

## 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 LTC<sub>4</sub>, LTD<sub>4</sub> and LTE<sub>4</sub>. The

leukotrienes are only formed de novo at the time of basophile 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 complementary courier service (+49 (0)30 77001-450).

### Invoicing

Costs for the test are 97,19 €.

**Do you have questions? Our serviceteam will be happy to support you: +49 (0)30 770 01-220.**

The following allergens are always in stock as standard test allergens in the laboratory.

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).

Medications
<b>Antibiotics</b>
Amoxicillin
Ampicillin
Cefaclor <i>new</i>
Cefamandole <i>new</i>
Cefazolin <i>new</i>
Ceftriaxone <i>new</i>
Cefuroxime <i>new</i>
Cephalosporin C <i>new</i>
Ciprofloxacin
Clarithromycin <i>new</i>
Clavulanic acid <i>new</i>
Clindamycin <i>new</i>
Doxycycline <i>new</i>
Erythromycin <i>new</i>
Levofloxacin <i>new</i>
Moxifloxacin <i>new</i>
Penicillin G
Penicillin V
Rifampicine <i>new</i>
Sulfamethoxazole <i>new</i>
Trimethoprim <i>new</i>
Tetrazycline
<b>Analgesics</b>
Aspirin/acetysalicylicacid
Diclofenac
Ibuprofen
Indomethazin
Mefenamic acid <i>new</i>
Metamizole <i>new</i>
Paracetamol
Phenylbutazone <i>new</i>
Propyphenazone <i>new</i>
<b>Local anaesthetics</b>
Articaine
Lidocaine
Mepivacaine
Prilocaine
Ubistesin
<b>Muscle relaxants</b>
Atracurium <i>new</i>
Mivacurium <i>new</i>
Pancuronium <i>new</i>
Propofol <i>new</i>
Rocuronium <i>new</i>
Suxamethonium <i>new</i>
Vecuronium <i>new</i>
<b>Beta-blocker</b>
Bisoprolol <i>new</i>
<b>ACE inhibitor</b>
Ramipril <i>new</i>
<b>Other</b>
Chlorhexidine

House dust & flour mites
Acarus siro (d70)
Dermatoph. farin. (d2)
Dermatoph. pter. (d1)
Mites mixtures contains house dust mites d1 and d2
Storage mite mixture contains Acarus siro d70, Glycophagus domesticus d73, Lepidoglyphus destructor d71, Tyrophagus putrescens d72

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.
Mould mixture contains Penicillium chrysogenum m1, Cladosporium herbarum m2, Aspergillus fumig. m3, Candida alb. m5, Alternaria tenuis m6

Insects
Anisakis <i>new</i>
Bee toxin i1
Hornet toxin i75
Paper wasp toxin i4
Wasp toxin i3

Animal epithelia
Cat epithelium e1
Dog epithelium e2

Dental materials
BIS-GMA
Bisphenol A
Butandiol-1-4-methacrylat (BDMA)
Camphorquinone
Diurethane dimethacrylate
Endomethasone
Ethylene glycol dimethacrylate
Gutta-percha

Methyl metacrylate (MMA)
N,N-dimethyl-4-toluidine
TEG-DMA
2-hydroxyethyl methacrylate (HEMA)

Workplace allergens
Alpha-amylase (baker's asthma)
BTX
Chlorpyrifos
Dichlofluanid
Formaldehyde
Latex
Lindane
PAK mix
PCB
Permethrin
Phthalic acid anhydride
Pentachlorophenol (PCP)
Tris(2-chloroethyl) phosphate
Tris(2-butoxyethyl) phosphate
Tris(2-ethylhexyl) phosphate

Food additives
Food colouring agent mixture I contains amaranth, azorubine, quinoline yellow, cochineal red, sunset yellow
Food colouring agent mixture II contains erythrosine, patent blue, indigotine, brilliant black
Food additives I contains tartrazine, sodium benzoate sodium nitrite, potassium metabisulphite, sodium salicylate
Food additives II contains benzoic acid, glutamate, propyl-p-hydroxybenzoate

Individual tests
Amaranth E123
Azorubine E122
Benzoic acid
Brilliant black E151
Carboxymethylcellulose
Cochineal red E124
Erythrosine E127
Glutamate (glutamic acid)
Indigotine E132
Patent blue E131
Polysorbate 80 E433 <i>new</i>
Potassium metabisulphite
Propyl-p-hydroxybenzoate
Quinoline yellow E104
Sodium nitrite
Sodium salicylate

Sunset yellow E110
Tartrazine

Food
Almonds
Alpha-lactalbumin
Aniseed
Apple
Asparagus
Avocado
Beef
Baker's yeast
Banana
Barley
Beta-lactoglobulin
Brazil nuts
Brewer's yeast
Carp
Carrots
Cashew nuts <i>new</i>
Casein (milk)
Cauliflower
Celery
Chicken
Cinnamon
Cocoa beans
Cod
Codfish
Coffee beans
Coriander
Corn
Cow's milk
Crayfish
Duck
Eel
Egg yolk (chicken's egg)
Egg white (chicken's egg)
Garlic
Gluten (gliadin)
Goose
Grapefruit
Grapes
Halibut
Hazelnuts
Herring
Hops
Kiwi fruit
Lamb
Lemon
Lobster
Mandarin
Milk (cow's milk)
Onion
Oysters <i>new</i>

Paprika
Peach
Peanuts
Pear
Peas
Pepper (black)
Pineapple
Pistachios
Pork
Potatoes
Prawns
Oats
Orange
Rice
Rye
Salmon
Sesame
Sole
Spelt
Spinach
Squid <i>new</i>
Soy
Strawberries
Tea (black)
Tomatoes
Trout
Tuna
Turkey
Vanilla
Walnuts
Wheat

Grass pollens
Bermuda grass g2
Cocksfoot g3
Timothy grass g6
Perennial ryegrass g5
Rye pollen g12
Grass mixture contains timothy grass g6, cocksfoot g3, meadow fescue, perennial ryegrass g5, smooth meadow grass g8, common velvet grass g13
Tree pollens
Alder t2 <i>new</i>
Birch t3
Hazelnut t4
Oak t7
Olive t9
Herb pollens
Common ragweed <i>new</i>
Mugwort w6
Ragweed mixture
Wall pellitory <i>new</i>
Ribwort <i>new</i>