Intolerance to food additives

Food additives include colouring agents, preservatives, antioxidants, gelling agents, thickeners, flavour enhancers and sweeteners. Some of these „E substances“ can trigger pseudoallergic reactions in individuals with hypersensitivity and even type I immediate-type reactions in rare cases. The widespread use of these substances by the food industry and the growing number of approved additives means that adverse reactions are becoming more frequent.

Pathogenesis and symptoms

In 98 % of cases, the response is a pseudoallergic reaction. The clinical symptoms of these intolerance reactions mimic an IgE-mediated allergic immediate type reaction but without the involvement of IgE. Mast cells are not activated via IgE binding to an allergen but rather via direct interactions, which are still only partly understood, of the substance with the mast cell activation cascade. Clinical symptoms include urticaria (often linked with angioedema), rhinitis, nasal polyps, airway constriction, gastrointestinal symptoms, cardiovascular responses, migraines and eczema.

Diagnostics

Diagnosis is difficult. Because IgE is not the trigger, detection of allergen-specific IgE in the CAP test and in the prick test does not play an important role.

A modern procedure for in vitro detection of sensitisations is the basophil degranulation test (BDT, synonymous with basophil activation test). This cellular test is a classical in vitro provocation test that detects all types of pseudoallergies as well as IgE-mediated sensitisations, in so far as the responsible cells are present in the blood. In accordance with current allergological guidelines, the diagnosis should be verified by a provocation test.

Important:
Identification of specific IgE in the CAP test is not suitable for food additives and dyes because these are almost exclusively pseudoallergies that are not mediated by IgE.

Validity of cellular allergy tests

Unlike the relatively error-prone histamine release test used in the past, the BDT measures the allergen-stimulated secretion of the sulfidoleukotrienes LTC4, LTD4 and LTE4. The leukotrienes are only formed de novo at the time of basophil activation which significantly improves the stability and specificity of the detection reaction compared to the histamine test. The test was significantly optimised by interleukin-3 pretreatment of the cells extracted from a patient’s blood sample. In our laboratory we use the CAST test from Bühlmann (Switzerland). The basophil granulocytes used in the test are concentrated using density gradient centrifugation which further increases the sensitivity.

Practical procedure

With suspected intolerance to food additives, it is recommended to test the following 18 substances in four group screening tests in the BDT.

Food colouring agent mixture I
Amaranth [E123], azorubine [E122], quinoline yellow [E104], cochineal red A [E124], sunset yellow FCF [E110]

Food colouring agent mixture II
Erythrosine [E127], patent blue V [E131], indigotine [E132], brilliant black BN [E151]

Food additives I
Tartrazine [E102], sodium benzoate [E211], sodium nitrite [E250], sodium salicylate, potassium metabisulphite [E224]

Food additives II
Iron oxide [E172], benzoic acid [E210], monosodium glutamate [E621], propyl-p-hydroxybenzoate [E216]

If the group screening yields a positive result, the substances in the group can then be individually tested. This requires a new blood sample, however!

If a particular substance is suspected, individual testing can be done first (e.g., glutamate with suspected Chinese restaurant syndrome).

Material

8 ml heparin blood
Sample receipt within 24 hrs has to be ensured. The sample should be stored and transported refrigerated. Within the Berlin city area, we offer a courier service (+49 (0)30 7701-250). For collections beyond Berlin, please contact our complimentary courier service (+49 (0)30 77001-450).

Invoicing

Costs for the test are 97,19 €.
For allergens not listed here, there is the option of sending in a sample which can be tested directly in the BDT (BDT special allergen).

### Antibiotics
- Amoxicillin
- Ampicillin
- Cefaclor
- Cefamandole
- Cefazolin
- Ceftriaxone
- Cefuroxime
- Cephalosporin C
- Ciprofloxacin

### Medications
- Aspirin / acetylsalicylic acid
- Tetrazycline
- Sulfamethoxazole
- Rifampicine
- Penicillin V
- Moxifloxacin
- Erythromycin
- Doxycycline
- Clindamycin
- Clavulanic acid
- Ciprofloxacin
- Cefaclor
- Aminoglycosides
- Penicillin
- Moxifloxacin
- Penicillin G
- Penicillin V
- Rifampicine
- Sulfamethoxazole
- Trimethoprim
- Tetrazycline

### Analgesics
- Aspirin
- Ibuprofen
- Indomethazin
- Mefenamic acid
- Paracetamol
- Cyclomethazin

### Local anaesthetics
- Chlorhexidine
- Other

### Antihistamines
- Clarithromycin
- Clavulanic acid
- Clindamycin
- Clindamycin phosphate
- Doxycycline
- Levofloxacin
- Moxifloxacin
- Penicillin G
- Penicillin V
- Rifampicine
- Sulfamethoxazole
- Trimethoprim
- Tetrazycline

### Antiallergics
- Analgesics
- Local anaesthetics

### Moulds
- Alternaria alternata
- Aspergillus fumigatus
- Aspergillus versicolor
- Botrytis cinerea
- Candida albicans
- Chaetomium globosum
- Cladosporium herbarum
- Geotrichum candidum
- Malassezia pachydermatis
- Penicillium chrysogenum
- Rhizopus nigricans
- Trichophyton mentagrophytes
- Stachybotrys spp.

### Inhalants
- Aspirin
- Ibuprofen
- Indomethazin
- Mefenamic acid
- Paracetamol
- Mould mixture contains
- Penicillium chrysogenum
- Rhizopus nigricans
- Trichophyton mentagrophytes
- Stachybotrys spp.

### Food colouring agent mixture
- Methyl metacrylate (MMA)
- N,N-dimethyl-4-toluidine
- TEG-DMA
- 2-hydroxyethyl metacrylate (HEMA)

### Food colouring agent mixture II
- Food colouring agent mixture contains amaranth, azurin, quinoline yellow, cochinella red, sunset yellow
- Food colouring agent mixture contains erythrosine, patent blue, indigotin, brilliant black

### Food colouring agent mixture III
- Food colouring agent mixture contains benzoic acid, sodium nitrite, contains tartrazine, sodium chloride

### Food additives
- Food colouring agent mixture I contains amaranth, azurin, quinoline yellow, cochinella red, sunset yellow
- Food colouring agent mixture II contains erythrosine, patent blue, indigotin, brilliant black

### Insects
- Anisakis
- Bee toxin
- Hornet toxin
- Paper wasp toxin
- Wasp toxin

### Animal epithelia
- Cat epithelium
- Dog epithelium

### Dental materials
- BIS-GMA
- Bisphenol A
- Butadion-1-4-methacrylate (BDMA)
- Camphorquione
- Diurethane dimethacrylate
- Endomethasone
- Ethylene glycol dimethacrylate
- Guta-percha

### Grass pollen allergens
- Bermuda grass
- Cocksfoot
- Timothy grass
- Perennial rye grass
- Rye pollen

### Tree pollen allergens
- Alder
- Birch
- Hazelnut
- Oak
- Olive

### Herb pollen allergens
- Common ragweed
- Mugwort
- Ragweed mixture
- Wall pellitory

### Individual tests
- Amaranth E123
- Azaleine E122
- Benzoinic acid
- Brilliant black E151
- Carboxymethylcellulose
- Cochineal red E124
- Erythrosine E127
- Glutamate (glutamic acid)
- Indigotin E132
- Patent blue E131
- Polysorbate 80 E433
- Potassium metabisulphite
- Propyl-p-hydroxybenzoate
- Quinoline yellow E104
- Sodium nitrite
- Sodium salicylate

### Work place allergens
- Alpha-amylase (baker’s asham)
- Beta-lactoglobulin
- Brewers yeast
- Carp
- Cashew nuts
- Casein (milk)
- Celery
- Chicken

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