Food-induced anaphylaxis: in adults

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Clinical management of anaphylaxis in children and adults is different
In children,
many patients
very common allergens (such as egg and milk) and others
pediatricians take all care of children with food allergy
search of allergen(s)
challenge test
instruction of avoidance
treatment of anaphylaxis
food allergen immunotherapy

In adults,
not many patients
no very-common allergens
internists take partial care of adults with food allergy
search of allergen(s)
challenge test (seldom)
instruction of avoidance
treatment of anaphylaxis
food allergen immunotherapy

Usually, family members are not a strong inducer of their visit to clinics
Overview
- Reported trends of food-induced anaphylaxis in adults
- Trends in Japan
- Various cases
- What needs to be kept in mind?
Food-induced hospital anaphylaxis admissions in Australia by age group from 1994 to 2005

Prevalence and characteristics of adult-onset food allergy (United States)

Prevalence and characteristics of adult-onset food allergy (U.S.)

Fatal anaphylaxis in Japan

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Data from Ministry of Health, Labor and Welfare of Japan
Anaphylaxis/urticaria cases at our outpatient clinic (2012-2013)

<table>
<thead>
<tr>
<th>Trigger</th>
<th>Number</th>
<th>M/F</th>
<th>Age (M/F)</th>
<th>Symptoms</th>
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<tbody>
<tr>
<td>Foods</td>
<td>76</td>
<td>25/61</td>
<td>40/39</td>
<td>anaphylaxis 69</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>urticaria 17</td>
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<tr>
<td>Drugs</td>
<td>37</td>
<td>14/23</td>
<td>53/47</td>
<td>anaphylaxis 25</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>urticaria 12</td>
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<tr>
<td>Animals +</td>
<td>35</td>
<td>25/10</td>
<td>44/42</td>
<td>anaphylaxis 30</td>
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<tr>
<td>Parasites</td>
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<td></td>
<td></td>
<td>urticaria 5</td>
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<tr>
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<td>19</td>
<td>7/12</td>
<td>42/50</td>
<td>anaphylaxis 12</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>urticaria 7</td>
</tr>
</tbody>
</table>

anaphylaxis: 126 case, urticaria 41 cases

Triggers of anaphylaxis/urticaria at our outpatient clinic (2012-2013)

Survey of anaphylaxis patients from 2005 to 2015 (a hospital in Yokohama)
Total 387 cases (<15 y.o. 218 cases, >= 15 y.o. 169 cases)

In patients <15 y.o., foods were by far the most frequent trigger
24.4% egg, 19.4% milk, 13.9% peanuts, 11.9% fish egg, 10.9% wheat

In patients >= 15 y.o., various triggers were observed
56.8% foods, 24.3% drugs, 13.0% insect stings


In patients >= 15 y.o., various triggers were observed
56.8% foods, 24.3% drugs, 13.0% insect stings

Among these patients,
11.5% wheat
11.5% shellfish
11.5% fishes
9.4% Anisakis
7.3% soba (buckwheat noodle)
6.2% FEIAn (due to wheat, crab and shrimp)
5.2% vegetables
4.2% storage mite
13.5% others
15.6% undetermined

A case with anisakis-induced anaphylaxis

Case: 63-year-old female
<CC> Urticaria, nausea and pharyngeal discomfort
<PH> Hyperlipidemia, Cholecystolithiasis
<Allergy> Allergic rhinitis, urticaria due to some drugs (unknown)
<Social History> (Alcohol) Japanese Sake 200ml/day, once a week
(Tobacco) none
<HPI> She came to our ER complaining urticaria, nausea and pharyngeal discomfort, two hours after intake of raw pacific sauries. Abdominal pain was absent.

Kasuya et al. (Lancet 335:665, 1990) reported that all of 11 patients with mackerel-related urticaria showed positive reaction to A. simplex Larval antigen on scratch test, whereas none reacted to mackerel antigen.

Since then, numerous cases with Anisakis-induced allergy ranging from isolated urticaria to life-threatening anaphylactic shock have been reported.

Anisakis specific IgE was highly positive.
IgE against other allergens such as fish and squid was negative.

We concluded that anisakis is probably a trigger of her anaphylaxis, and educated her to avoid taking raw and cooked fish that may contain anisakis.

Hydrolyzed wheat-induced anaphylaxis is a big problem

There are thousands of mainly adult patients of wheat-induced anaphylaxis who were previously sensitized via skin, through use of facial soap containing hydrolyzed wheat.

Succeeding information is continuously reported by Fukutomi and others. For example, Epidemiological link between wheat allergy and exposure to hydrolyzed wheat protein in facial soap. Allergy. 2014 Oct;69(10):1405-11.

Another case

A 39-year-old female was referred for evaluation of allergic reactions following ingestion of a commercial bottled supplement containing vitamin Bs and C and fruit flavors.

The reactions occurred three times, at one-month intervals. The first two episodes were mild and localized hives on her lower extremities. However, after drinking the supplement every day for 3 months, she manifested more severe symptoms of anaphylactic shock. Interestingly, each of the allergic reactions was associated with her menstrual period; the episodes occurred within three days before or after the beginning day of menstruation.

Skin prick tests were negative for the supplement.

An intradermal test revealed that a 10-fold dilution of the solution was an irritating concentration eliciting reactions in the patient and all four of the tested controls; lower, nonirritating concentrations showed negative intradermal results.

We then decided to try the in vitro basophil activation test (BAT).

The drink itself and, among its constituents, only cochineal dye, gave positive results in BAT using the patient’s blood, but not nonallergic subjects' blood.

Obvious induction of basophil surface CD203c was observed with carminic acid, but not with protein preparation extracted from Coccus cacti.

What is cochineal dye?

Cochineal dye (extracted from Coccus cacti) is usually regarded as a highly safe material, and it is widely used as a food additive and cosmetic ingredient. To date, type I allergy due to the dye, including anaphylaxis, urticaria and occupational asthma, has been reported only occasionally. Allergy to cochineal dye is generally due to a hypersensitivity reaction to a contaminating protein (i.e., CC38K, a phospholipase), while allergy to the main compound—carminic acid—is very rare.

Exaggerated BAT response during menstruation

BAT response to cochineal dye was stronger during the menstrual period, compared to the non-menstrual period.
Blockade of passive sensitization of basophils byomalizumab. Basophils from a nonallergic donor were treated with IgE-eluting lactate buffer, pH 3.7, and then incubated in the presence of the patient’s serum, with and without omalizumab at 10 μg/mL. The highest concentration, i.e., 10-fold dilution, of carminic acid was 2.36 μg/mL.

Passive sensitization study showed that the response is IgE-dependent

<table>
<thead>
<tr>
<th>Carminic acid</th>
<th>Histamine release (%)</th>
</tr>
</thead>
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<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1 (1:10 dilution)</td>
<td>10</td>
</tr>
<tr>
<td>2 (1:100 dilution)</td>
<td>20</td>
</tr>
<tr>
<td>3 (1:1000 dilution)</td>
<td>30</td>
</tr>
<tr>
<td>4 (1:10000 dilution)</td>
<td>40</td>
</tr>
</tbody>
</table>

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Foods are the most frequent trigger of anaphylaxis in both children and adults.

Special considerations:
- so many kinds of allergens, affected by location, hospitals, inclusion of children, etc
- atopy may not be uniformly important
- various routes of sensitization
- need to consider past history, drugs and supplements
- need to consider occupations
- hidden or many potential trigger(s) even in one person
- need to consider exacerbating factors (co-factors)