

What items contain allergenic heavy metals and plastics?

Sensitisation to heavy metals and plastic components is becoming more common. For **nickel**, a frequency of 19 % in women and 9 % for men is cited. In the case of **gold**, a greater proportion of the female population is affected (3.5-9 %) due to the higher exposure to jewellery. There are no sex-specific differences for **mercury** (9.6 % positive reactions in clinically symptomatic amalgam wearers, Luderschmidt 1995). For thiomersal (ethylmercury) up to 10 % positive epicutaneous reactions have been cited. Some 7 % react to **palladium** in the lymphocyte transformation test up.

Apart from titanium for which the non-allergenic form of the intolerance reaction dominates, all metals (e.g., **platinum, silver, copper, iridium, etc.**) can cause an allergic sensitisation). The sensitisation rate is lower but is still about 1-2 %. Larger scientific studies have not yet been done for **plastics** (acrylates). It is undisputable that their frequency has significantly increased in the last 10 years. The prevalence of 5 % is probably too low an estimate.

Although diagnosis of sensitisations is not uncommon in relation to intolerances to dental materials, other sources of exposure should always be considered. Elimination of these sources can often reduce the symptoms. Without considering them, complete recovery is unlikely to be achieved, however.

The numbers are similar for plastics, which are increasingly under discussion. As for metals, diagnostic skin tests themselves carry the risk of sensitisation. The lymphocyte transformation test (LTT) should always be preferred to the skin test for preventive testing because exposure of the patient and the attendant risk of sensitisation is avoided. The same applies for patients with a known history of allergies.

The following is a list of the most important sources of exposure to metals.

Nickel: Food (e.g., nuts, bananas, cocoa, chocolate), drinking water (particularly if left standing in tap fittings), dentures and endoprostheses, fashion jewellery (also piercings!), coins (€ 1 and € 2 coins), pigment dyes, cosmetics, textile dyes, dissolved from household items (cutlery and saucepans made from stainless steel, coffee machines), old aluminium products, methyl acrylates, garbage incineration, industrial emissions, tobacco smoke, toner

Gold: Dental alloys, jewellery, medications, decorative gilding (eyeglass arms made of porcelain, glass), dyes, food additive E175 in sweets, hair dyes, previous epicutaneous tests with the metal series

Cadmium: Tobacco smoke, root filling materials (guttapercha), batteries (nickel/cadmium and silver/cadmium), food (offal, vegetables, fruit), transistors, dye pigments (tattoos, prosthesis materials, acrylic resins, tinfoil, toys, enamelled kitchen equipment), paint dyes, toner

Palladium: Dental alloys, jewellery, dyes, medications, catalysts, textile applications, piercings (often contain palladium), previous epicutaneous tests

Inorganic mercury: Barometer, thermometer, manometer, blood pressure monitor, gas analysis equipment, neon tubing, energy-saving light bulbs, mercury vapour lamps, rectifiers, drop electrodes, as a catalyst, in the manufacture of fungicides and antiseptic mercury compounds and of dental alloys (amalgam, 50 % mercury), dry batteries, mercury sprays (plant protection product), old mirrors

Ethyl/phenyl mercury: Vaccines (thiomersal), contact lens cleaner, pesticides (sprayed citrus fruit), root fillings, cosmetics

Copper: Heating pipes, brew kettle, soldering iron, medications (mineral and vitamin preparations), dental alloys (including amalgam), medicinal baths, intrauterine pessaries (coil), building materials, e.g., rainwater guttering, coins (€1 and €2 and 1, 2 and 5 euro cent coins), brass, bronze, pigments (copper chromate), toner

Aluminium: Construction materials in aircraft, automotive and machine construction, electric cords, antennas, cosmetics (including roll-on deodorants), tins for food and drinks (including Tetrapaks), aluminium foil (food packed in foil), preservative as adjuvant in vaccines, toner, aluminium silicate as a component of the food dye E173 in baked goods, baking powder, soft cheese, pickled vegetable preserves, coffee whiteners, table salt and spices, nail polish, dental cements, confectionery coatings

Silver: Jewellery, coins, amalgam including dental alloys, antiseptics (silver nitrate), photo developers, batteries, (silver/cadmium), textiles

Chrome: Fashion jewellery, galvanic technology, manufacture of stainless steel, tanning and dyeing agents (dye pigments), wood preservative, leather, etchant in dentistry, welding technology, dental materials (NPM alloys), household equipment (chrome-nickel steels), building cements, catalysts and oxidants in the chemical industry, developer dye in colour photography, garbage incineration, toner

Tin: Fashion jewellery, amalgam and other dental alloys, dental cleansers (tin fluoride), denture materials (tin chloride), paints, soldering materials, galvanic products, toner

Cobalt: Fashion jewellery, household items (cutlery, kitchen equipment), coins, bleaches and dyes in hairdressing, mineral oil products, artificial fertilisers, cements and other building materials, dental materials (NPM alloys), manufacture of (blue) dyes in glass, enamel and ceramics industries, toner

Molybdenum: Materials in resistance wires in heater winding, for electrodes in glass melting furnaces, for anodes in cathode ray tubes or for filaments in light bulbs, dental materials (nickel/molybdenum and chrome/cobalt/molybdenum alloys), fossil fuels

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Platinum: Jewellery (platinum/copper or platinum/palladium alloys), dental restoration materials (often in gold alloys), catalysts, photography materials (toner), cytostatics.

Iridium: As platinum/iridium alloy in nibs of fountain pens, injection needles, surgical instruments, laboratory crucibles, spark plugs for aircraft, jewellery

Indium: Dental alloys, electronics (semiconductors), solar cells, soldering tin, jewellery, glass dyes, mirrors, lasers, radionuclides in medicine

The following is a list of the most important sources of exposure to acrylates and other allergens present in plastics (e.g., polymerisation initiators).

Methyl methacrylate (MMA) In the medical sector in dental restoration material (dental plates, veneers, crowns, adhesives), in bone cement and in artificial fingernails, plasters, slow-release medications

In the technical sector in sealing compound in the automotive industry, surface treatment of leather, paper, textiles, in acrylate adhesives as well as some varnishes and dyes

BIS-GMA (2,2-bis-[4-(2-hydroxy-3-methacryl-oxypro-poxy)-phenyl]-propane) in dental restoration material made from plastics, e.g., crowns, veneers, filling material, dental plates, in plastic adhesives, in some cases in impression trays

2-hydroxyethyl methacrylate (HEMA) In dental restoration material (dental plates, filling materials, veneers, crowns), as lightweight building material in the air-craft industry

Triethylene glycol dimethacrylate (TEGDMA) In dental restoration materials made from plastics, e.g., crowns, veneers, filling plastics, dental plates, in plastic adhesives, in some cases in impression trays

Diurethane dimethacrylate As crosslinker for anaerobic adhesives and dentistry materials. Used in dentistry for filling materials, veneers, dental plates, impression trays and plastic adhesives.

Ethylene glycol dimethacrylate In dental restoration materials made from plastic, e.g., filling materials, veneers, dental plates; plastic adhesives

N,N-dimethyl-4-toluidine As an initiator in the manufacture of acrylic resins, in dental restoration materials made from plastic (dental plates, plastic fillings, crowns), widespread use in the plastic processing industry

1,4-butanediol dimethacrylate Intermediate product in the manufacture of dispersions, crosslinker for dental plastics, elastomers

Hydroquinone As a reducing agent in plastics manufacture and thus also in dental restoration materials (plastic crowns, dental plates, adhesives), in medicine (bleach for freckles and liver spots), in hair dyes and photo developers and as preservative for oils and paints

Benzoyl peroxide In medications (acne and leg ulcer treatment) and in medicated shampoos, in bone cements (made from plastic), in dental restoration materials made from plastic (crowns, dental plates, adhesives)

Camphorquinone Initiator in the polymerisation of composites, camphor is present in the wood of the camphor tree, in the leaves of rosemary *Rosmarinus officinalis* and common sage. Used in camphor wine, camphor poultices, moth repellents.

Formaldehyde Bonded products made from wood materials, cork tiles (formaldehyde-containing adhesives), insulation, foaming materials, paints, dyes, varnishes, parquetry sealants, glass and rock wool, fibre mats, textile flooring, cleaning and care products and disinfectants (formalin), cosmetics, e.g., mouth washes or nail hardeners, tobacco smoke and emissions from gas cookers

Phthalates (plasticisers) Flooring, ducting and cables, carpets, wall coverings, wallpapers, shoe soles, vinyl gloves, automotive components, dispersions, varnishes/paints, emulsifiers, (food) packaging, sealing compounds, artificial leather, food transport conveyor belts, nail polish, adhesives (primarily polyvinyl acetate), foam prevention agents and crosslinkers in the textiles industry, body care products, perfume, deodorants, pharmaceutical products (extended release medications), blood bags, hosing, catheters, bags for nutrient solutions, medication packaging.

Toys (now forbidden by German manufacturers), drink bottles made from PET, food packaging (outer).