.9	No	Skin rash, urticaria	<0.07	2.0	<0.1	17.3
Male	Egg (no)	Mother	45.9	No	Skin rash, urticaria	<0.07	18.7	0.39	0.6
Male	Egg (yes)	Father	7.2	No	Vomiting	<0.07	1.0	<0.1	0.66
Male	Egg (yes)	Mother + Father	7.2	No	Vomiting	<0.07	<0.07	<0.1	0.51
Male	Egg (yes)	Mother + Father	17.9	No	Skin rash, urticaria, facial swelling	<0.07	Not done*	0.86	Not done*
Male	Egg (yes)	Mother	19.2	Yes	Facial swelling, vomiting	<0.07	0.12	2.07	7.06
Male	Rice (no)	Mother + Father	22.0	Yes	Skin rash, urticaria, facial swelling, vomiting	Not done*	Not done*	Not done*	Not done*
Male	Rice (no)	Mother + Father	0.0	Yes	Skin rash, urticaria	<0.07	<0.07	<0.1	<0.1
Female	Rice (no)	No	33.6	Yes	Skin rash, urticaria	Not done*	Not done*	0.1	3.42
Male	Rice (no)	Mother	24.9	No	Generalized skin rash	<0.07	Not done*	0.31	Not done*
Female	Rice (yes)	Father	11.1	Yes	Urticaria, vomiting, respiratory difficulties (anaphylaxis)	Not done*	0.23	Not done*	18.2
Male	Rice (yes)	Mother + Father	0.0	No	Skin rash, urticaria, vomiting	0.9	4.13	43.6	8.86

*Unsuccessful blood collection.

It is important to note that both of these infants had persistent moderate-to-severe eczema symptoms during the intervention period. Investigating this further, we have found that the mean objective SCORAD score on the day of the cooked egg exposure was higher ($P = .046$) for those infants who had an allergic reaction (mean objective SCORAD score, 17.5 ± 14.1) compared with those who tolerated the cooked egg (mean objective SCORAD score, 8.3 ± 6.7). We might speculate whether improving the condition of the infant's skin through optimal eczema treatment might be an important management strategy before new food introduction, and therefore this could suggest an important new avenue of investigation in light of our observations. Other possible factors that might alter the immune response around the time of consumption of an "allergenic" food might also play a role. This has been observed in some participants in oral immunotherapy studies who have previously tolerated a particular dose of a food during the desensitization phase but subsequently had allergic symptoms after exposure to the same form and dose of the food during a concurrent illness.³

In the majority of subjects with egg allergy, cooked egg has been shown to be less allergenic than raw egg because of changes in protein (allergen) conformation that occur with cooking. This was seen in our randomized controlled trial in which 32 infants were given a diagnosis of IgE-mediated egg allergy at 12 months of age; however, 23 (72%) of 32 of these infants tolerated hard-boiled egg (n = 21) or baked egg-containing foods (n = 23). The 2 infants who reacted to cooked egg despite tolerating the pasteurized raw egg study powder appear to be an anomaly, and their allergic reaction to the cooked egg exposure could have been a result of an altered immune status on the day. In conclusion, caution should always be taken when introducing egg to infants

with eczema, but the introduction of cooked egg should be tried to allow a more varied nutritious diet when tolerated.

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