64차 알레르기 교육강좌

식품알레르기 진단과 치료의 첫걸음

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Invited Review Article

Japanese guidelines for food allergy 2020☆

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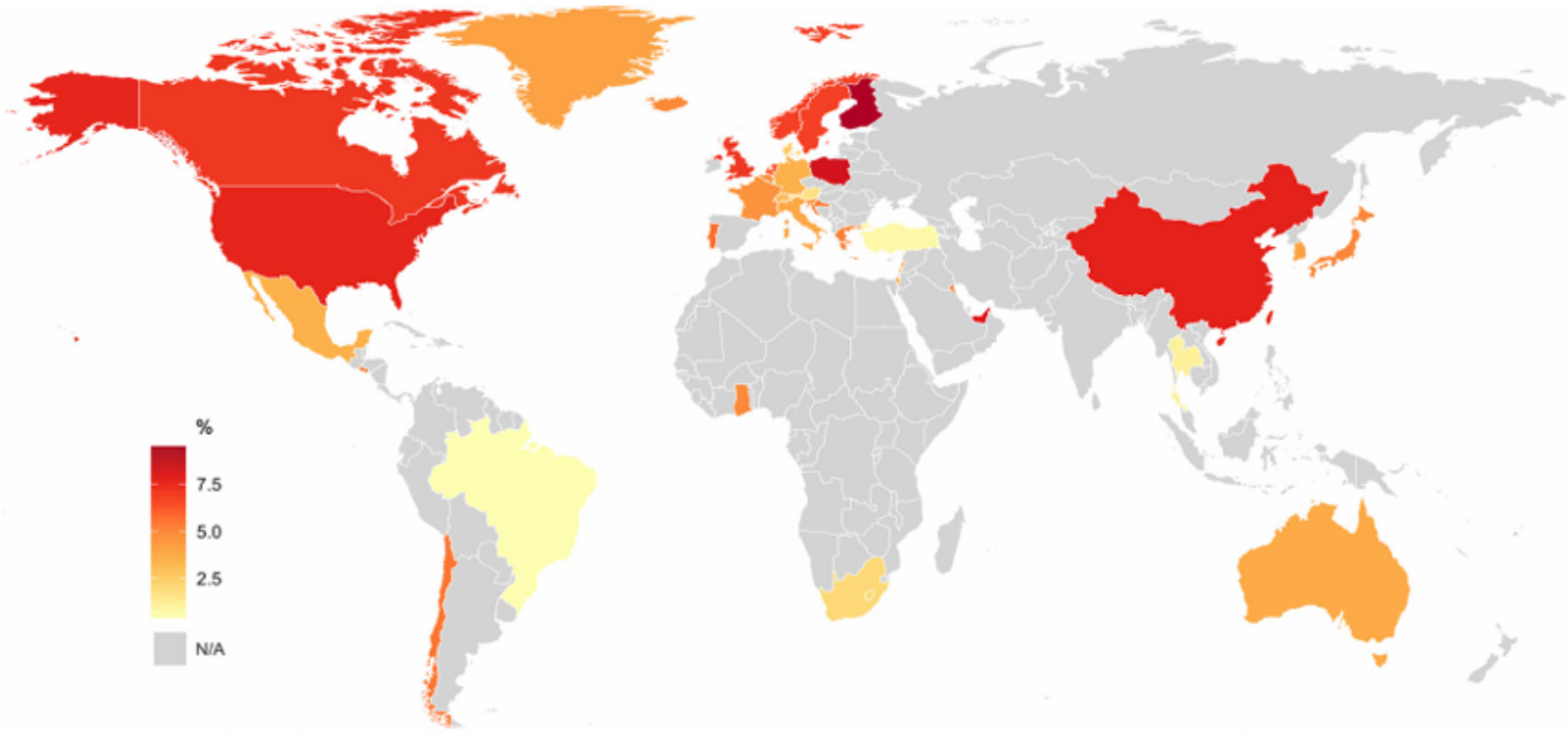
Allergy WILEY

GUIDELINE

EAACI guidelines on the diagnosis of IgE-mediated food allergy

Contents

Food allergy Prevalence



North America

Canada	7.1%	Soller 2012	(0-17 yr)
Mexico	3.5%	Ontiveros 2016	(5-13 yr)
USA	7.6%	Gupta 2018	(0-17 yr)

Central & South America

Brazil	0.6%	Goncalves 2016	(4-59 mo)
Chile	5.5%	Hoyos-Bachiloglu 2014	(5-15 yr)
El Salvador	5.3%	Cabrera-Chavez 2018	(4-12 yr)

Middle East

Israel	3.6%	Graif 2012	(13-14 yr)
Kuwait	5.4%	Ali 2017	(17-30 yr)
Lebanon	4.1%	Irani 2015	(0-17 yr)
Turkey	0.8%	Orhan 2009	(6-9 yr)
UAE	8.0%	Al Hammadi 2010	(6-9 yr)

Europe

Austria	1.7%	Steinke 2007	(0-17 yr)
Belgium	4.9%	Steinke 2007	(0-17 yr)
Croatia	5.4%	Baricic 2015	(6 yr)
Denmark	2.5%	Steinke 2007	(0-17 yr)
Finland	9.3%	Pyrhonen 2009	(1-4 yr)
France	4.7%	Rance 2005	(2-14 yr)
Germany	3.5%	Roehr 2004	(0-17 yr)
Greece	5.2%	Papathoma 2016	(0-3 yr)
Greenland	4.1%	Krause 2002	(5-18 yr)
Iceland	5.0%	Thrastardottir 2018	(2-6 yr)
Italy	3.9%	Steinke 2007	(0-17 yr)
Malta	2.5%	Abdila 2016	(5-6 yr)
Netherlands	6.2%	Saleh-Langenberg 2016	(11-20 yr)
Norway	6.8%	Kvenshagen 2008	(2 yr)
Poland	8.3%	Steinke 2007	(0-17 yr)
Portugal	5.7%	Gaspar-Marques 2014	(0-6 yr)
Slovenia	4.6%	Steinke 2007	(0-17 yr)
Sweden	6.8%	Protudger 2016	(16 yr)
Switzerland	3.1%	Steinke 2007	(0-17 yr)
UK	7.1%	Perkin 2016	(3 yr)

Africa

Ghana	5.0%	Obeng 2011	(5-16 yr)
South Africa	2.0%	Botha 2019	(1-3 yr)

Asia & Oceania

Australia	3.8%	Peters 2017	(4 yr)
China	7.7%	Hu 2010	(0-2 yr)
Hong Kong	4.8%	Ho 2012	(0-14 yr)
Japan	5.1%	Ebisawa 2017	(0-17 yr)
Singapore	5.4%	Lee 2014	(11-30 mo)
South Korea	4.1%	Kim 2017	(6-16 yr)
Taiwan	7.4%	Wu 2012	(0-18 yr)
Thailand	1.1%	Lao-Araya 011	(3-7 yr)

(range of ages comprising study sample)

Current Allergy and Asthma Reports (2020) 20: 6

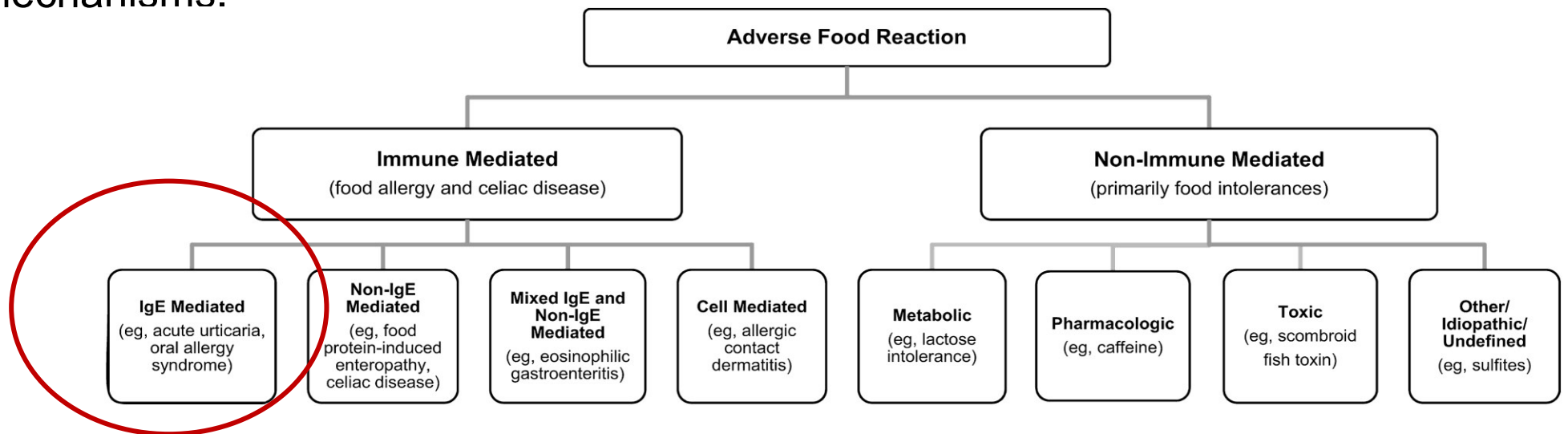
Definition

- **Food Allergy**

  An adverse health effect arising from a specific immune response that occurs reproducibly on exposure to a given food

- **Food Intolerance**

  Non-immune reactions that include metabolic, toxic, pharmacologic, and undefined mechanisms.



Non-IgE and mixed IgE and non-IgE mediated FA

TABLE 1 Examples of non-IgE and mixed IgE and non-IgE mediated food allergies.

Non-IgE mediated food allergy	Mixed IgE and non-IgE mediated food allergy
• Contact dermatitis • Food protein-induced enterocolitis syndrome (FPIES) • Food protein-induced allergic proctitis and proctocolitis • Food protein-induced enteropathy • Dermatitis herpetiformis • Heiner syndrome • Coeliac disease (may also be considered an auto-immune condition)	• Exacerbation of atopic eczema[a] • Eosinophilic oesophagitis • Eosinophilic gastritis/enteritis • Exacerbation of asthma[a]

[a]Following exposure (namely on contact with the skin or by inhalation) to the culprit food allergen.

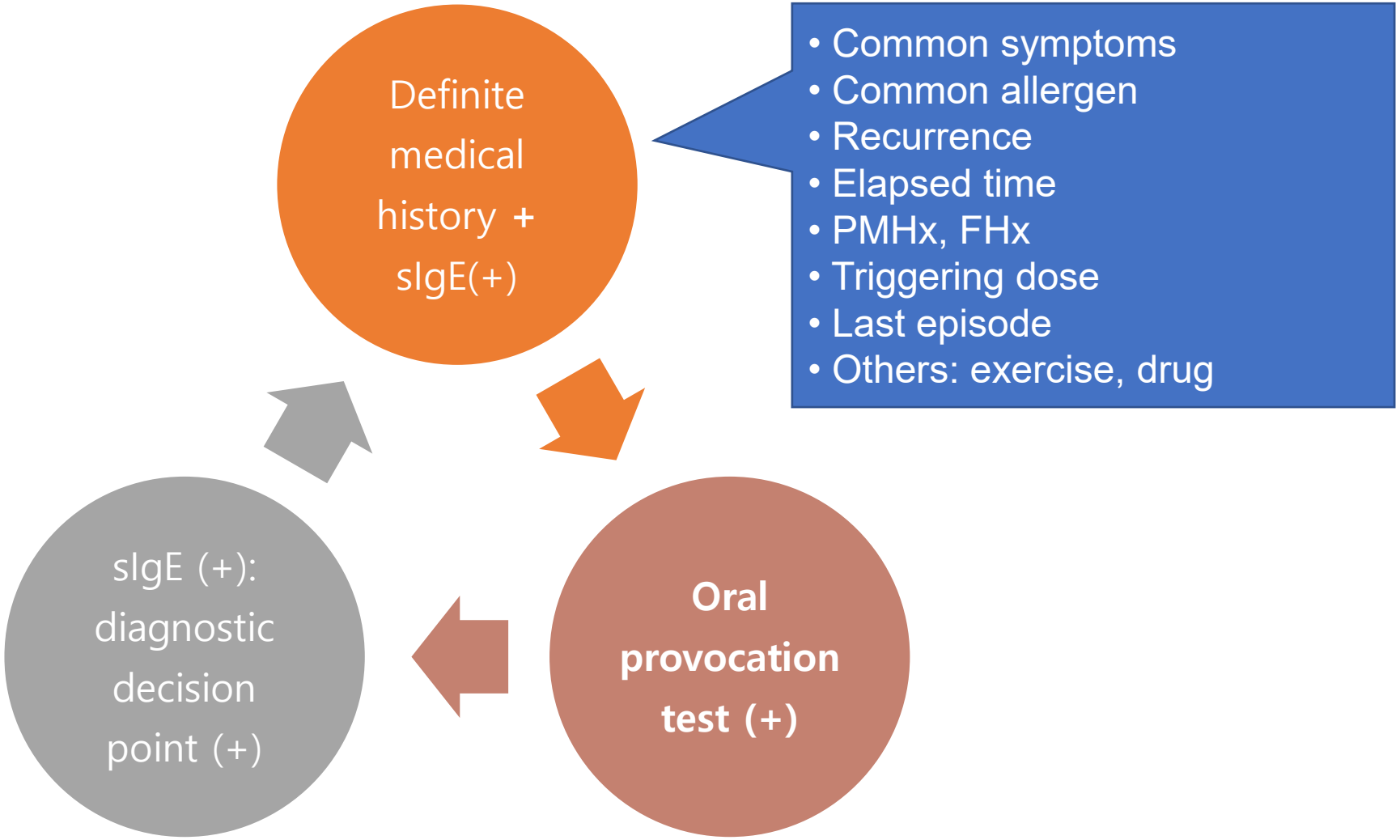
Allergy. 2023;78:3057–3076.

Differential diagnoses of IgE-mediated FA

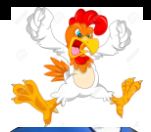
Mechanism	Clinical entities
Metabolic	• Lactose intolerance • Galactosemia • Intolerance to FODMAPs (fermentable oligosaccharides, disaccharides, monosaccharides and polyols)
Pharmacologic	• High histamine-containing foods (e.g. aged cheese, fermented meat fish and sauerkraut) • Histamine-releasing foods (e.g. strawberry, papaya, wine, kiwi and pineapple) • Tyramine (aged cheese, pickled fish) • Caffeine • Theobromine (chocolate) • Phenylethylamine (chocolate) • α-solanine (potatoes) • TRPV1 and TRPA1 agonists (spices, capsaicin, allicin in garlic and onion, ginger, wasabi, horseradish, pepper) • Monosodium glutamate (MSG) • Alcohol • Serotonin (tomato, banana) • Tryptamine (tomato, plum)
Toxic	• Infectious gastritis/enteritis • Histamine intoxication (e.g. Scombroid poisoning, poisoning from other types of fish or cheese)
Other	• Infectious/post-infectious acute urticaria • Bacterial/ yeast / fungal overgrowth • Pancreatic insufficiency • Gustatory rhinitis • Frey syndrome or auriculotemporal syndrome • Stress/anxiety • Psychogenic reactions (factitious illness, food phobias/aversions) • Irritable bowel syndrome (IBS) • Gastroesophageal reflux • Peptic ulcer and other dyspeptic disorders • Anatomical disorders (e.g. hiatal hernia, pyloric stenosis, Hirschsprung disease and tracheoesophageal fistula) • Carcinoid syndrome

Allergy. 2023;78:3057–3076.

Diagnosis of FA

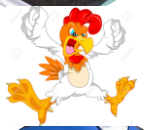


실제 진료실에서는…

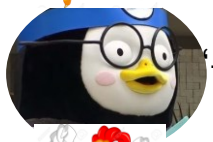


“우유 알레르기가 있는 것 같아요. 얼굴에 두드러기가 나요”

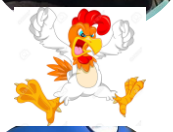
“어떻게 생겼는지 사진 있나요?”



“사진 없어요. 그냥 오돌토돌하게 생겼어요.”

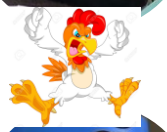


“우유를 먹고 얼마나 있다가 증상이 생기죠?”



“아침에 먹고 저녁때 되면 꼬옥~ 밤에 그래요..”

“발진 말고 다른 증상이 있나요? 기침을 하거나.. 먹기 싫어하거나..“



“먹기 싫어해요. 알레르기 때문에 그런 것 맞죠?”

“그래서 우유를 안 먹고 있나요?”

“ 네..안 먹고 분유 먹고 있어요..”

실제 진료실에서는…

“어제 이유식으로 비트를 처음 먹었는데, 얼굴에 뭐가 났어요“

“원래 우리 애가 피부가 백옥이었는데.. 이 시판 이유식을 먹고 아토피가 생겼어요. 이 회사 잘못 아니에욧~~!!””

“어제 점심에 계란을 먹었는데, 저녁에 발진이 전신에 막 올라왔어요. 그리고나서 밤에 열이 났어요. 근처 소아과를 다녔는데, 발진이 일주일동안 없어지질 않았어요. 알레르기일까봐 걱정되요 "

Common food allergen in early childhood

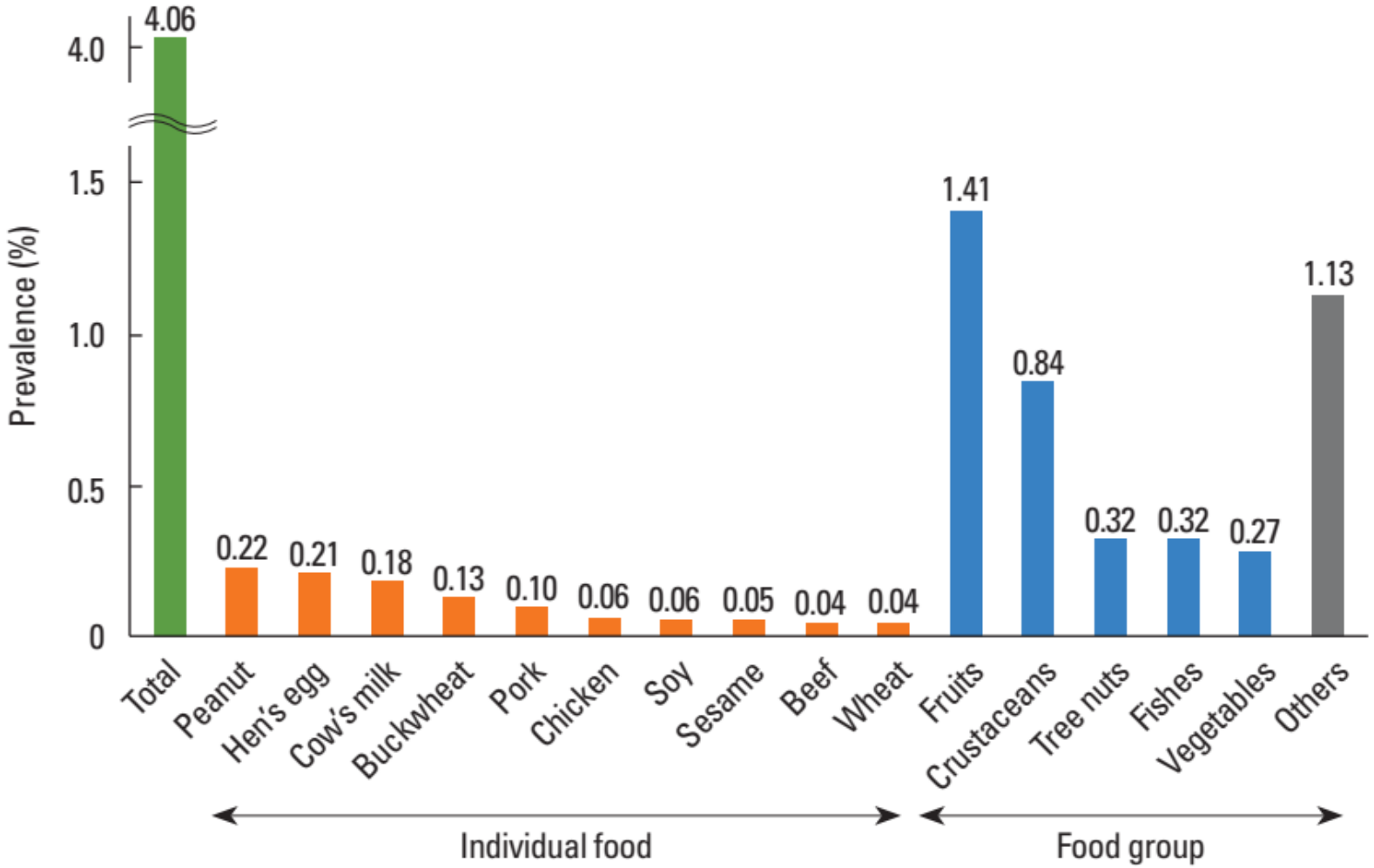
Table 2. Causes of immediate-type food allergy in Korean children depending on the age groups

	< 2 years	2-6 years	7-12 years	13-18 years
Sample size	1,073	331	76	29
1st	Cow's milk (37.1%)	Walnut (16.6%)	Walnut (13.2%)	Buckwheat (17.2%)
2nd	Hen's egg (34.3%)	Hen's egg (15.4%)	Buckwheat (9.2%)	Wheat (10.3%)
3rd	Wheat (8.3%)	Cow's milk (11.2%)	Peanut (6.6%)	Shrimp (10.3%)
4th	Walnut (4.0%)	Peanut (9.7%)	Wheat (6.6%)	
5th	Peanut (3.7%)	Wheat (8.5%)	Crab (6.6%)	
6th	Soybean (1.8%)	Almond (5.1%)	Apple (6.6%)	
7th	Pine nut (0.9%)	Pine nut (3.6%)	Hen's egg (5.3%)	
8th	Shrimp (0.9%)	Buckwheat, Kiwi (3.0% each)	Shrimp (5.3%)	

<2 years and 2-6 years: causative foods with ≥10 cases were included in this table; 7-12 years and 13-18 years: causative foods with ≥3 cases were included in this table.

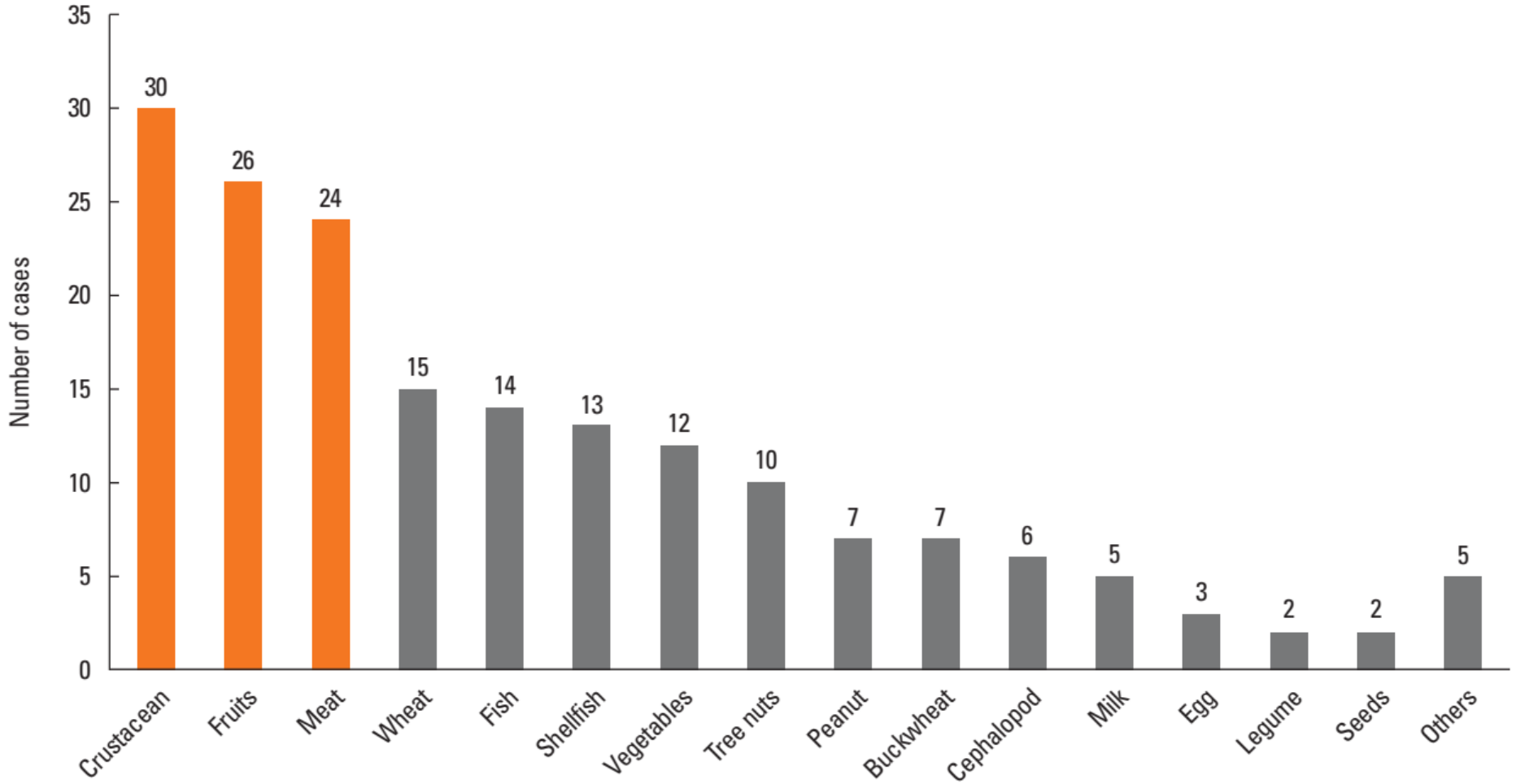
Allergy Asthma Immunol Res. 2017September;9(5):423-430

Common food allergen in Korean schoolchildren



Allergy Asthma Immunol Res. 2017 September;9(5):410-416

Common food allergen in adults



Allergy Asthma Immunol Res. 2017 November;9(6):534-539.

Symptoms of IgE-mediated food allergy

Organ or system	Symptoms and signs
Skin	Urticaria Angio-oedema Pruritus Flushing Erythema in the predilection sites of eczema Ear or palm itching
Gastro-intestinal	Oral/pharyngeal pruritus Oral/pharyngeal swelling Vomiting Nausea Abdominal cramps Diarrhoea Abdominal pain
Ocular	Conjunctival erythema Pruritus Lacrimation
Respiratory	Rhinitis (rhinorrhoea, sneezing, nasal obstruction, pruritus) Hoarseness Stridor/laryngeal oedema Cough Dyspnoea Chest tightness Wheezing Cyanosis
Cardiovascular	Pallor Cold sweats Heart palpitations Pre-syncope / Syncope Tachycardia Hypotension Shock
Neurological	Anxiety 'Feeling of impending doom' Change in behaviour Irritability Apathy Lethargy Seizures Syncope/Loss of consciousness
Other	Uterine contractions resulting in abdominal pain and bleeding Shivering

Allergy. 2023;78:3057–3076.

Key questions for an allergy-focused history.

Age at symptom onset	When did the manifestations start? Infancy, childhood, adolescence or adulthood
Presenting symptoms—type and severity	Symptom type and organ involved (skin, gut, upper and lower airway, neurological, cardiovascular), and whether they were mild, moderate or severe
Speed of symptom onset and duration of symptoms	Were the symptoms immediate, usually within a few minutes and up to 2 h after eating (3–6 h for alpha-gal allergy)? Did the symptoms resolve spontaneously?
Treatment for previous reactions	Was an antihistamine given and effective? Were other medications administered including adrenaline?
Food(s) suspected	Which foods were new to the individual's diet? Have they been eaten previously without a problem? Were they eaten in a different form previously? Are hidden allergens a likely trigger? Foods commonly implicated in IgE-mediated food allergy: cow's milk, egg, wheat, soya, sesame, peanut, tree nuts, fish, shellfish, legumes, fruits and vegetables. Common hidden allergens: celery, mustard, cochineal, lupin, soy, fenugreek, other legumes such as pea/bean/lentil protein, insects/mealworm, pink peppercorns)
Quantity of food	How much of the ingested food provoked symptoms—a mouthful, or up to a whole portion?
Reproducibility of reactions	Does the reaction occur every time the food is eaten, or can it be tolerated in a different form, or a different variety (fruits and vegetables)?
Food processing	Was the food raw, cooked or processed and does tolerance depend on the cooking method?

Allergy. 2023;78:3057–3076.

Key questions for an allergy-focused history.

Route of exposure	Was the suspected food ingested, touched or inhaled? Occupational exposure to the food?
Involvement of co-factors	Did the reaction only occur when the food was eaten within 2 h and was it linked to exercise, alcohol, aspirin or non-steroidal anti-inflammatory drugs, acid suppressant medications, sleep deprivation, stress, cannabis use, hormonal factors?
Setting of the reaction	Where did the reaction occur? At home, school, restaurant, on holiday or in the workplace?
Potential for cross-reactivity	Is the patient sensitized to pollens, latex or house dust mite? If so, what is the potential for a cross-reactive food allergy?
Dietary history	What is the type of feeding (breast and/or formula feeds)? What is the complementary food history (if applicable), typical daily intake and foods habitually consumed without consequence?
Previous/current food elimination	Which foods are being avoided? Has a food allergy been diagnosed before or was an elimination diet undertaken previously? and if so, what was the result?
Other foods being avoided	Which foods are avoided for personal, religious or cultural reasons?
Dietary Adequacy	Is the current diet nutritionally adequate or is it already compromised due to the exclusion of foods for other reasons? Consider the effect of dietary restrictions with regard to age, growth, weight loss (body mass index) and current food intake.
History of concomitant atopic and other diseases	Are atopic dermatitis, seasonal or perennial allergic rhinitis, asthma and urticaria present?
Family history of atopic disease	Do any of their parents and/or siblings have atopic disease?

Allergy. 2023;78:3057–3076.

Tests to support the diagnosis of IgE-mediated allergy

Diagnostic tests	Rationale for using these tests to support the diagnosis of IgE-mediated food allergy
Skin prick test to allergen extracts	Wheal size reflects the amount of mast cell mediators following stimulation with allergen.
Skin prick test to fresh food (prick-to-prick)	Wheal size reflects the amount of mast cell mediators following stimulation with allergen. Use of fresh foods can increase sensitivity of tests as fresh foods contain allergens that may be destroyed or excluded during preparation of allergen extracts (e.g. thermolabile allergens or lipophilic allergens).
Specific IgE to allergen extracts	Concentration of IgE in the serum reflect the amount of circulating IgE antibodies directed to the allergen tested.
Specific IgE to individual allergen components	IgE to specific allergen components shown to be clinically relevant can be more specific than IgE to whole allergen extracts.
Basophil activation test	Proportion of in vitro allergen-activated basophils reflects the amount of mediators released by circulating basophils following stimulation with allergen. This functional test uses patients' own basophils and detects the combined intrinsic cellular response and effect of allergen-IgE binding.

Allergy. 2023;78:3057–3076.

Diagnostic decision point

	혈청 IgE (kU/L)		Predictive Level (%)
Milk	<12mon	**≥ 5**	95
	≥12mon	**≥ 15**	94
Egg	<24mon	**≥ 2**	94
	≥24mon	**≥ 7**	98
Soybean		**≥ 30**	73
Wheat		**≥ 26**	74
Peanut		**≥ 14**	95
Tree nuts		**≥ 15**	~95
Fish		**≥ 20**	100

J Allergy Clin Immunol 2004;113:805-19

검사의 판독 (milk)

Table 2. Positive predictive values of cow milk-specific IgE titers reported from various studies

Year	Reporter	Country	Number	Prevalence (%)	% of AD	PPV	Age	sIgE titer (kU_A/L)
1997	Sampson[1]	US	109	50	All	95% PPV	0.6-17.9 yr	32
2001	**Sampson[2]**	**US**	**62**	**66**	**61**	**90% specificity (95% PPV)**	**3 mo-14 yr**	**15***
2001	**Garcia-Ara[14]**	**Spain**	**170**	**44**	**23**	90% PPV **95% PPV**	<1 yr **<1 yr**	2.5 **5***
2001	Roehr[10]	Germany	98	41	all	100% PPV (with APT)	2 mo-11.2 yr	0.35
2004	Garcia-Ara[15]	Spain	66	all	unrevealed	90% PPV	13-18 mo 19-24 mo 25-36 mo	1.5 6 14
2005	Celik-Bilgili[5]	Germany	397	49	88	90% PPV	<1 yr 1-16.1 yr	25.8 88.8
2007	Komata[14]	Japan	861	25	74	95% PPV	<1 yr 1 yr ≥2 yr	5.8 38.6 57.3
2015	Kim[6]	Korea	225	23.1	81.3	90% PPV	<2 yr ≥2 yr	31.4 10.1

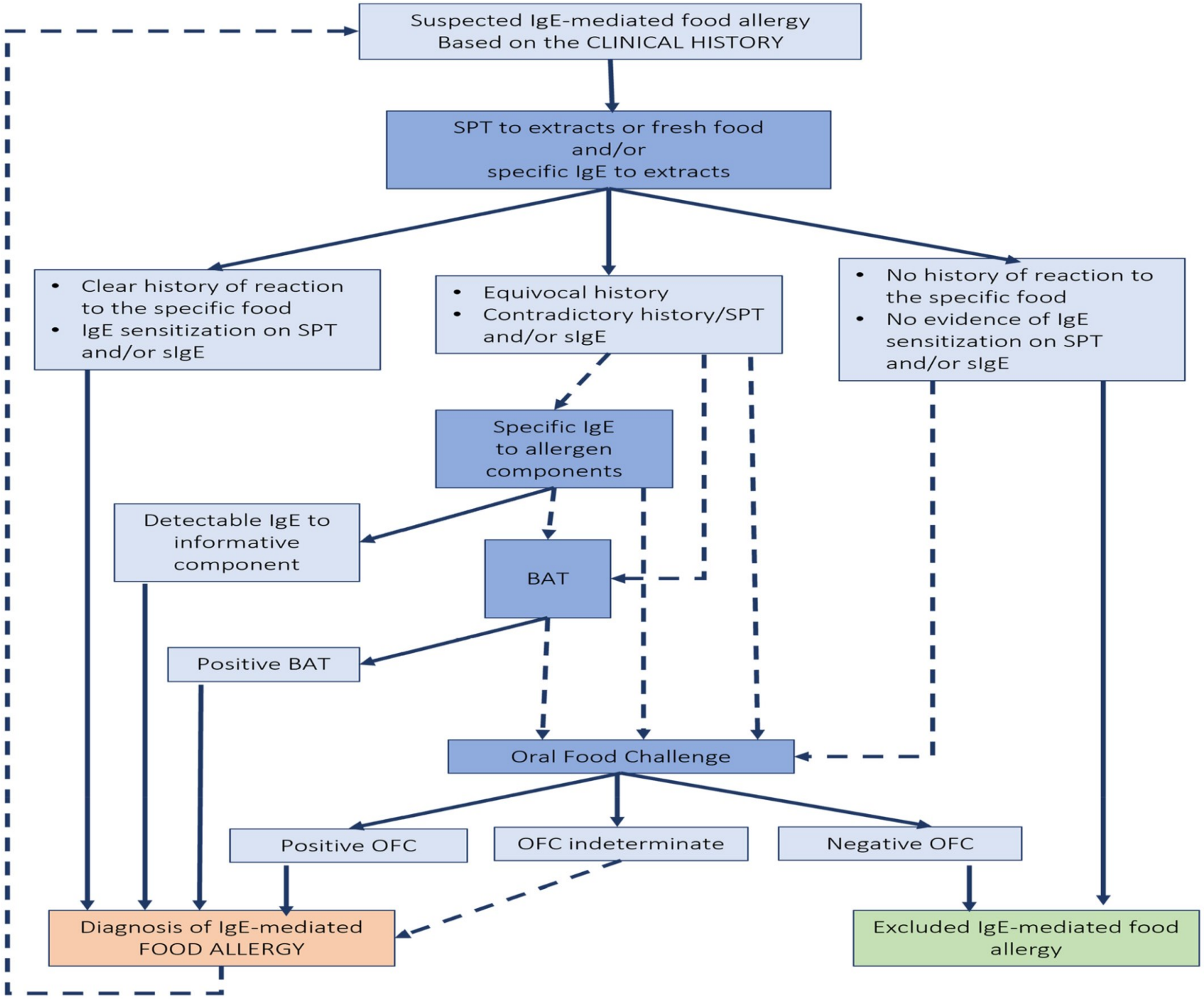
Allergy Asthma Immunol Res. 2015 July;7(4):309-311

Diagnostic performance of various tests for specific foods based on the results of recent meta-analyses

Diagnostic test	Cow's milk	Egg	Peanut	Hazelnut	Cashew	Sesame	Wheat	Shrimp
Skin prick test								
Cut-offs (mm)	4 (3; 8)	5 (3; 8)	4 (3–8)	5 (3–7)	5 (4–6)	8 (4–10)	3 (3–5)	3 (3–5)
Sensitivity	0.52 (0.24- 0.79)	0.68 (0.37- 0.88)	0.84 (0.69- 0.92)	0.82 (0.68- 0.91)	0.93 (0.89- 0.96)	0.70 (0.55- 0.82)	0.53 (0.23;0.81)	0.62 (0.44 0.77)
Specificity	0.80 (0.65- 0.90)	0.77 (0.64- 0.86)	0.86 (0.79- 0.91)	0.78 (0.44; 0.94)	0.92 (0.82; 0.96)	0.89 (0.76- 0.95)	0.72 (0.57; 0.84)	0.90 (0.31; 0.99)
Specific IgE to allergen extracts								
Cut-offs (KU/L)	3.5 (0.9–10.5)	3.5 (1.7–5.5)	4.3 (0.35–10)	2.34 (0.6–6.3)	1.1 (0.6–3.1)	7.5 (0.9–50)	0.6 (0.35–5.6)	1.2 (0.5–3.1)
Sensitivity	0.82 (0.59; 0.94)	0.85 (0.77; 0.90)	0.81 (0.71- 0.88)	0.79 (0.71- 0.85)	0.94 (0.89- 0.97)	0.70 (0.23- 0.95)	0.72 (0.54; 0.84)	0.96 (0.42; 1.00)
Specificity	0.92 (0.80; 0.97)	0.73 (0.63- 0.80)	0.83 (0.71- 0.90)	0.62 (0.38- 0.81)	0.64 (0.54- 0.74)	0.83 (0.26- 0.99)	0.79 (0.68; 0.86)	0.63 (0.46- 0.78)
Specific IgE to allergen-components								
Cut-offs (KU/L)	Casein 2.6 (1.0–5.3)	Ovomucoid 0.8 (0.35–3.7)	Ara h 2 0.44 (0.3–1.3)	Cor a 14 0.64 (0.35–3.5)	Ana o 3 0.4 (0.2; 0.6)	Ses i 1 2.0 (0.3-4.0)	Omega-5-gliadin 0.3 (0.1–0.6)	Pen a 1 1.1 (0.6; 4.4)
Sensitivity	0.67 (0.53- 0.78)	0.74 (0.54; 0.87)	0.82 (0.77- 0.86)	0.73 (0.53- 0.87)	0.96 (0.91- 0.98)	0.77 (0.64-0.86)	0.79 (0.68- 0.88)	0.62 (0.45- 0.76)
Specificity	0.93 (0.85- 0.97)	0.91 (0.87- 0.93)	0.92 (0.87- 0.95)	0.95 (0.90- 0.98)	0.94 (0.88- 0.97)	0.87 (0.77-0.92)	0.78 (0.66- 0.86)	0.89 (0.75- 0.95)
Basophil activation test								
Cut-offs (%CD63+ Basophils)			5.0 (4.7–7.1)			10.9 (8.2–11. 6)		
Sensitivity			0.84 (0.76- 0.90)			0.89 (0.80- 0.94)		
Specificity			0.90 (0.83- 0.94)			0.93 (0.76- 0.98)		

Allergy. 2024;79:324–352

FA diagnosis Algorithm



Allergy. 2023;78:3057–3076.

Non-recommended tests for the diagnosis of IgE-mediated allergy.

Test type	Background	Rationale for recommending against these tests.
IgG and IgG subclass testing	**-IgG4**: Produced in response to tolerance -Presence of antibodies **does not indicate disease**	**-Limited to research settings** only -No evidence supports **IgG alone** for diagnosing IgE-mediated allergies
Hair analysis	**electromagnetic resonance** on hair samples	**No/insufficient evidence** to support this test for diagnosing **IgE-mediated allergies**
indiscriminate panel testing	-Clarifying cross-reactivity in multiple plant food allergies -Combined pollen and food allergies -Identifying hidden triggers in recurrent anaphylaxis	Allergen selection should be **based on clinical history**

Indication for oral food challenge (OFC)

IgE sensitization (+), but..	No Ig E sensitization, but..
해당 식품 섭취력 (-), 또는 이전에는 섭취 가능하였으나 오랫동안 섭취하지 않은 경우	해당식품에 대한 반응(+)
결과값 > validated cut-off level 이지만 관련 애매	높은 불안도 and/or 여러가지 식품 금식 중
흡입 항원과의 교차 감작에 의한 식품 항원 양성 의심(예: HDM-shellfish, Pollens-fruits, nuts)	Non-IgE-mediated food allergy 의심될 때
Eliciting dose 결정 → therapeutic regimen 결정	
Tolerance 획득 예상될 때	
특정 형태 섭취 가능 여부 확인 (예: baked milk/egg, cooked/processed fruits/veg/nuts)	

Allergy. 2023 Dec;78(12):3057-3076.

개방경구유발시험

- 외래에서 가능하며, IgE 매개형 식품알레르기에서 주로 사용
- 시험 전 준비사항
  - 설명과 동의서
  - 환자의 상태: 건강해야 하며, 동반된 알레르기질환이 잘 조절되고 있는 상태이어야 함.
  - 해당식품은 적어도 7일 동안은 섭취해서는 안됨.
  - 성인은 적어도 4시간, 영유아나 소아는 평소 양의 절반 정도의 가벼운 식사를 시험 전 2시간 전에 주도록 함.
  - 통상적으로 아침 시간 동안 시험 시행
  - 환자가 반응하거나 최대용량에 이를 때까지 15-30분 간격으로 증가
  - 의미 있는 반응이 있으면 수 시간 동안의 환자 관찰 필요
  - 시험 전 약물 투여 중단

Pediatr Allergy Respir Dis(Korea) 2012;22:3-20

개방경구유발시험

- 경구유발시험 식품의 총 용량
- 체중(kg) 당 0.15-0.3 g의 단백질
- 총 단백질량 3 g, 총 식품용량 10 g을 초과하지는 않는다.
- 이전에 심한 반응이 있었던 환자는 체중(kg) 당 0.06 g 정도의 단백질량 추천
- 식품마다 단백질 함량이 다르므로 주의 필요
- 경구유발시험 총량의 0.1-1.0 %로 시작
- 증량은 환자가 반응하거나 최대 용량에 이를 때까지 15-30분 간격으로 2배씩 혹은 로그 평균(1, 3, 10, 30, 100배 등의 순서)을 이용하여 증가시킨다.

Example 2) Egg*, boiled, medium-sized (total dose 55 g): preparation with scales

Time (min)	Dose (g)†
0	Lip provocation†
15	1†
30	2†
45	6†
60	18†
75	Rest†
135	(observation)

*Clinician may use egg white and/or egg yolk according to patients. †Amount of doses may be adjusted on the basis of a patient's history.

Example 3) Milk 200 mL (except for low-fat or fortified milk)

Time (min)	Dose (mL)*
0	Lip provocation*
15	1*
30	2*
45	6*
60	18*
75	54*
90	Rest*
135	(observation)

*Amount of doses may be adjusted on the basis of a patient's history.

Pediatr Allergy Respir Dis(Korea) 2012;22:3-20

부록 1. 식품 경구유발시험 설명서

식품 경구유발시험에 대한 설명문

식품 경구유발시험 설명서

날짜: 20 년 월 일

등록번호 :	이름 :	생년월일 :
주소 :		전화번호 :

식품과 관련하여 나타날 수 있는 다양한 반응을 일컬어 '식품에 의한 이상 반응'이라고 하며, 이 중에서 면역학적 기전에 의해 발생하는 이상 반응을 '식품 알레르기'라고 합니다.

식품 알레르기의 원인이 무엇인지를 확인하는 방법은 알레르기 피부시험, 혈액 검사 등 여러 가지가 있습니다. 그러나 가장 확실한 방법은 의심되는 식품을 직접 먹인 후 이상 반응을 확인하는 '식품 경구유발시험'입니다.

식품 경구유발시험은 크게 두 가지 목적으로 실시할 수 있습니다.

첫 번째는 대상 식품이 알레르기의 원인인지를 확인하려는 경우입니다. 경구유발시험의 결과가 양성인 경우 식품 알레르기를 확실하게 진단할 수 있으므로 원인 식품에 대하여 주의를 기울일 수 있고 따라서 부주의한 섭취로 인한 위험을 피할 수 있습니다. 경구유발시험 결과가 음성인 경우에는 더 이상 불안감으로 식품 섭취를 망설일 필요가 없기 때문에 안심하고 골고루 먹일 수 있어서 균형 잡힌 영양 공급과 함께 생활의 폭도 넓어질 수 있습니다.

두 번째는 이미 확인된 식품 알레르기가 없어졌는지를 평가하기 위한 경우입니다. 아이들은 성장하면서 식품에 대한 알레르기 반응이 없어질 수 있으므로 이를 확인하기 위하여 일정한 시간이 지난 후 경구유발시험이 필요할 수 있습니다.

식품 경구유발시험은 식품섭취 후에 입이나 목구멍의 가려움증, 전신적 가려움증, 발진이나 두드러기, 구역, 구토, 설사 등의 증상이 있으면 양성으로 판정합니다. 드물게 호흡 곤란, 혈압 하강, 혼돈 상태, 쇼크 등의 심각한 증상이 초래되기도 하므로 이러한 상황에 대한 응급 처치를 수행할 수 있는 준비가 되어 있는 장소에서 검사를 하게 됩니다.

식품 경구유발시험 전에는 다음과 같은 준비 사항을 확인하여야 합니다.

식품 경구유발시험 전 준비사항	예	아니오
1) 지금까지 먹던 약이나 흡입 혹은 바르는 약을 지속해도 되는지 담당자에게 확인 합니다.	□	□
2) 검사 예정 시간 2시간 전부터는 금식 합니다.	□	□
3) 경구용 항히스타민제를 지참 합니다.	□	□
4) 원인이 된다고 여기는 음식은 최소한 7일 이상 섭취를 제한합니다. *모유 수유아의 경우에는 엄마도 드시지 않아야 합니다.	□	□
5) 기타 사항 : 검사 당일 아이는 건강한 상태이어야 합니다. 감기 등의 질병이 있는 경우에는 주치의에게 전화하여 예약 날짜를 재조정		

부록 2. 피험자 동의서

식품 경구유발시험에 대한 동의서

피험자 동의서(법적 대리인용)

진단명 :

검사명 :

등록번호 :

환자이름 :

시행일 :

환자 _____의 보호자 _____는 본원에서 실시되는 식품 경구유발시험과 관련된 모든 정보(원인, 결과의 판독, 장점, 부작용) 들에 관하여 책임자(담당자)로부터 자세하게 설명을 듣고, 설명서를 통해 그 내용을 충분히 이해하였습니다.

이에 환자/환자의 법적 대리인인 본인은 자유로운 의사에 따라 본 검사에 참여할 것을 동의합니다.

년 월 일

성명 : _____ (인)

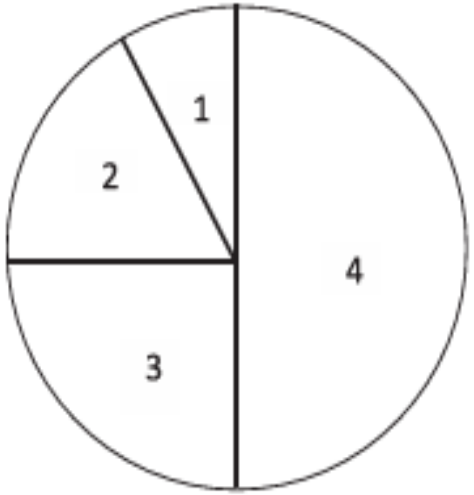
어머니 : _____ (인)

아버지 : _____ (인)

설명인 : _____ (인)

Current version : V1 Current date : 2012. 03 대한 소아알레르기 호흡기학회

Open OFC protocol

Four Dose Protocol	Six Dose Protocol
Divide the serving as outlined below. Dose 1 = 1/12th of the total serving Dose 2 = 1/6th of the total serving Dose 3 = 1/4 of the total serving Dose 4 = 1/2 of the total serving  	Dose 1 = 1% of total dose Dose 2 = 4% of total dose Dose 3 = 10% of total dose Dose 4 = 20% of total dose Dose 5 = 30% of total dose Dose 6 = 35% of total dose

Risk
(fatal and near-fatal food-induced reactions)

- Peanut, tree nuts, fish, shellfish, and milk
- Asthma (regardless of severity).
- Delayed use of epinephrine.
- Upright posture during assessment of the anaphylactic reaction may contribute to cardiovascular compromise.

J Allergy Clin Immunol Pract 2020;8:75-90

Allergen	Food	Protein content per serving size	Age				
			4-11 mo	1-3 y	4-8 y	9-18 y	19+ y
Egg	French toast (1 egg per 1 slice of bread)*	6 g if made with 1 large egg	1/2-1 slice	1/2-1 slice	1 slice	1-2 slices	1-2 slices
	Hard-boiled or scrambled egg	6 g/1 large egg	1/2-1 egg	1/2-1 egg	1 egg	1-2 eggs	1-2 eggs
Fish	Cooked fish†	6 g/1 oz	1/2-1 oz	1 oz	1 oz	2-3 oz	3-4 oz
Grains	Cooked cereal	5 g per 1/4 cup dry (oatmeal or Cream of Wheat)	1/4 cup	1/4 cup	1/3-1/2 cup	1/2-1 cup	1/2-1 cup
	Cooked pasta*/rice	3 g per 1/2 cup	1/4 cup	1/4 cup	1/3-1/2 cup	1/2-1 cup	1/2-1 cup
	Infant cereal	1-2 g per 1/4 cup	1/4-1/2 cup	1/4-1/2 cup			
	Muffin or roll bread*	4-6 g/muffin or roll	1/4-1/2 piece	1/2 piece	1/2-1 piece	1 piece	1 piece
	Ready-to-eat cereal	2-6 g/1 cup	1/4-1/3cup	1/4-1/3 cup	1/2-3/4 cup	3/4-1 cup	3/4-1 cup
	Slice bread	2-4 g/slice	1/4-1/2 slice	1/2 slice	1/2-1 slice	1-2 slices	2 slices
Milk	Infant formula	2-3 g/5 oz	4-8 oz				
	Milk	8 g/8 oz		4-8 oz	4-8 oz	8 oz	8 oz
	Cottage cheese	10-14 g/4 oz	1/4-1/2 cup	1/4-1/2 cup	1/2-1 cup	1/2-1 cup	1 cup
	Hard cheese	6-8 g/1 oz	1/4-1/2 oz	1/2 oz	1 oz	1 oz	1 1/2 oz
	Yogurt (NOT Greek style)	8 g/8 oz	1/4-1/2 cup	1/4-1/2 cup	1/2-1 cup	1/2-1 cup	1/2-1 cup
Peanut	Peanut (whole)	2 g/~8 peanuts			16 pieces	16 pieces	16 pieces
	Peanut butter	3 g/1 tbsp	1 rounded tbsp‡	1-2 tbsp	1-2 tbsp	2 tbsp	2 tbsp
	Peanut flour or peanut butter powder	3 g/1 tbsp original or 2.25 g/1 tbsp chocolate flavor	1 rounded tbsp‡	1-2 tbsp	1-2 tbsp	2 tbsp	2 tbsp
	Peanut/chocolate candy cups (full-size)	0.875 g/1 cup		1-2 candy cups	1-2 candy cups	2-3 candy cups	2-3 candy cups
Shellfish	Shellfish§	5 g/1 oz	1/2-1 oz	1 oz	1 oz	2-3 oz	3-4 oz
Soy/legumes	Infant formula	2-3.1 g/5 oz	4-8 oz				
	Soy beverage	7 g/8 oz		4-8 oz	4-8 oz	8 oz	8 oz
	Cooked beans (kidney, black, chickpeas, lentils)	7-9 g per 1/2 cup	1/8-1/4 cup	1/4 cup	1/3-1/2 cup	1/2-1 cup	1 cup
	Tofu	8 g/3 oz Firm tofu	1/2-1 oz	1 oz	1 oz	2-3 oz	3-4 oz
	Yogurt	5 g/6 oz	1/4-1/2 cup	1/4-1/2 cup	1/2-1 cup	1 cup	1 cup
Tree nut	Almond	3 g/11 whole nuts			11 pieces	11 pieces	11 pieces
	Almond butter (Barney butter brand)	3 g/1 tbsp	1 tbsp ‡	1-2 tbsp	1-2 tbsp	1-2 tbsp	1-2 tbsp
	Brazil nut	3 g/4.5 nuts			4 1/2 pieces	4 1/2 pieces	4 1/2 pieces
	Cashew	3 g/10 whole nuts			10 pieces	10 pieces	10 pieces
	Coconut flour	3 g/1 tbsp	1 tbsp	1-2 tbsp	1-2 tbsp	2-3 tbsp	2-3 tbsp

J Allergy Clin Immunol Pract 2020;8:75-90

Open OFC protocol

Table 10
Examples of total challenge doses in oral food challenge test (open method).

Doses	Hen's egg	Cow's milk	Wheat
Low dose	One cooked egg yolk, about 1/32 cooked whole egg	About 3 mL	Udon noodle (50–75 mg wheat protein)
Medium dose	About 1/8–1/2 cooked whole egg	15–50 mL	Udon noodle (375–1250 mg wheat protein)
Full dose	One cooked whole egg 50 g (corresponding to one egg)	200 mL	Udon noodle 200 g, one of six slices of 5000 mg wheat protein

Table 12
Administration intervals and dividing methods in oral food challenge tests.

Dosing method	Administration interval	Dose dividing method
Single dose	–	1/1
Two doses	60 min	1/4 → 3/4, 1/3 → 2/3
Three doses	30–60 min	1/8 → 3/8 → 1/2
Five doses	20–40 min	1/16 → 1/16 → 1/8 → 1/4 → 1/2

Table 11
Examples of total challenge doses in an oral food challenge test (open method).

	Total challenge dose	Special instructions
Fish	Fish stock (Dashi), fish 50–100 g	Most patients do not react to fish stock.
Shrimp	20–40 g	
Potatoes	50–100 g	
Fruit	50–100 g	
Shellfish/Molluscs	10–20 g	
Meats	20–50 g	Very few patients react to meats.
Soybeans	Boiled soybeans 5–10 g, Tofu 50–100 g, soy milk 200 mL	Very few patients react to soy sauce and miso.
Buckwheat	2–80 g (boiled)	Severe reactions may occur.
Peanut, sesame, and other nuts	0.1–10 g	As a measure against accidental ingestion, the test may be conducted with a total challenge dose of 0.1–0.5 g. Food elimination can be released at school in a case that patient can intake 10 g. Each peanut weighs approximately 1 g.

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Treatments implemented on the day of the OFC

TABLE 1 Treatments implemented on the day of the oral food challenge

	Total ($n = 10,050$)	0 years ($n = 4904$)	1–2 years ($n = 2347$)	≥3 years ($n = 2799$)	p-Value*
Total of each treatment					
Adrenaline	82 (0.8)	39 (0.8)	23 (1)	20 (0.7)	.56
1 injection	74 (0.7)	33 (0.7)	21 (0.9)	20 (0.7)	
≥2 injections	8 (0.1)	6 (0.1)	2 (0.1)	0 (0.0)	
Antihistamine injection	98 (1.0)	47 (1.0)	24 (1.0)	27 (1.0)	.96
Corticosteroid injection	113 (1.1)	52 (1.1)	26 (1.1)	35 (1.3)	.75
β_2 stimulant by nebulizer	68 (0.7)	29 (0.6)	16 (0.7)	23 (0.8)	.49
Oxygen supply	18 (0.2)	10 (0.2)	7 (0.3)	1 (0.0)	.07
Fluid transfusion	240 (2.4)	106 (2.2)	66 (2.8)	68 (2.4)	.23
Combination of drugs					
Adrenaline + antihistamine + corticosteroid	23 (0.2)	7 (0.1)	10 (0.4)	6 (0.2)	.06
Adrenaline + antihistamine	30 (0.3)	11 (0.2)	11 (0.5)	8 (0.3)	.2
Adrenaline + corticosteroid	31 (0.3)	13 (0.3)	10 (0.4)	8 (0.3)	.5
Antihistamine + corticosteroid	63 (0.6)	30 (0.6)	16 (0.7)	17 (0.6)	.93

Clin Exp Allergy. 2022;52:898–900

증 례 1

8개월 남아

특이병력 없음

이전에 모유 수유하다가 **분유 섭취 후 1시간 후 두드러기** 발생

출생 직후 조리원에서 잠깐 분유섭취 하였다가 처음 먹어 봄.

가족력: 음성

- 검사: 특이 IgE (U/mL) : 난백 3.88, **우유 7.15**, 밀 1.69, 콩 0.48, 땅콩 0.36

→ Definite medical Hx + sIgE → FA (cow's milk)

증 례 2

- 8개월 남아
- 간헐적으로 혼합수유 하던 도중 2일전부터 분유를 먹으면 2시간정도 뒤부터 보채면서 입주위를 문지름

  기타 다른 증상 없음.

- Milk sIgE = 0.45 (kUL/L)

→ OFC

증 례 3

21/F

S) 딸기, 망고, 사과, 복숭아, 배, 토마토 먹을 때 입술이 가렵고,붓는다. 가끔 목에 두드러기도 발생한다.

Onset: 7 years ago

Past medical history: 봄철에 늘 nasal sx(+)

고양이 만지면 itching(+),sneezing(+)

증 례 3

검사종목	검사결과 (단위:mm)	양성도
1. D.pteronyssinus (유럽집먼지 진드기)	21*19	5+
2. D.farinae (아메리카집먼지 진드기)	20*15	5+
3. Cockroach (바퀴벌레) - 독일형, 아메리칸형 혼합	0*0	-
4. Alternaria (알터나리아)	0*0	-
5. Cat fur (고양이털)	10*8	5+
6. Dog hair (개털)	5*3	3+
7. Grass mixture, B2(2.0%) (잔디혼합*)	5*5	3+
8. Orchard grass (새발풀)	8*7	4+
9. Timothy grass (큰조아재비)	11*6	4+
10. Bermuda (우산잔디)	2*3	2+
11. B3 Trees(10) (나무혼합**)	10*8	5+
12. Birch (자작나무)	9*9	5+
13. Oak (참나무)	13*12	5+
14. Alder (오리나무)	11*7	5+
15. Hazel (개암나무)	19*14	5+
16. Japanese ceder (삼나무)	2*2	2+
17. B5 Weeds & Shrubs (잡초혼합***)	18*16	5+
18. Mugwort (쑥)	22*10	5+
19. Cult. Rye (경작호밀)	5*7	4+
20. Ragweed (두드러기쑥, 돼지풀)	7*6	4+
21. Milk (우유)	0*0	-
22. Whole Egg (달걀)	7*6	4+
23. Peanut(땅콩)	2*2	2+
24. Histamine (양성대조)	3*3	
25. Prick Control (음성대조)	0*0	

O) Apple : 33.0 KUA/L
Birch: 83.9 KUA/L
Oak: 65.4 KUA/L

A) AR/AC, pollen (tree, grass, weed), HDM, pet
Oral allergy syndrome

Cross-reactivity patterns in oral allergy syndrome (pollen-food allergy syndrome)

Birch

Apple Peach Plum Pear Cherry Apricot Almond

Rosaceae

Carrot Celery Parsley Caraway Fennel Coriander Aniseed

Apiaceae

Soybean Peanut

Fabaceae (old Leguminosae)

Hazelnut

Betulaceae

Ragweed

Cantaloupe Honeydew Watermelon Zucchini Cucumber

Cucurbitaceae

Banana

Musaceae

Mugwort

Celery Carrot Parsley Caraway Fennel Coriander Aniseed

Apiaceae

Bell pepper

Solanaceae

Black pepper

Piperaceae

Mustard Cauliflower Cabbage Broccoli

Brassicaceae

Garlic Onion

Liliaceae

Peach

Rosaceae

Pollen food allergy syndrome (PFAS)

- Primary sensitization (pollen) → cross reacts (fresh fruit, vegetables, and legumes)
- Symptoms:
  - immediate-onset oropharyngeal symptoms on ingestion of raw fruit
  - lipid transfer protein (LTP) that can present with anaphylaxis
- Most prevalent new-onset food allergy in adults
- Diagnosis: history taking, sIgE antibodies,

  prick-prick test using fresh vegetables and fruit

  oral challenge test
- While an elimination diet is the basis of treatment,

  many heat-treated foods can be orally ingested.
- Antihistamine medication

증 례 4

17세/남자

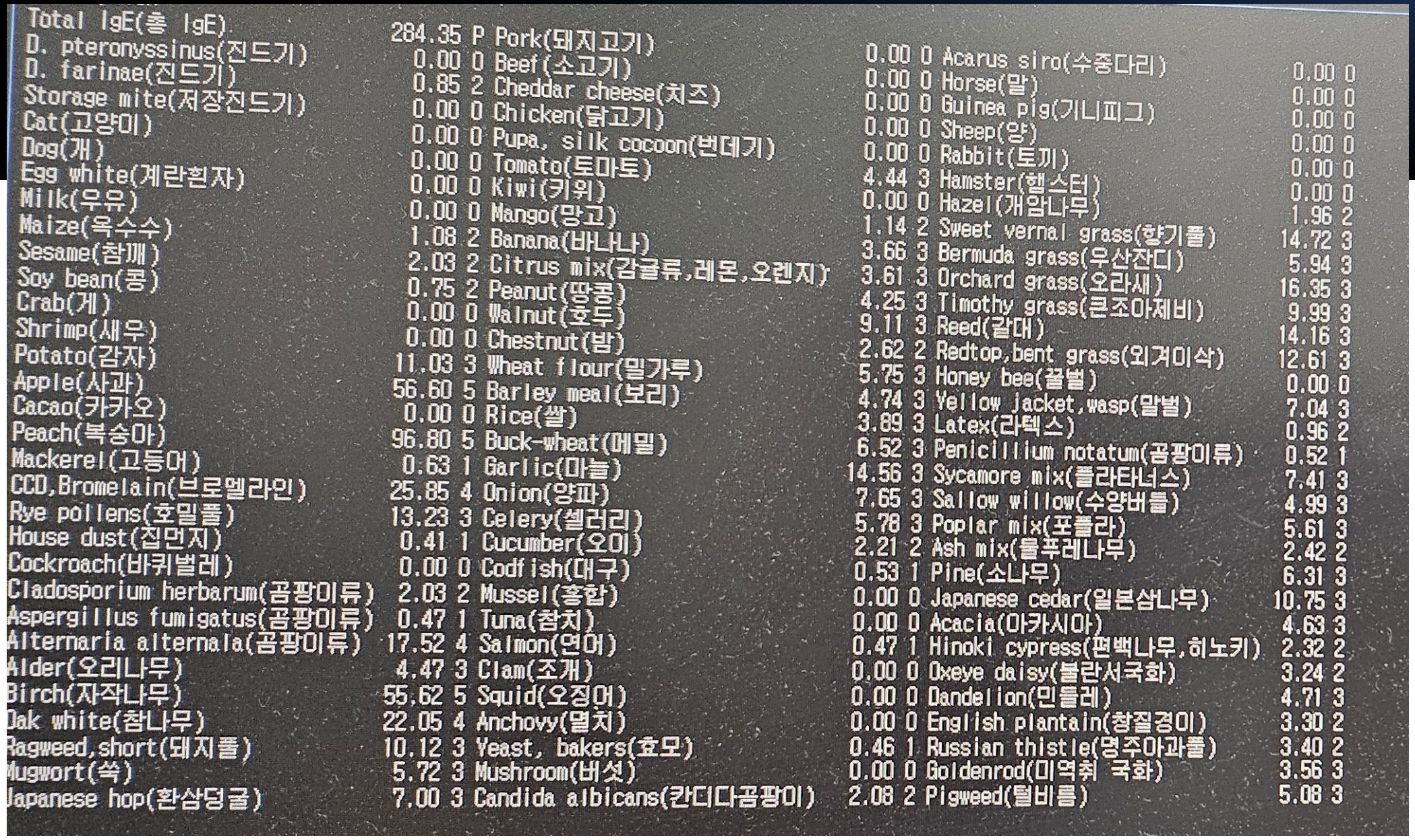
23년 3월부터 urticaria 발생
식품에 따라서 악화되는지 잘 모르겠음.
봄에 증상이 더 심했음.
땅콩, 견과류 괜찮다. 우유는 안 먹으려고 한다.

과거력: atopic dermatitis(+)

Table 4. Recommended diagnostic tests in chronic urticaria

분류	아형	기본검사	추가로 고려해볼 수 있는 검사
만성 자발성 두드러기		말초혈액검사	제1형 과민반응
		적혈구침강속도(ESR)	기능성 자가항체
		C 반응단백(CRP)	갑상선 호르몬 및 자가항체
		의심약물 중단	감염 질환(헬리코박터균 등)
			물리적 자극을 포함한 피부반응시험
			가성 알레르겐 제한식이(3주)
			자가혈청 피부반응시험
			피부조직검사
			트립타제*
만성 유발성 두드러기	한랭 두드러기	한랭 유발시험 (얼음조각, 찬물, 찬공기)	말초혈액검사, ESR, CRP, cryoproteins
	지연성 압박 두드러기	압박검사	없음
	피부묘기증	피부를 긁은 후 반응 확인	말초혈액검사, ESR, CRP
	콜린성 두드러기	운동 또는 뜨거운 목욕	없음
	일광 두드러기	파장별 자외선 검사	밝기에 의한 피부반응 감별 필요
	열 두드러기	열 유발 시험	없음
	진동성 혈관부종	진동 검사	없음
	수인성 두드러기	20분간 젖은 옷에 노출 (체온과 동일 온도)	없음
	접촉성 두드러기	피부 접촉 시험	없음

ESR, erythrocyte sedimentation rate; CRP, C-reactive protein.
*중증 전신 질환이 의심되는 경우 시행 고려



Total IgE(총 IgE)							
D. pteronyssinus(진드기)							
D. farinae(진드기)							
Storage mite(저장진드기)							
Cat(고양이)							
Dog(개)							
Egg white(계란흰자)							
Milk(우유)							
Maize(옥수수)							
Sesame(참깨)							
Soy bean(콩)							
Crab(게)							
Shrimp(새우)							
Potato(감자)							
Apple(사과)							
Cacao(카카오)							
Peach(복숭아)							
Mackerel(고등어)							
CCD,Bromelain(브로멜라인)							
Rye pollens(호밀풀)							
House dust(집먼지)							
Cockroach(바퀴벌레)							
Cladosporium herbarum(곰팡이류)							
Aspergillus fumigatus(곰팡이류)							
Alternaria alternala(곰팡이류)							
Alder(오리나무)							
Birch(자작나무)							
Oak white(참나무)							
Ragweed,short(돼지풀)							
Mugwort(쑥)							
Japanese hop(환삼덩굴)							
	284.35	P	Pork(돼지고기)				
	0.00	0	Beef(소고기)	0.00	0	Acarus siro(수중다리)	0.00 0
	0.85	2	Cheddar cheese(치즈)	0.00	0	Horse(말)	0.00 0
	0.00	0	Chicken(닭고기)	0.00	0	Guinea pig(기니피그)	0.00 0
	0.00	0	Pupa, silk cocoon(번데기)	0.00	0	Sheep(양)	0.00 0
	0.00	0	Tomato(토마토)	0.00	0	Rabbit(토끼)	0.00 0
	0.00	0	Kiwi(키위)	4.44	3	Hamster(햄스터)	0.00 0
	0.00	0	Mango(망고)	0.00	0	Hazel(개암나무)	1.96 2
	1.08	2	Banana(바나나)	1.14	2	Sweet vernal grass(향기풀)	14.72 3
	2.03	2	Citrus mix(감귤류,레몬,오렌지)	3.66	3	Bermuda grass(우산잔디)	5.94 3
	0.75	2	Peanut(땅콩)	3.61	3	Orchard grass(오라새)	16.35 3
	0.00	0	Walnut(호두)	4.25	3	Timothy grass(큰조아제비)	9.99 3
	0.00	0	Chestnut(밤)	9.11	3	Reed(갈대)	14.16 3
	11.03	3	Wheat flour(밀가루)	2.62	2	Redtop,bent grass(외겨이삭)	12.61 3
	56.60	5	Barley meal(보리)	5.75	3	Honey bee(꿀벌)	0.00 0
	0.00	0	Rice(쌀)	4.74	3	Yellow jacket,wasp(말벌)	7.04 3
	96.80	5	Buck-wheat(메밀)	3.89	3	Latex(라텍스)	0.96 2
	0.63	1	Garlic(마늘)	6.52	3	Penicillium notatum(곰팡이류)	0.52 1
	25.85	4	Onion(양파)	14.56	3	Sycamore mix(플라타너스)	7.41 3
	13.23	3	Celery(셀러리)	7.65	3	Sallow willow(수양버들)	4.99 3
	0.41	1	Cucumber(오이)	5.78	3	Poplar mix(포플라)	5.61 3
	0.00	0	Codfish(대구)	2.21	2	Ash mix(물푸레나무)	2.42 2
	2.03	2	Mussel(홍합)	0.53	1	Pine(소나무)	6.31 3
	0.47	1	Tuna(참치)	0.00	0	Japanese cedar(일본삼나무)	10.75 3
	17.52	4	Salmon(연어)	0.00	0	Acacia(아카시아)	4.63 3
	4.47	3	Clam(조개)	0.47	1	Hinoki cypress(편백나무,히노키)	2.32 2
	55.62	5	Squid(오징어)	0.00	0	Oxeye daisy(불란서국화)	3.24 2
	22.05	4	Anchovy(멸치)	0.00	0	Dandelion(민들레)	4.71 3
	10.12	3	Yeast, bakers(효모)	0.00	0	English plantain(창질경이)	3.30 2
	5.72	3	Mushroom(버섯)	0.46	1	Russian thistle(명주아과풀)	3.40 2
	7.00	3	Candida albicans(칸디다곰팡이)	0.00	0	Goldenrod(미역취 국화)	3.56 3
				2.08	2	Pigweed(털비름)	5.08 3

증 례 4

O)

CBC: w.n.l

Chemistry: w.n.l

TFT: w.n.l

A) Chronic U

Mx) Regular antihistamine

증 례 5

37/M

- 2019/4/1 저녁 7시경 빵 먹고 산책하던 도중 전신 두드러기, 어지러움증, 안면 부종으로 응급실 내원함

  평소에 국수, 빵 먹어도 이상이 없다.

- 2018년도에 등산 끝나고 감자전, 바베큐, 술 먹고 걸어와서 두드러기 발생

증 례 5

O) Gluten (글루텐)(CAP) 4.62 KU/L

ω-5 Gliadin (CAP) 6.38 KU/L

Wheat (밀)(CAP) 2.76 KU/L

A) Food dependent exercise-induced anaphylaxis

Food dependent exercise-induced anaphylaxis (FDIEA)

- Induced by **exercise after food ingestion**
- **Does not occur** after either **food ingestion** or **exercise alone**
- Mostly induced by exercise **within 2hr** after food ingestion
- Common foods: **wheat, crustaceans**
- High intensity exercise, NSAID medication, alcohol, infection → exacerbation
- Diagnosis: history taking, allergy test, provocation test
- **No drug** has been determined to **prevent** FDEIA
- Lifestyle guide: not to consume any causative food within 2 h prior to exercise
- Caution is required to avoid instructing complete elimination of foods and restriction of physical exercise

증 례 6

- 은표와 춘희는 아이들과 함께 캠핑을 왔다. 아침에 일어났을 때 아이들이 보이지 않았고, 어느 텐트에서 무엇인가를 먹고 있는 아이들을 발견한 은표.

- 갑자기 동주가 몸을 **가려워하더니 호흡곤란**을 호소하며 쓰러진다. **견과류 알레르기가** 있던 동주가 **마카롱**을 먹고 **아나필락시스**가 발생한 것이다.

- 더 이상 시간을 지체할 수 없어 그 길로 춘희는 차를 세우고 주사를 놓자 동주는 안정을 되찾는다.

Anaphylaxis

- Anaphylaxis: serious, systemic hypersensitivity reaction that is usually rapid in onset and may cause death.

Table 5
NIAID and WAO Side-by-Side Comparison[10,19]

NIAID criteria (2006)	WAO criteria (2020)
Anaphylaxis is highly likely when any one of the following 3 criteria are fulfilled: 1. Acute onset of an illness (minutes to several hours) with involvement of the skin, mucosal tissue, or both (eg, generalized hives, pruritus or flushing, swollen lips-tongue-uvula) and at least one of the following: a. Respiratory compromise (eg, dyspnea, wheeze-bronchospasm, stridor, reduced PEF, hypoxemia) b. Reduced BP or associated symptoms of end-organ dysfunction (eg, hypotonia [collapse], syncope, incontinence) 2. Two or more of the following that occur rapidly after exposure to a likely allergen for that patient (minutes to several hours): a. Involvement of the skin mucosal tissue (eg, generalized hives, itch-flush, swollen lips-tongue-uvula) b. Respiratory compromise (eg, dyspnea, wheeze-bronchospasm, stridor, reduced PEF, hypoxemia) c. Reduced BP or associated symptoms (eg, hypotonia [collapse], syncope, incontinence) d. Persistent gastrointestinal symptoms (eg, crampy abdominal pain, vomiting) 3. Reduced blood pressure after exposure to known allergen for that patient (minutes to several hours): a. Infants and children: low systolic BP (age specific) or greater than 30% decrease in systolic BP b. Adults: systolic BP of less than 90 mm Hg or greater than 30% decrease from that person's baseline	Anaphylaxis is highly likely when any one of the following 2 criteria are fulfilled: 1. Acute onset of an illness (minutes to several hours) with involvement of the skin, mucosal tissue, or both (eg, generalized hives, pruritus or flushing, swollen lips-tongue-uvula) and at least one of the following: a. Respiratory compromise (eg, dyspnea, wheeze-bronchospasm, stridor, reduced PEF, hypoxemia) b. Reduced BP or associated symptoms of end-organ dysfunction (eg, hypotonia [collapse], syncope, incontinence) c. Severe gastrointestinal symptoms (eg, severe crampy abdominal pain, repetitive vomiting), especially after exposure to non-food allergens 2. Acute onset of hypotension or bronchospasm[a] or laryngeal involvement after exposure to a known or highly probable allergen for that patient (minutes to several hours), even in the absence of typical skin involvement. a. Excluding lower respiratory symptoms triggered by common inhalant allergens or food allergens perceived to cause "inhalational" reaction in the absence of ingestion.

Ann Allergy Asthma Immunol 132 (2024) 124–176

Anaphylaxis

알레르기 **원인물질에 노출된 후 즉시 또는 2시간 이내에** 아래와 같은
증상이 두 가지 이상의 기관에서 나타나는 경우

>> 피부

입속, 귀속이 따끔거림
입술, 구강 부종
가려움
홍반
두드러기

>> 호흡기

삼키거나 말하기 힘듬
호흡곤란
숨소리

>> 심장혈관계

실신
요실금
혈압저하

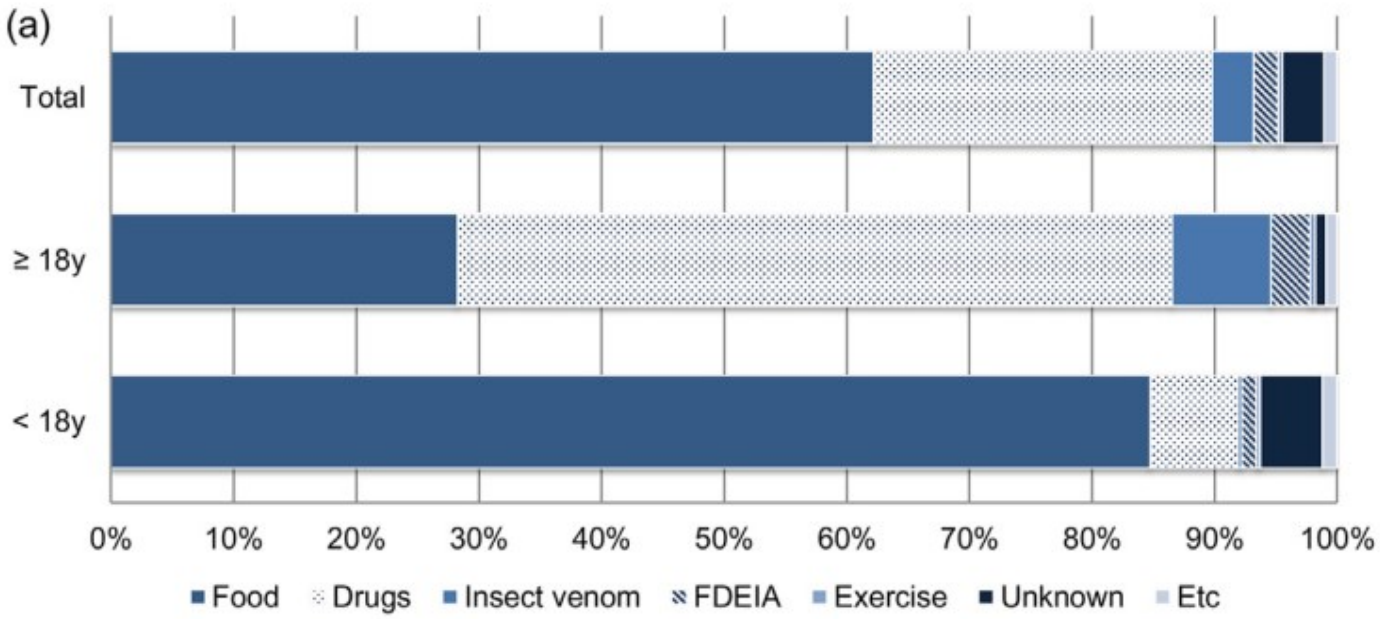
>> 소화기

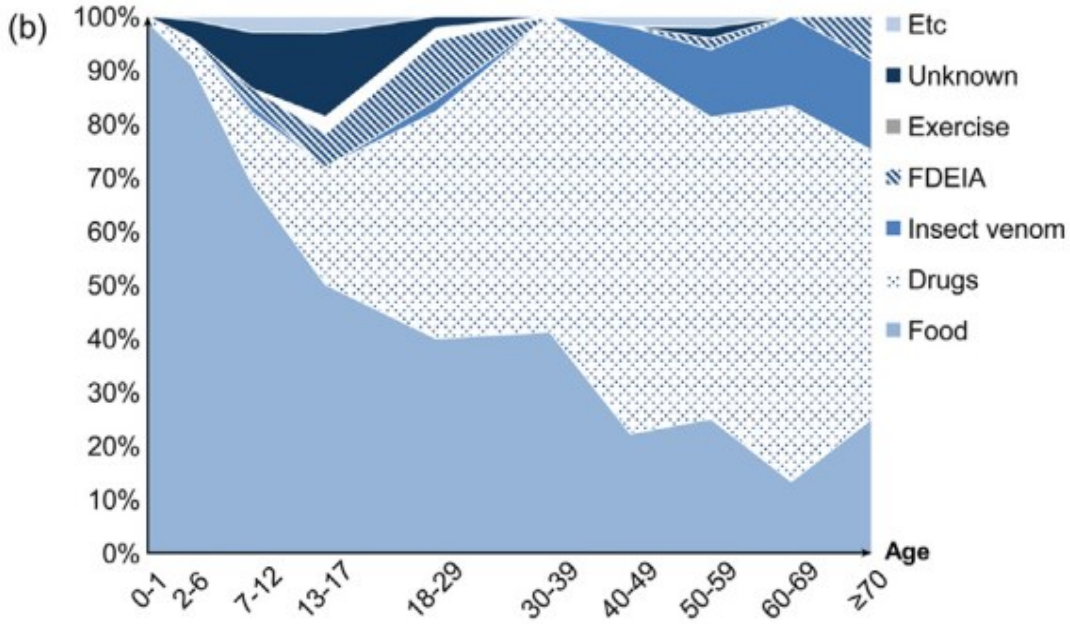
구역
설사
복통
구토

>> 전신 및 신경

죽을 것 같은 느낌
의식소실
금속 맛
부종
불안감

Triggers of anaphylaxis





World Allergy Organization Journal (2020) 13:100449

Specific food triggers and drug triggers of anaphylaxis.

Children and adolescents (<18 years)

	Triggers	n (%[b])
Food	Hen's egg	72 (25.4)
	Cow's milk	51 (18.0)
	Walnut	27 (9.5)
	Wheat	23 (8.1)
	Peanut	14 (4.9)
	Kiwi	12 (4.2)
	Pine nut	11 (3.9)
	Buckwheat	9 (3.2)
	Soybean	5 (1.8)
	Other foods	60 (21.1)
Drugs	Analgesics	13 (54.2)
	Antibiotics	4 (16.7)
	Other drugs	7 (29.1)

Adults (≥18 years)

Food	Shrimp	14 (22.2)
	Wheat	12 (19.0)
	Crab	4 (6.3)
	Soybean	2 (3.2)
	Peanut	2 (3.2)
	Beef	2 (3.2)
	Pork	2 (3.2)
	Other foods	25 (39.7)
Drugs	Antibiotics	65 (50.0)
	Analgesics	24 (18.5)
	H_2 blockers	23 (17.7)
	Radiocontrast media	2 (1.5)
	Other drugs	16 (12.3)

World Allergy Organization Journal (2020) 13:100449

Anaphylaxis emergency action plan

07. 응급처치는 어떻게 하나요?

01

원인을 제거하거나 중단합니다.

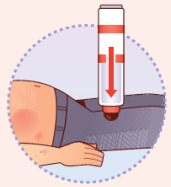
02

편평한 곳에 눕히고, 의식과 맥박, 호흡을 확인합니다.

03

빨리 119에 연락하거나 주변에 도움을 청합니다.

04

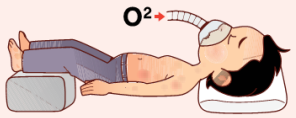


에피네프린이 있으면, 주사하고 시간을 기록합니다.

05

다리를 올려서 혈액순환을 유지합니다.

06



산소가 있으면 마스크로 공급합니다.

07

2차 반응이 올 수 있으므로 응급실로 신속하게 이송합니다.

* 3, 4, 5는 동시에 시행합니다.
* 자가주사용 에피네프린 구입방법은 주치의에게 문의하세요.

08. 자가주사용 에피네프린(에피펜®) 사용법

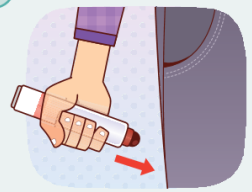
01

오렌지색 부분을 아래로 향하게 한 손으로 잡고 위쪽에 있는 파란색 안전 팁을 다른 손으로 뽑습니다.

02

파란색 안전탭을 건드리지 않습니다.

03



오렌지색 팁 부분이 대퇴부(허벅지) 바깥쪽 부위에 가깝게 위치되도록 에피네프린을 잡습니다.

04

팔을 흔들어서 대퇴부 바깥쪽에 수직방향으로 딸깍 소리가 날 때까지 끝을 강하게 밀어서 넣고, 약이 제대로 들어가도록 10초 정도 이 상태를 유지합니다.

05

기구를 대퇴부에서 떼고, 주사 부위를 약 10초 정도 마사지합니다.

06

에피네프린 사용만으로 치료가 충분치 않으므로 주사 후 반드시 가까운 병원으로 가도록 합니다.

Epinephrine auto-injector

Table 21
Specifications for EAIs and Prefilled Epinephrine Injection Devices

Name	Dosage (mg)	Weight class specified by manufacturer[a] (kg)	Weight class supported by practice parameter[a] (kg)	Needle length[b] (cm)	Pressure[c]
Adrenaclick	0.15	15-30	<25	1.17	High
	0.3	≥30	≥25	1.17	High
Anapen[d]	0.15	15-30	<25	1.0-1.5	High
	0.3	≥30	≥25	1.0-1.5	High
Auvi-Q	0.1	7.5-15	<13	0.64-0.89	High
	0.15	15-30	<25	1.14-1.4	High
	0.3	≥30	≥25	1.47-1.73	High
Emerade[d]	0.15	15-30	<25	1.5-1.67	Low
	0.3	≥30	≥25	2.21-2.36	Low
	0.5	>60	≥45	2.21-2.36	Low
Epipen Jr.	0.15	15-30	≤25	1.0-1.5	High
Epipen	0.3	≥30	≥25	1.3-1.8	High
Jext[d]	0.15	15-30	≤25	1.3	High
	0.3	≥30	≥25	1.5	High
Symjepi	0.15	15-30	≤25	Not published	N/A
	0.3	≥30	≥25	Not published	N/A

Epinephrine auto-injector

- Administration: anterolateral aspect of the mid-thigh
- Standard adrenaline concentration: 1mg/mL
- Recommendation dose: 0.01 mL/kg (0.01mg/kg)
- Maximum single dose:
  ≥ 12-year-old patients 0.5mL (0.5mg)
  <12-year-old patients 0.3mL (0.3mg)
- Re-evaluation for 5-15minutes

- AAP
- 0.1 mg dose (if available) for patients weighing 7.5 to 13 kg
- 0.15 mg dose for patients weighing 13 to 25 kg
- 0.3mg dose (≥ 25kg)

- AAP & JTFPP supports the use of 0.15 mg epinephrine auto-injector(EAI) for infants or children weighing less than 15 kg.

- 0.5 mg EAI (Emerade) is also available in some countries for patients weighing more than 60 kg.

- We suggest that they routinely prescribe more than 1 EAI when patients have previously required multiple doses of epinephrine to treat an episode of anaphylaxis and/or have a history of biphasic reactions. (7.7%)

Management of IgE-mediated food allergy

Dietary management

-allergen avoidance

-consumption of safe foods

-individualized dietary advice

Psychological Support

-coping strategies

-cognitive behavior therapy

Treatment plan

-emergency medications

-Written treatment plan with emergency contact

Immunomodulatory treatment

-omalizumab

-allergen specific immunotherapy

Allergen cross- reactivity

If Allergic to:	Risk of Reaction to at Least One:	Risk:
A legume* (peanut)	Other legumes (peas, lentils, beans)	5%
A tree nut (walnut)	Other tree nuts (brazil, cashew, hazelnut)	37%
A fish* (salmon)	Other fish (swordfish, sole)	50%
A shellfish (shrimp)	Other shellfish (crab, lobster)	75%
A grain* (wheat)	Other grains (barley, rye)	20%
Cow's milk*	Beef (hamburger)	10%
Cow's milk*	Goat's milk (goat)	92%
Cow's milk*	Mare's milk (horse)	4%
Pollen (birch, ragweed)	Fruits/vegetables (apple, peach, honeydew)	55%
Peach*	Other Rosaceae (plum, pear, apple, cherry)	55%
Melon* (cantaloupe)	Other fruits (watermelon, banana, avocado)	92%
Latex* (latex glove)	Fruits (kiwi, banana, avocado)	35%
Fruits (kiwi, avocado, banana)	Latex (latex glove)	11%

J Allergy Clin Immunol 2001;108:881-90

우유·계란 알레르기 치료 기술 등 신의료기술에 등재

알레르기 유발시험 후 반응 없는 용량 확인 … 섭취 늘려가며 치료

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|열처리된 우유·계란을 이용한 경구면역요법|

이 기술은 우유나 계란에 대한 알레르기가 있는 환자를 대상으로 면역 반응 둔화 또는 내성을 획득하는 알레르기 치료 기술이다. 열처리된 우유나 계란으로 알레르기 유발시험을 하고, 반응이 나타나지 않는 용량을 확인한 다음 해당 용량부터 계속적으로 섭취 및 용량을 늘려가며 치료한다.

이 기술은 회피요법, 위약대조군과 비교 시 치료성공률이 높고, 면역학적 지표가 개선되어 유효한 치료법으로 평가됐다. 시술관련 사망이 보고되지 않았고 이상반응은 경증에서 중등증으로 안전성도 수용 가능하다고 판단됐다.

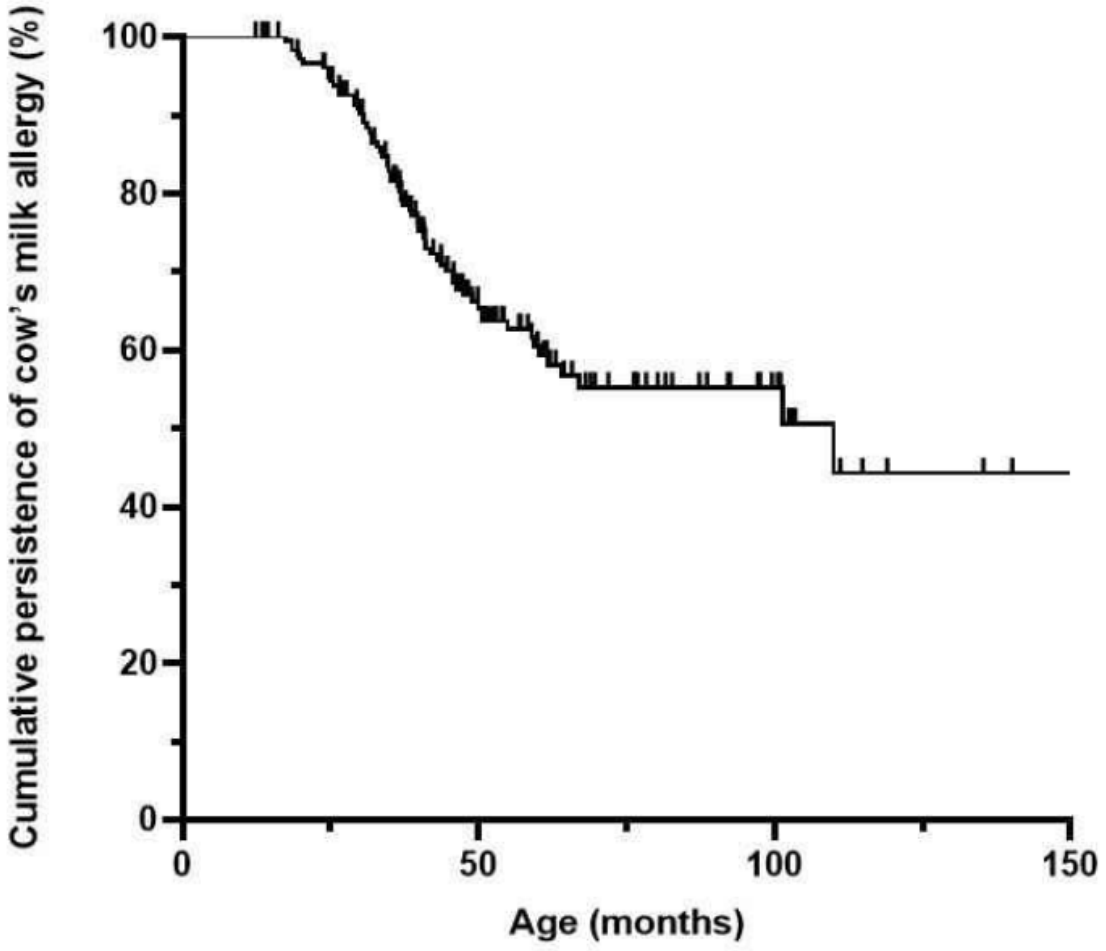
다만 우유 및 계란에 대한 아나필락시스 과거력이 있거나, 심한 천식을 진단받은 환자에게 사용 시에는 주의가 필요하다. 응급 상황 발생 시 투여할 수 있는 약제도 항시 사용할 수 있도록 해야 한다.

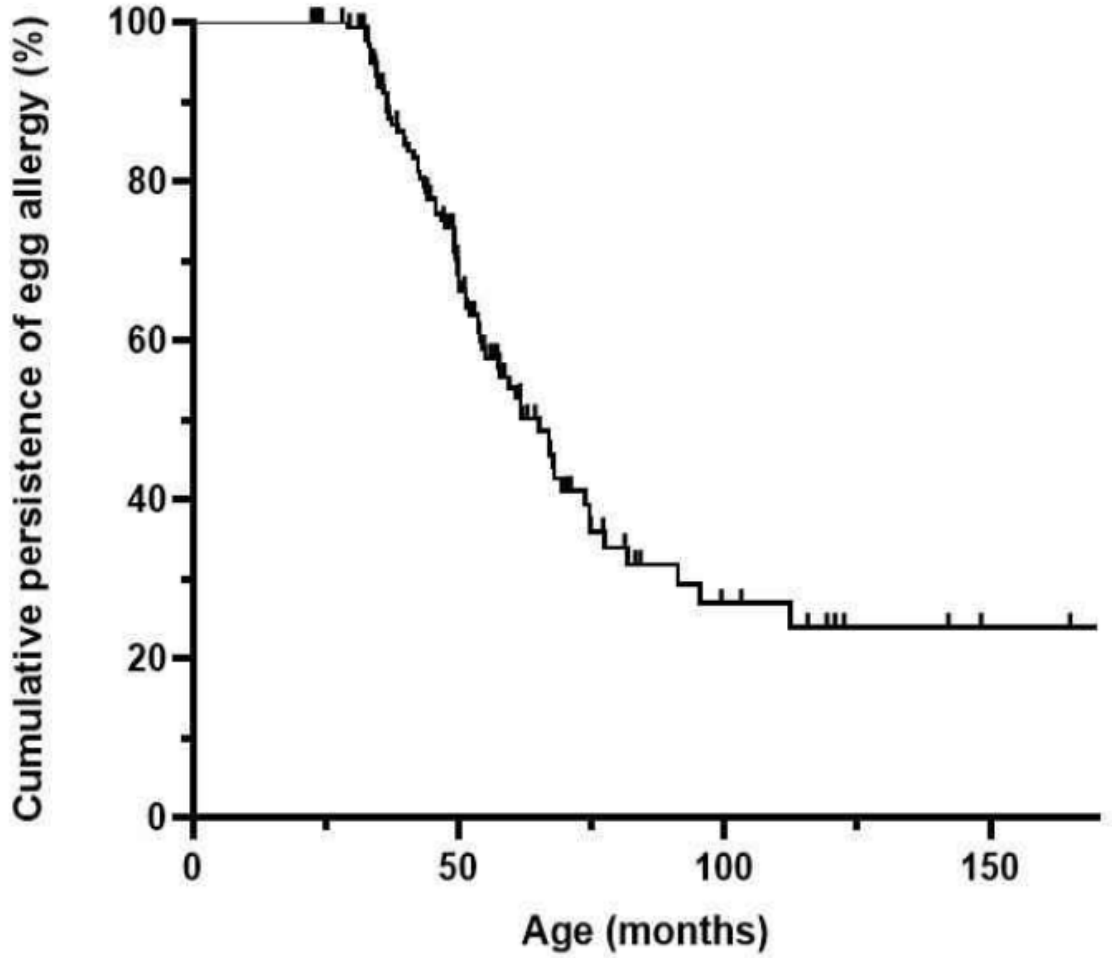
Natural course of FA

Food	Age of onset	Rate/age of resolution (study type)	Clinical pearls
Milk	Infant/toddler	Early to late childhood • 50% by age 5 y (US, prospective)[15] • 57% by age 2 y (EuroPrevall, Europe, population-based, prospective)[30] • 57% by age 5 y (Israel, population-based, prospective)[11] • 43% by age 10 y (Portugal, tertiary care center, retrospective)[31] • 50% at age 10 y (US, tertiary care center, retrospective)[13]	Extensively heated milk may be safely tolerated before uncooked milk; incorporation of extensively heated milk into diet may hasten development of tolerance to uncooked milk
Egg	Infant/toddler	Early to late childhood • 50% by age 6 y (US, prospective)[8] • 47% by age 2 y (HealthNuts, Australia, population-based, prospective)[32] • 50% by age 9 y (US, tertiary center, retrospective)[12]	Extensively heated egg may be safely tolerated before cooked egg; incorporation of extensively heated egg into diet may hasten development of tolerance to cooked egg
Peanut	Infant/toddler	Early to late childhood-uncommon • 22% by age 4 y (HealthNuts, Australia, population-based, prospective)[33]	Because only a minority of children outgrow these, frequent reassessments for the likelihood of tolerance acquisition may not be indicated
Tree nuts	Toddler/early childhood	Early to late childhood-uncommon • Resolves in 10% (US, tertiary center, retrospective)[34]	
Soy	Infant/toddler	Early to late childhood 45% by age 6 y (US, tertiary center, retrospective)[35]	Few studies have investigated the association between IgE levels and clinical reactivity; consider assessing for resolution at higher IgE levels than for other foods
Wheat	Infant/toddler	Early to late childhood • 50% by age 7 y (US, tertiary center, retrospective)[36]	

J Allergy Clin Immunol Pract 2016;4:196-203)

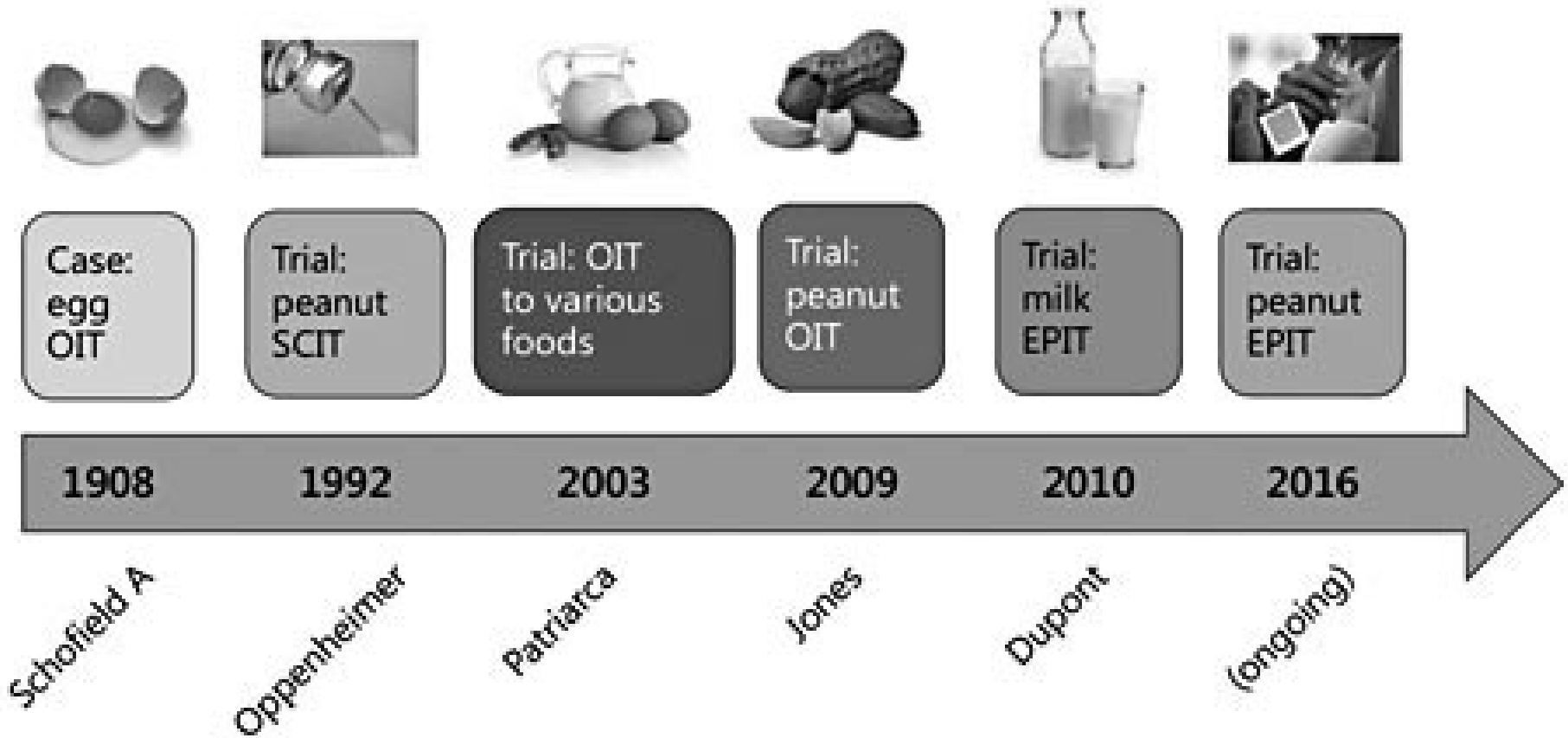
Natural course of CM/egg allergy (Korea)



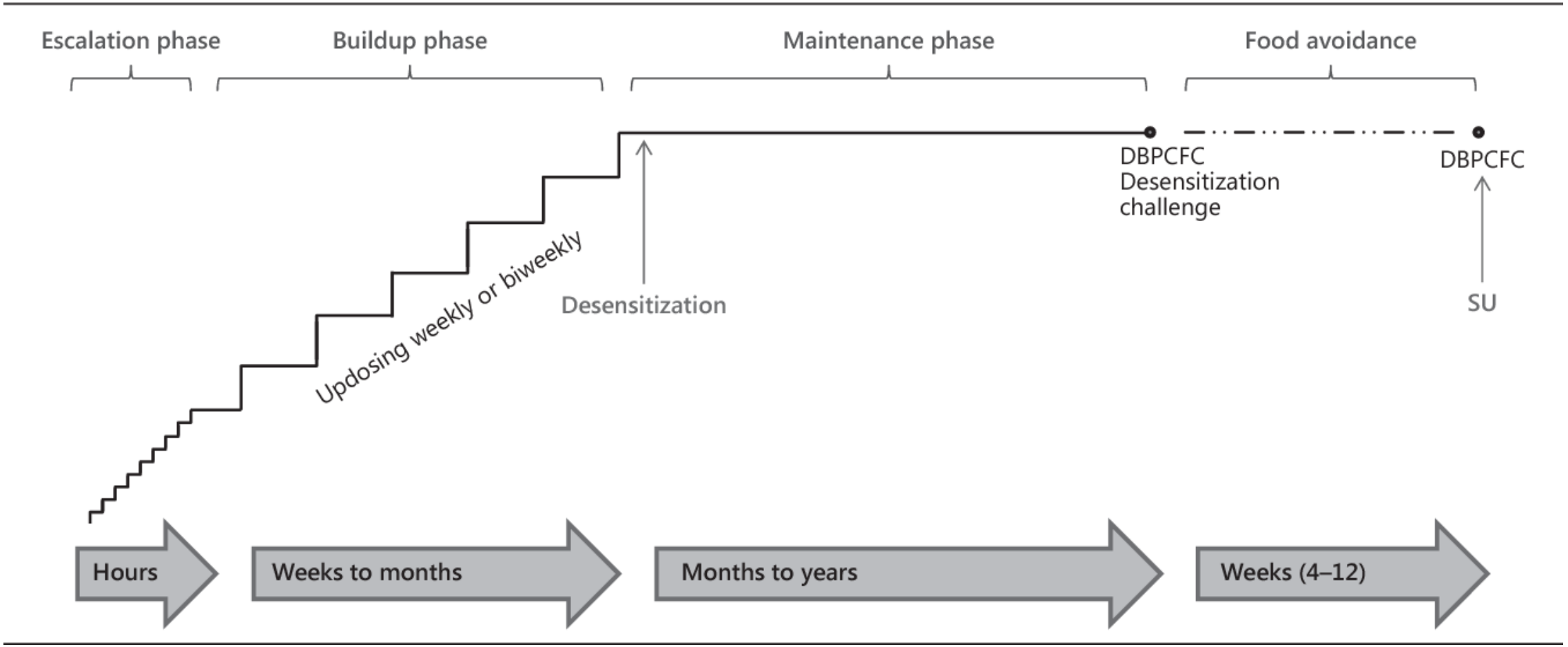


Int Arch Allergy Immunol (2020) 181 (2): 103–110.

Timeline of food allergen-specific immunotherapy

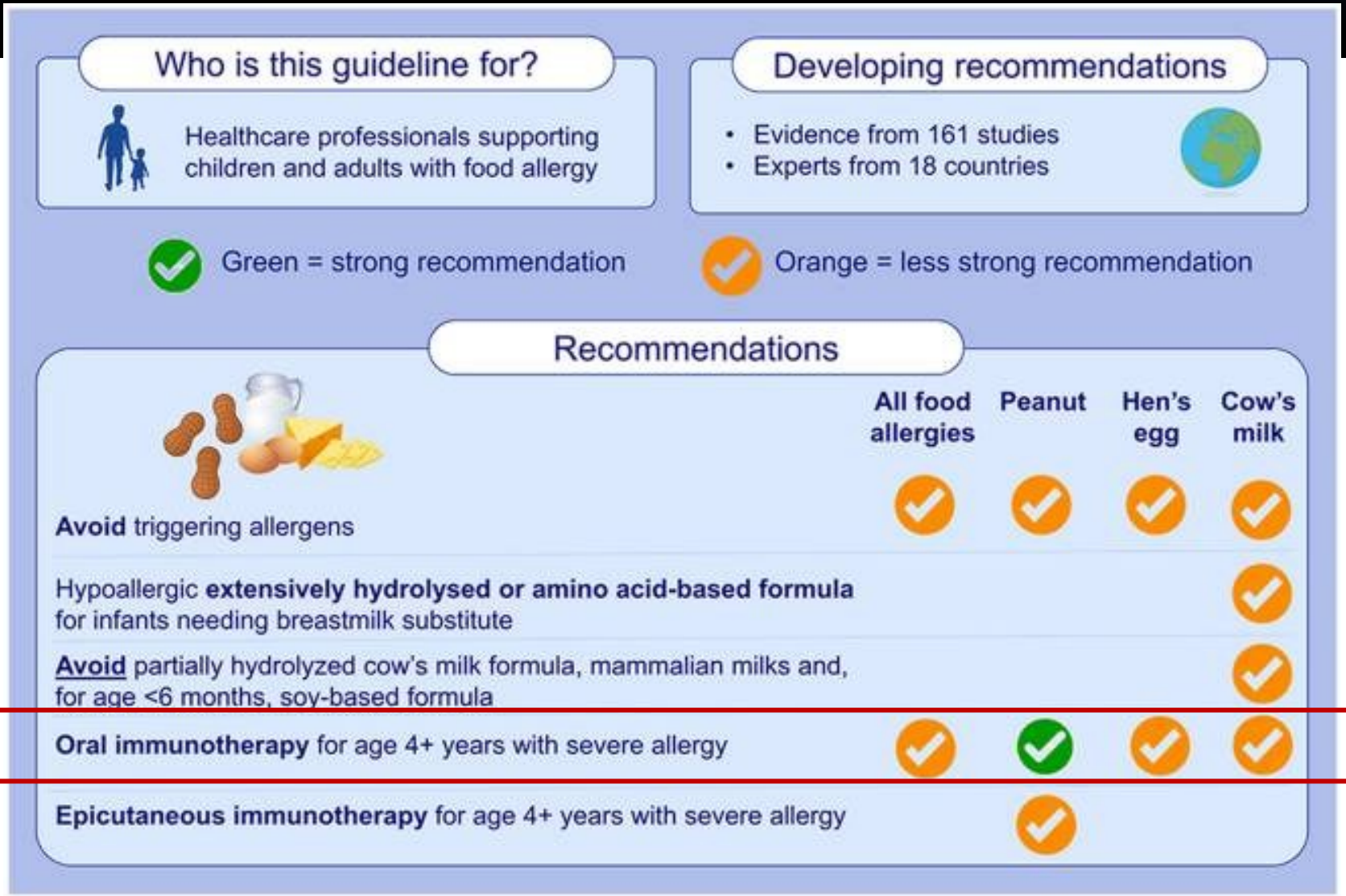


Oral immunotherapy



J allergy clin Immunol 2016;137:937-82

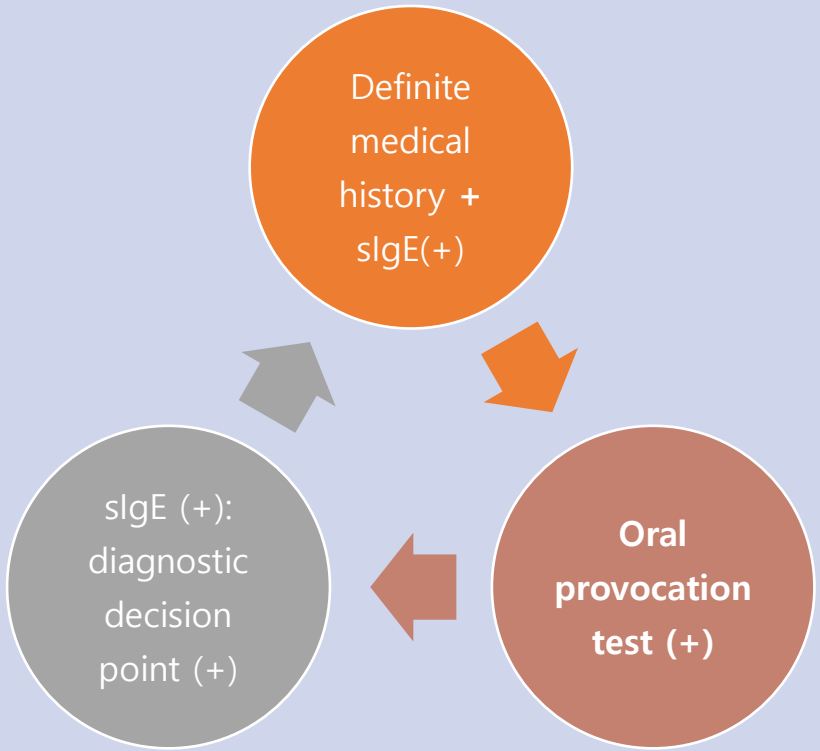
Managing FA



World Allergy Organization (2022) 15:100687

Take home message

Food allergy diagnosis



Food allergy treatment

- **Dietary management**
- **Psychological Support**
- **Treatment plan**
- **Oral immunotherapy**