High-molecular-weight agents

• Animal-derived antigens

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Laboratory animal		Laboratory worker	(1)	296	13%	17% +	34% of 255 +	ND	ND	
		Laboratory worker	(2)	5	NA	100% +	100% +	Negative precipitins	100% +	
Cow dander		Agricultural worker	(3)	49	NA	100%	ND	Immunoblotting	ND	
Cow bone dust		Butcher	(4)	1	NA	+	+	Immunoblotting	+	
Monkey dander		Laboratory worker	(5)	2	NA	2 +	2 +	ND	ND	
Deer dander		Farmer	(6)	1	NA	+	ND	ND	+	
Mink urine		Farmer	(7)	1	NA	+	-	ND	+	
Chicken		Poultry worker	(8)		NA	79% +	79% +	ND	1/1 +	
		Poultry worker	(9)	4	NA	+ to feathers	ND	ND	+	
Goat dander		Butcher, veterinarian	(10)	3	NA	+	+	Immunoblotting, crossreactivity to cow epithelium	+	
Goat cheese (goat whey)		Cheese production process	(11)	1	NA	+(goat whey)	ND	Immublotting	+	
Pig		Butcher	(12)	1	NA	ND	+	ND	ND	PEF
Pig gut (vapour from soaking water)		Pork producer	(13)	1	NA	+	+	Immunoblot	+ (soaking water)	
Frog		Frog catcher	(14)	1	NA	+	+	Negative precipitins	ND	
Lactoserum		Dairy industry	(15)	1	NA	+	ND	+ Basophil degranulation	+	
Raw beef		Cook	(16)	1	NA	+	ND	SDS-PAGE	+	
Bovine serum albumin	9048-46-8	Laboratory technician	(17)	1	NA	+	ND	ND	+	
Lactalbumin	9013-90-5	Bakery and dairy	(18)	2	NA	+	+	ND	+	
Casein (cow's milk)	9000-71-9	Tanner	(19)	1	NA	ND	+	ND	+	
Egg protein		Egg producer	(20)	188	7%	34% +	29% +	ND	ND	PEF, 7% +
Endocrine glands		Pharmacist	(21)	1	NA	+	ND	ND	+	
Bat guano		Various	(22)	7	NA	+	+	RAST inhibition	ND	

- **Animal-derived antigens**

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Ivory dust		Ivory worker	(23)	1	NA	Negative	ND	ND	+	FEV1 at work
Nacre dust		Nacre buttons	(24)	1	NA	+	ND	Negative precipitins	+	
Sericin	60650-88-6	Hairdresser	(25)	2	NA	1/1 +	ND	ND	ND	
Birds		Zoo keepers	(26)	200	13.6% (of 147 with sensitization)	8% (of 147)	72%	ND	ND	
African penguin		Animal behaviourist	(27)	1	NA	ND	ND	Western blot (serum and mucus proteins)	ND	PEF changes
Royal jelly		Technicians in Pharmacy	(28)	2	NA	+	+	Immunoblotting	+(1)	PEF
Sea anemone (Actinia equina)		Fisherman and worker in a seafood proces- sing plant	(29)	2	NA	+	+	Immunoblotting	+	Improvement away from work

• Crustacea, seefoods, fish

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Crab		Snow-crab processor	(30)	303	16%	22% +	ND	ND	72% of 46 +	PEF, PC20
Prawn		Prawn processor	(31)	50	36%	26% +	16% +	ND	2/2 +	
Hoya (Oyster Farm Prawn or Sea-Squirt)		Oyster farm	(32)	1413	29%	82% of 511 with asthma +	89% of ~180 with asthma +	ND	ND	
Clam and shrimp		Food processor	(33)	2	4%	+	+	RAST inhibition	+	PC20
Lobster and shrimp		Fishmonger shop	(34)	1	NA	+	+	ND	+	
Gammarus shrimp		Fishfood factory	(35)	1	NA	+	+	SDS-PAGE	+	PC20
Scallop and shrimp		Restaurant seafood handler	(36)	1	NA	+	+	SDS-PAGE	+	PEF
Small shrimp Gammarus		Technician animal food	(37)	1	NA	+	+ (Specific IgE protein Pen m 4)		+	Improvement away from work
King scallop and queen scallop		Scallop plant processor	(38)	1	NA	ND	+	SDS-PAGE	ND	PEF
Cuttle-fish		Deep-sea fisherman	(39)	66	Incidence of 1% per year	ND	ND	ND	ND	
Cuttle fish bone		Jewellery polisher	(40)	1	NA	+	ND	ND	+	
Salmon		Processing plant	(41)	291	8% (n=24)	ND	25 (9%)	Specific IgG (33%)	ND	PEF
Trout (?)		Trout processor	(42)	5	NA	ND	100% Negative	100% +	ND	
Turbot		Fish farm	(43)	3	NA	+(3)	ND	SDS-PAGE	ND	PEF
Alaska pollock and Yellowfin sole		Workers on factory ships	(44)	7	NA	+	ND	ND	+	
Shrimpmeal (Artemia salina)		Restaurant worker	(45)	1	NA	+	ND	ND	+	
		Technician	(46)	1	NA	+	+	ND	+	
Red soft coral		Fisherman	(47)	74	9%	2/2 +	ND	ND	ND	
Marine sponge		Laboratory grinder	(48)	1	NA	+	ND	Precipitins	ND	Asthma attack at work
Shark cartilage		Dietetic product	(49)	1	NA	+	ND	immunoblotting	+	
Octopus		Canning factory	(50)	1	NA	+	+	SDS-PAGE; immunoblot	+	
Various fishes		Fish-processor	(51)	2	NA	+	+	ND	+	PEF

- **Crustacea, seefoods, fish**

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Squid (Loligo vulgaris)		Seafood production worker	(52)	1	NA	+	ND	ND	+	Eosinophilia (tears, nasal fluid, sputum)
Shrimp shell powder		Processing plan	(53)	1	NA	ND	-	Increase in specific IgG	+	Possible associated extrinsic alvéolitis

• Arthropods

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Grain pests (Eurygaster and Pyrale)		Farmer	(54)	15	NA	+	+	RAST inhibition	+	
Locust		Laboratory worker	(55)	118	26%	32% of 113 +	Done	Specific IgG	ND	Reduced FEV1
		Laboratory worker	(56)	15	60%	77% +	53%	RAST inhibition	ND	
Screw worm fly (Cochliomyia homnivorax)		Flight crew	(57)	182	25%	91% of 11 +	ND	ND	ND	
Caddis flies (Phryganeiae)		Engineer at electric power plant	(58)	1	NA	+	ND	ND	+	
Cricket		Laboratory worker	(59)	2	NA	+	+	Passive transfer	+	
Insect larvae (Galleria mellonella)		Fish bait breeder	(60)	14	NA	+	+	RAST inhibition	+	PEF
		Fish bait farmer	(61)	76	4%	32%	19%	ND	ND	
Moth, butterfly		Entomologist	(62)	2	NA	+	ND	ND	ND	
Mexican bean weevil (Zabrotes subfaciatus Boh.)		Seed house	(63)	2	NA	+	ND	Passive transfer	ND	
Fruit fly		Laboratory worker	(64)	22	32%	27% +	27% +	RAST inhibition	21% of 14 +	
Mediterranean fruit fly (Ceratitis capitata)		Producer of flies	(65)	2	NA	+ in two	+ in two	immunoblotting	+ in two	PEF
Honeybee		Honey processors	(66)	1	NA	+	+	ND	+	
Green bottle fly larvae (Lucilla caesar)		Angler	(67)	14	NA	13/14	13/14	RAST inhibition	7/7 +	
Lesser mealworm (Alphitobius diaperinus Panzer)		Entomologist	(68)	3	NA	Negative	100% of 3 +	RAST inhibition	ND	
Mealworm larvae (Tenibrio molitor)		Fish bait handler	(69)	5	NA	4/5	2/5	RAST inhibition	2/2	
Bruchus lentis		Agronomist	(70)	1	NA	+	+	Immunoblotting	+	
Daphnia		Fish food-store	(71)	2	NA	+	+	ND	2/2 +	
Sheep blowfly (Lucilia cuprina)		Technician	(72)	53	24%	ND	67% of 15 +	ND	ND	
Grasshoper		Laboratory worker	(73)	16	25% (n=4)	7 (44%)	ND	ND	+ In one	
Grasshopper (Locusta migratoria)		Laboratory worker	(74)	3	NA	+	+	SDS-PAGE	ND	

• Arthropods

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Sewer fly (Psychoda alternata)		Sewage plant worker	(75)	1	NA	+	+	Histamine release F +	+	
Chiromids midge (Chironomus thummi)		Aquarist, fish-food	(76)	225	45%	80%	34%	ND	ND	
Beetles (Coleoptera)		Museum curator	(77)	1	NA	+	ND	Passive transfer	ND	
Dermestidae spp		Wool worker	(78)	1	NA	+	+	SDS-PAGE	+	
Confused flour beetle (Tribolium confusum)		Mechanic in a rye plant	(79)	1	NA	+	+	ND	ND	
Liposcelis decolor		Carpenter (work close to a granary)	(80)	1	NA	+	+	SDS-Page	ND	Improvement in symptoms away from work
Silkworm		Silk worker	(81)	53	34%	ND	ND	ND	ND	
Herring worm (Anisakis simplex)		Chicken breeder Fish monger	(82)	2	NA	+	+	Immunoblotting	+	
		Fish processing	(83)	578	1%	6%	ND	ND	ND	
Larva of silkworm		Sericulture	(84)	5519	0,2%	100% of 9 (?) +	1 /1 (?) +	PK	100% of 9 +	
Fish-feed Echinodorus larva (Echinodorus plasmosus)		Fish-food handler	(85)	1	NA	+	+	ND	+	
Arthropods (Chrysoperla carnea, Leptinotarsa decemlineata, Ostrinia nubilalis and Ephestia kuehniella)		Technician	(86)	3	23%	ND	+	ND	ND	
Ground bug		Bottling	(87)	1	NA	+	+	ND	ND	PEF
Nematode (Steinernema feltiae)		Technician	(88)	1	NA	+	+	ND	+	

- **Acarians**

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Grain mite		Farmer	(89)	290	12%	21% +	19% of 219 +	ND	ND	
		Grain-store worker	(90)	133	33%	25% +	23% of 128 +	ND	1/1 +	21% of 116 with + PC20
Mites and parasites		Flour handler	(91)	12	NA	ND	+	ND	ND	
Amblyseius cucumeris		Horticulturist	(92)	472	25,7%	23%	Done in some	ND	ND	With + PC 20 nasal challenges
Fowl mite		Poultry worker	(93)	13	NA	77% +	60%	ND	1/1 +	
Barn mite		Farmer	(94)	38	NA	100% +	~100%	ND	ND	
Fruit tree red spider mite (Panonychus ulmi)		Apple grower	(95)	4	NA	+	ND	Negative precipitins	ND	
Citrus red mite (Panonychus citri)		Citrus farmer	(96)	16	NA	+	+	RAST inhibition	+ (One)	
McDaniel spider mite (Tetranychus macdanieli)		Vine grower	(97)	35	11% (4/35)	100%	ND	ND	ND	
Two spotted spider mite (Tetranychus urticae)		Farmer	(98)	16	35% (16/46)	100%	100%	ND	ND	
Various insects used in biological pest control		Greenhouse workers	(99)	2	NA	+	+	ND	+	

- **Molds**

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Dictyostelium discoideum (mold)		Technician	(100)	1	NA	+	+	ND	Workplace +	
Aspergillus niger	68038-55-1	Technician	(101)	3	1%	3 +	ND	ND	ND	
Aspergillus (unspecified)		Beet sugar worker	(102)	1	1%	+	+	ND	ND	
		Baker	(103)	1	NA	+	ND	Negative precipitins	+	
Alternaria		Baker	(103)	1	NA	+	ND	Negative precipitins	+	
Trichoderma koningii	67892-32-4	Sawmill worker	(104)	1	NA	ND	ND	Precipitins specific IgG	ND	PEF
Plasmopara viticola		Agricultural	(105)	1	NA	+	+	Various	+	
Neurospora		Plywood factory worker	(106)	1	NA	+	+	ND	+	
Chrysonilia sitophila		Logging worker	(107)	1	NA	+	+	ND	ND	PEF
		Coffee maker	(108)	1	NA	+	+	ND	+	
Rhizopus nigricans		Coal miner	(109)	1	NA	+	+	ND	+	
Sooty molds (Ascomycetes, deuteromycetes)		Laborer	(110)	1	NA	+	ND	ND	ND	
Penicillium nalgiovensis		Sausage processing	(111)	1	NA	+	ND	+ precipitins	ND	
Mucor species (contaminating esparto fibers)		Stucco worker	(112)	1	NA	+	ND	ND	+	

• Mushrooms

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Mushroom unspecified		Mushroom soup processor	(113)	8	NA	+	ND	ND	50% of 8 +	
Pleurotus cornucopiae		Mushroom producer	(114)	1	NA	ND	+	Immunoblotting	ND	PEF
Boletus edulis		Office worker, cook, hotel manager	(115)	3	NA	+	+	ND	2+	
Agaricus bisporus (White mushroom)		Agriculture	(116)	2	NA	+	+	SDS Page	ND	PC20
Pleurotus ostreatus (Spores of White spongy rot)		Seller	(117)	1	NA	+	+	Immunoblotting	+	
Sweetpea (Lathyrus odoratus)		Greenhouse worker	(118)	1	NA	+	+	ND	ND	PEF
Baker's yeast (Saccharomyces cerevisiae)	68876-77-7	Baker	(119)	1	NA	+	+	ND	+	PEF
Shiitake (lentinus edodes)		Packager of dried mushrooms	(120)	1	NA	+	ND	immunoblotting	ND	improvement in spirometry away from work

• Algae

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Chlorella		Pharmacist	(121)	1	NA	+	ND	ND	+	PEF
Algae (specie unspecified)		Thalassotherapist	(122)	1	NA	ND	ND	ND	ND	+

- **Flours**

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Wheat, rye and soya flour		Baker	(123)	279	35%	9% + (cereals)	ND	ND	ND	FEV1, PC20
		Baker	(124)	7	100%	100% +	100% +	100% negative	57% +	
		Baker	(125)	9	100%	ND	100% +	Western blotting, etc.	ND	
Hydrolyzed wheat protein	70084-87-6	Hairdressers	(126)	2	NA	+ (laudimonium hydroxypropyl)	Neg with flours and gliadin	ND	+ in one	+ nasal challenge in one subject
White pea flour (Lathyrus sativus)	92128-86-4	Flour handler	(127)	1	NA	+	ND	+ Precipitins	+	
Buckwheat flour		Baker	(128)	3	NA	100% +	ND	ND	ND	
Konjac flour		Flour handler	(129)	1	NA	+	+	RAST inhibition	+	
White Lupin flour (Lupinus albus)		Food processing	(130)	1	~2%	+	+	ND	+	
Marigold flour (Tagetes erecta)		Animal fodder	(131)	1	NA	+	+	Immunoblotting	ND	+ Nasal challenge

• Pollens

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Bell pepper		Greenhouse worker	(92)	472	13.3%	35.4%	18.6%	ND	ND	
Brassica oleracea (cauliflower and broccoli)		Vegetable plant	(132)	54	38%	39%	58%	ND	ND	
Sunflower (Helianthus spp)		Laboratory worker	(133)	1	NA	+	+	RAST inhibition	+	
Helianthus annuus		Processing worker	(134)	102	16.6%	23.5%	ND	ND	ND	
Canari island date palm (Phoenix canariensis)		Gardener	(135)	1	NA	+	+	ND	+	
White mustard (Sinapis alba)		Olive farmers	(136)	11	NA	+	+	ND	ND (nasal challenge)	
Cyclamen		Florist	(137)	2	NA	+ (pollen)	+	ND	ND	
Eggplant (Solanum melongena)		Greenhouse worker	(138)	1	NA	+	ND	ND	+ conjunctival	PEF
Chrysanthemum		Greenhouse worker	(139)	104	9%	20,2%	+ in some	ND	ND	
Bell of Ireland (Molucella laevis)		Grower	(140)	1	NA	+	+	ND	+	
Rose		Culture of roses	(141)	290	6,2%	ND	19,5%	Immunoblotting	ND	
Thale cress (Arabidopsis thaliana)		Research student	(142)	1	NA	+	ND	ND	+	PEF

• Plants

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Grain dust		Grain elevator	(143)	610	~40%	9% +	ND	Negative precipitins	ND	Spirometry pre-post shift
		Grain elevator	(144)	502	47%	~ 50% of 51 exposed +	ND	ND	ND	FEV1, volumes
		Grain elevator	(145)			of 51 exposed +				
		Grain elevator	(146)	22	NA	0% +	ND	Negative precipitins	27% +	50% PC20 +
		Baker	(119)	1	NA	+	+	ND	+	PEF
Triticale (Tricosecale Wittmack) (hybrid cereal of rye and wheat)		Farmer	(147)	1	NA	+	+	Immunoblotting	ND	Spirometry (at work, off work)
Rice		Rice mill worker	(148)	3	NA	+(3)	+	IgE inhibition test	+	
Vetch (Vicia sativa)		Farmer	(149)	1	NA	+	+	+ Preciptins, passive transfer	+	
Coffee bean		Food processor	(150)	372	34%	24% +	12% +	ND	ND	Lung function
		Emptying	(151)	45	9%	9-40% +	ND	ND	ND	Spirometry
		Roastery	(152)	22	NA	82% +	50% +	ND	67% of 12 +	PC20 + in 14
Castor bean		Oil industry	(153)	14	NA	100% +	100% +	ND	ND	
Green bean (Phaseolus multiflorus)		Cook	(154)	1	NA	+	+	Histamine	+	
Carob bean		Jam factory	(155)	1	NA	-	+	ND	+	
Lima bean (Phaseolus lunatus)		Cake processor	(156)	1	NA	+	ND	+ basophil activation	+	
Soybean (Glycine maxima)		Soyabean processers	(157)	144	20.8%	ND	ND	ND	ND	
Almond shell dust		Sheller	(158)	1	NA	-	-	ND	+	
Tea plant dust (Camellia sinensis)		Tea processor	(159)	3	NA	+	+	+ PCA with catechin	+	
Herbal tea		Herbal tea processor	(160)	1	NA	ND	Negative	ND	+	
Tobacco leaf	84961-66-0	Tobacco manufacturer	(161)	1	NA	+	+	ND	+	
		Tobacco manufacturer	(162)	16	69%	ND	ND	ND	ND	PEF
Wonji (Polygala tenuifolia)		Herbal manufacture	(163)	1	NA	+	+	SDS-PAGE	+	

• Plants

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Copperleaf (Acalypha wikesiana)		Gardener	(164)	1	na	+	neg	Immunoblotting	+	
Hops		Brewery chemist	(165)	1	NA	+	ND	ND	ND	
Baby's breath (Gypsophila paniculata)		Florist	(166)	1	NA	+	+	Histamine release	+	
Freesia (Freesia hybride) and paprika (Capricum anuum)		Horticulture	(167)	2	NA	+	+	Histamine release	ND	
Flower (various)		Flower industry	(168)	40	7.7%	+ (21%, flowers)	ND	ND	3 subjects +	
Amaryllis (Hippeastrum sp)		Greenhouse worker	(169)	1	NA	+	+	ND	+	PEF
Chamomile (uspecified)		Cosmetician	(170)	1	NA	+	ND	ND	+ Nasal challenge	
		Tea-packing worker	(171)	1	NA	+	+	ND	+	
Statice (Limonium tartaricum)		Floral worker	(172)	1	NA	+	+	ND	ND	PEF
Sea lavender (Limonium sinuatum)		Owner of greenhouse	(173)	1	NA	+	+	Immunoblotting	+	
Decorative flower		Floral worker	(174)	4	NA	+ 2/4	+ 2/4	ND	+ 3/4	
Safflower (Carthamus tinctorius) and yarrow (Achilea milefolium)		Floral worker	(175)	1	NA	+	+	Immunoblotting	+	
Spathe flower		Floral worker	(176)	1	NA	+	+	Immunoblotting	Negative (done 8 months later)	
Peach		Factory worker	(177)	1	NA	+	+	ND	+	
Peache leave		Fruit grower	(178)	1	NA	+	+	Immunoblotting	+	
Ivy (Hedera helix)		Florist	(179)	1	NA	-	ND	ND	+	PEF
Madagascar jasmine sap (Stephanotis floribunda)		Greenhouse worker	(180)	4	50%	+	+	ND	+ In one	PEF
Herb material		Herbal worker	(181)	1	NA	+	+	Identification of 3 protein fractions	+	
Umbrella tree (Schefflera)		Landscape gardener	(182)	1	NA	+	+	ND	ND	
Passion flower (Passiflora alata) & Cascara sagrata (Rhamnus purshiana)		Technician pharmacy	(183)	1	NA	+	+	Immunoblotting	+	

- **Plants**

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Sarsaparilla root		Herbal tea worker	(184)	1	NA	+	+	ND	+	
Olive oilcake		Oil industry	(185)	1	NA	+	ND	ND	+	
Brazil ginseng (Pfaffia paniculata)		Medicinal plant processor	(186)	1	NA	+	+	Negative precipitins	+	
Sanyak (Dioscorea batatas) and Korean ginseng (Panax ginseng)		Herbal merchant	(187)	1	NA	+	+	Immunoblotting	+	
Voacanga Africana seed dust		Chemist' spouse	(188)	1	NA	+	+	Negative precipitins	+	
Tampico fiber in agave leaves		Brusk-makers	(189)	2	NA	+	ND	Immunobliotting	+	
Onion		Homemakers	(190)	3	NA	+	+	ND	+	
Onion seeds (Allium cepa, red onion)		Seed packing	(191)	1	NA	+	+	Immunoblotting	+	
Feenel seed		Sausage processing	(192)	1	NA	ND	+	Immunoblotting	ND	
Sesame seed		Baker	(193)	1	NA	+	+	Immunoblotting	+	
Linseed oilcake		Chemist	(194)	1	NA	+	+	ND	+	
Grass juice		Gardener	(195)	1	NA	+	+	Immunoblotting	+	
Potato		Housewive	(196)	2	NA	+	+	Histamine release	+	
Citrus food handling (d,l-limonene, citronellol and dichloroprene)		Labourer	(197)	1	NA	-	+	ND	ND	
Carrot (Daucus carota L.)		Cook	(198)	1	NA	+	+	SDS-PAGE	+	
Asparagus		Food processor	(199)	1	NA	+	+	Immunoblotting	+	
Courgette		Fruit warehouse	(200)	1	NA	+	+	ND	ND	
Cauliflower and cabbage		Restaurant	(201)	1	NA	+	+	ND	+	
Spinach powder		Pasta factory	(202)	1	NA	+	+	Lymphocyte activation test	+	Eosinophils in BAL
Swiss chard (Beta vulgaris L. cycla)		Housewive	(203)	1	NA	+	+	Histamine release	+	
Cacoon seed (Entage gigas)		Decorator	(204)	1	NA	+	ND	ND	ND	
Dusts from seeds of Sacha Inchi (Plukenetia volubis)		Cosmetic factory	(205)	1	NA	+	ND	SDS-PAGE	+	

- **Plants**

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Chicory		Vegetable wholesaler	(206)	1	NA	+	+	Immunoblotting	ND	
Rose hip		Pharmaceutical	(207)	9	NA	67% +	67% +	ND	50% of 4 +	
Garlic dust		Food packaging	(208)	1	NA	+	+	ND	+	
		Food packaging	(209)	1	NA	+	+	RAST inhibition	+	
Liquorice roots (Glycyrrhiza spp)		Herbalist	(210)	1	NA	+	+	ND	+	
Esparto (Stipa tenacissima and Lygeum spartum)		Stucco handler	(211)	1	NA	+	+	Immunoblotting	ND	PEF
Spice		Spices processing	(212)	1	NA	+	+	ND	ND	
Saffron (Crocus sativus)	89899-18-3	Saffron processor	(213)	5	10%	6%+	26%	Immunoblotting RAST inhibition	+ In one	
Aromatic herb		Butcher	(214)	1	NA	+	+	ND	+	PEF
Lycopodium powder		Powder	(215)	30	7%	ND	ND	ND	2/2 +	
Weeping fig (Ficus benjamina)		Plant keeper	(216)	84	7%	21% +	21%	ND	100% of 6 +	PC20
Henna (unspecified)		Hairdresser	(217)	2	NA	+	+	ND	1/2 +	
Fenugreek	68990-15-8	Food industry	(218)	1	NA	+	+	ND	ND	
Aniseed		Food industry	(219)	1	NA	+	+	ND	+	
Kapok		Sewer	(220)	1	NA	-	-	ND	+	Lung function
Argan (Argania spinosa)		Cosmetic factory	(221)	3	33.3% (3/9)	+ in one	negative	Immunoblotting	+	
Miracle tree (Moringa oleifera) seed		Technician (cosmetic factory)	(222)	1	NA	+	ND	+ SDS-Page	+	PEF
Melon	68649-66-1	Agricultural worker	(223)	1	NA	+	ND	Immunoblotting	+	
Cellulose [9004-34-6]		Operator sanitary pad production	(224)	1	NA	negative	negative	Immunoblotting	+	PEF

- **Plant-derived natural products**

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Gluten	8002-80-0	Baker	(225)	1	NA	+	+	RAST inhibition	+	
Soybean lecithin	8002-43-5	Baker	(226)	2	NA	+	+	ND	+	
Pectin	9000-69-5	Christmas candy maker	(227)	1	NA	+	-	Specific IgG4	+	
Latex		Glove manufacturer	(228)	81	6%	11%+	ND	ND	ND	PEF
		Health professional	(229)	7	2,5%	4,7% +	ND	ND	+	
Rose oil	8007-01-0	Rose extraction	(230)	52	NA	+	ND	ND	ND	

• Biologic enzymes

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Bacillus subtilis	68038-70-0	Detergent industry	(231)	1642	3,2% (over 7 years)	4,5-75% +	26% of 248 +	ND	ND	Lung function
		Factory worker	(232)	38	NA	66% +	ND	Passive transfer, 100% of 5 + Precipitin (nonspecific)	90% +	Lung function
Trypsin	9002-07-7	Plastic, pharmaceutical	(233)	14	29%	+	+	ND	75 % of 4 +	
Papain	9001-73-4	Pharmaceutical	(234)	29	45%	34% +	34% +	ND	89% of 9 +	
Pepsin	9001-75-6	Pharmaceutical	(235)	1	NA	+	+		+	
Pancreatin	8049-47-6	Pharmaceutical	(236)	14	NA	93% +	100% of 3 +	ND	100% of 8 +	Lung function
Flaviastase		Pharmaceutical	(237)	3	NA	+	+	+ Precipitin	ND	
Bromelin	9001-00-7	Pharmaceutical	(238)	76	11%	25% +	ND	ND	ND	
		Pharmaceutical	(239)	2	NA	+	ND	ND	2/2 +	
Egg lysosyme	12650-88-3	Pharmaceutical agent	(240)	1	NA	+	+	ND	+	PEF
Fungal amylase	9013-01-8	Baker	(241)	118	NA	100% of 10 +	2% exposed 34% occup. asthma +	ND	ND	
		Baker	(242)	1	NA	+	+	ND	+	
Phytase from Aspergillus niger	37288-11-2	Technician	(243)	53	36%	ND	+	SDS-PAGE	ND	
Fungal amyloglucosidase and hemicellulase		Baker	(244)	140	NA	ND	5-24%	ND	ND	
Serratial peptidase and lysozyme chloride		Pharmaceutical	(245)	1	NA	ND	+	Immunoblotting	+	
Esperase	9073-77-2	Detergent industry	(246)	667	NA	ND	5%	ND	ND	
Xylanase	37278-89-0	Laboratory worker	(247)	2	NA	2	2	ND	ND	PEF
Pectinase and glucanase		Fruit processor	(248)	3	NA	ND	Pos	Immunoblotting	ND	PEF
Lactase	9031-11-2	Pharmaceutical	(249)	207	4%	31% +	ND	ND	ND	
Empynase (pronase B)		Hospital personnel	(250)	154	3.9%	20%	+	Immunoblotting	ND	
Various enzymes in rennet production (proteases, pepsine, chymosines)		Cheese producer	(251)	35	17%	40%+	ND	ND	ND	

• Biologic enzymes

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Lallzyme EX-V (from Aspergillus niger)		Wine cellar	(252)	1	NA	+	ND	Immunoblotting	+	
Protease	9001-92-7	Operator in a dishwashing tablet factory	(253)	1	NA	+	+	ND	+	FeNO
Chymosine	9001-98-3	Cheese maker	(254)	1	NA	+ (rennet)	+	Immunoblotting	ND	Improvement away from work

• Vegetable Gums

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Acacia	9000-01-5	Printer	(255)	63	19% of 31 (selection)	ND	ND	ND		
		Printer	(256)	10	NA	+	ND	Passive transfer (3 +)	ND	
Tragacanth	9000-65-1	Gum importer	(257)	1	NA	+	ND	ND	ND	
Karaya	9000-36-6	Hairdresser	(258)	9	4%	+	ND	Passive transfer	ND	
Guar	9000-30-0	Carpet manufacturing	(259)	162	2%	5% +	8% +	ND	67% of 3 +	PC20
Gutta-percha	9000-32-2	Dental hygienist	(260)	1	NA	+	ND	ND	ND	

Low-molecular-weight agents

• Diisocyanates

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Toluene diisocyanate	26471-62-5	Polyurethane	(261)	112	12,5%	3% +	0% +	0%+	45% of 11+ PCA	
		Plastics	(262)	26	NA	ND	19% +	ND	100% +	
		Varnish	(263)	195	28%	ND	5% +	ND	70% of 17+	
		(?)	(264)	91	NA	NA	ND	0% +	ND	Specific IgG
		(?)	(265)	162 †	NA	ND	ND	ND	57% +	
Diphenylmethane diisocyanate	26447-40-5	Foundry	(266)	11	NA	ND	27% +	36% + Specific IgG	54,5% +	
		Foundry	(267)	76	13%	ND	3% +	7% + Specific IgG	ND	
		Steel foundry	(268)	26	27%	4% +	4% +	15% + Specific IgG	ND	
1,5-Naphthylene diisocyanate	3173-72-6	Manufacture rubber	(269)	3	NA	ND	ND	ND	100%+	
Isophorone diisocyanate	4098-71-9	Spray painter	(270)	1	NA	ND	ND	ND	+	
Prepolymers of TDI		Floor varnisher	(271)	2	NA	ND	0% +	Specific IgG negative	+	
Prepolymers of HDI		Spray painter	(272)	9	45%	ND	33% +	56% +	+	

• Combination of diisocyanates

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
TDI, MDI, HDI, PPI		Spray painters	(273)	51	11,8% *	ND	ND	ND	60% of 10 + to PPI	
TDI, MDI, HDI		Various industries	(274)	24	NA	ND	ND	ND	70% + to TDI 33% + to MDI 33% of 9 + to HDI	
		Chemical manufacturing	(275)	247 †	NA	60% of 53 + 14% +	ND	ND		
		Paint shop	(276)	62	NA	ND	15% +	47%+ Specific IgG	6% + to TDI 16% to MDI 24% to HDI	
TDI, MDI		Chemical manufacturing	(277)	28	NA	ND	27% of 22 + TDI-HSA 83% of 6 + MDI-HSA	ND	100%+	

• Other hardeners

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Triglycidyl isocyanurate	2451-62-9	Spray painter	(278)	1	NA	ND	ND	ND	+	PEF
Polyfunctional aziridine		Hardener in paints	(279)	7	NA	33% of 7	ND	ND	+ In 7	
Bisphenol A diglycidyl ether (BADGE)	1675-54-3	Epoxy resin	(280)	1	NA	+	+	ND	+	

• Anhydrides

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Phthalic anhydride	85-44-9	Plastics	(281)	1	NA	+	+	ND	+	
		Toolsetter, resin plant agent	(282)	3	NA	ND	ND	ND	100% +	
		Production of resins	(283)	118	28%	18% of 11 +	ND	ND		
		Production of resins	(284)	60	14%	ND	7% +	17% + Specific IgG	ND	
Trimellitic anhydride	552-30-7	Epoxy resins, plastics	(285)	4	NA	100% +	75% +	100% +	100% of 1 +	
Tetrachlorophthalic anhydride	117-08-8	Epoxy resins, plastics	(286)	5	NA	ND	ND	ND	100% +	
		Factory (plastic coating)	(287)	7	NA	100% +	100% +	ND	100% +	
Pyromellitic dianhydride	89-32-7	Epoxy adhesive	(288)	7	NA	ND	ND	ND	30% +	
Methyl tetrahydrophthalic anhydride (MTHPA)	11070-44-3	Curing agent	(289)	1	NA	+	+	Negative Specific IgG	ND	Improvement with removal
Hexahydrophthalic anhydride (HHPA)	85-42-7	Chemical worker	(290)	1	NA	ND	ND	ND	+	PEF
MTHPA + HHPA		Electrical plant	(291)	109	5,4%	ND	15,4%	ND	6/17	
Himic anhydride	2746-19-2	Manufacture of flame retardant	(292)	20	35%	ND	40% of 7 +	RAST inhibition	ND	
Chlorendic anhydride	115-27-5	Mechanic	(293)	1	NA	+	+	ND	+	PEF
Maleic anhydride	108-31-6	Polyester resin production	(294)	1	NA	ND	ND	ND	+	
Dioctyl-phthalate	117-81-7	Production of PVC	(295)	1	NA	ND	ND	ND	ND	PEF

• Aliphatic amines (ethyleamines)

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Ethylene diamine	107-15-3	Shellac handler	(296)	7	NA	100% +	ND	ND	100% +	
		Photography	(297)	1	NA	ND	ND	ND	+	
Ethylene diamine tetraacetic acid (EDTA) sodium salts		Cleaners and health care professionals	(298)	8	NA	ND	ND	ND	+ (nasal)	PC20
Isophorone diamine (IPDA)	2855-13-2	Epoxy floor coater	(299)	1	ND	Négative	ND	ND	+	PC20, FeNO
Hexamethylene tetramine	100-97-0	Lacquer handler	(296)	7	NA	100% +	ND	ND	100% +	
Aliphatic polyamine		Chemical factory	(300)	12	33,3%	ND	ND	ND	100% of 2 +	
Triethylene tetramine	112-24-3	Aircraft filter	(282)	1	NA	ND	ND	ND	+	
Mixture of trimethyl-hexanediamine and isophorondiamine		Floor covering material, salesman	(301)	1	NA	-	ND	ND	+	BAL

• Aliphatic amines (ethanolamines)

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Monoethanolamine	141-43-5	Beauty culture	(296)	10	100% +	ND	ND	ND	100% +	
Triethanolamine	102-71-6	Metal worker	(302)	2	NA	ND	ND	ND	100% of 2	
Aminoethylethanolamine	111-41-1	Soldering	(303)	3	NA	ND	ND	ND	100% +	
		Cable jointer	(304)	2	NA	ND	ND	ND	+	
Dimethylethanolamine	108-01-0	Spray paint	(305)	1	NA	-	ND	ND	+	

• Aliphatic amines (others)

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
3-(Dimethylamino)propylamine (3-DMAPA)	109-55-7	Ski manufacture	(306)	34	11,7%	ND	ND	ND	ND	Cross-shift change in FEV1

• Heterocyclic amines

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Piperazine hydrochloride	142-64-3	Chemist	(307)	2	NA	50% +	ND	ND	100%	
		Pharmaceutical	(308)	131	11,4%	ND	ND	ND	100% of 1 +	
		Chemical plant	(309)	2	NA	50% +	100% +	ND	ND	
N-Methylmorpholine	109-02-4	Chemical manufacturing	(310)	48	16,6% **	ND	ND	ND	ND	
4,4-methylene-bismor-pholine		Machine tool setter operator	(311)	1	NA	+	ND	ND	+	PEF

• Aromatic amines

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Paraphenylene diamine	106-50-3	Fur dyeing	(312)	80	37,0%	66% +	ND	ND	74% +	
		Hair dyers	(313)	5	NA	neg	ND	ND	+	

• Quaternary amines

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Benzalkonium chloride	8001-54-5	Cleaning product	(314)	1	NA	+	ND	ND	+	

• Mixture of amines

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
EPO 60		Mould maker	(315)	1	NA	ND	ND	ND	+	

• Fluxes

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Colophony	8050-09-7	Electronic worker	(316)	34	NA	ND	ND	ND	100% +	
		Manufacture solder flux	(317)	68 low	4%	ND	ND	ND	ND	
				14 med	21%	ND	ND	ND	ND	
				6 high	21%	ND	ND	ND	ND	
Zinc chloride & ammonium chloride flux		Metal jointing	(318)	2	NA	ND	ND	ND	+	PC20
95% Alkylaryl polyether alcohol +5% polypro-pylene glycol		Electronic assembler	(319)	1	NA	ND	ND	ND	+	
Adipic acid	124-04-9	Solderer	(320)	1	NA	ND	ND	ND	+	PEF
Lipophilic resin		Aerospace plant	(321)	1	NE	ND	ND	ND	ND	Improvement

• Wood dust or bark

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Western red cedar (Thuja plicata)		Carpentry	(322)	35	NA	ND	ND	ND	ND	Improvement on removal
		Furniture making	(323)	1320	3,4%	1,9% +	ND	ND	ND	Improvement on removal
		Cabinetmaking, carpentry	(324)	22		100% -	ND	100% - Precipitin	82% +	
		Sawmill	(325)	185		100% -	ND	ND	100% +	
		Cedar sawmill	(326)	652	4,1%	100% -	ND	ND	ND	Questionnaire
Eastern white cedar (Thuja occidentalis)		Sawmill	(327)	3	4 to 7%	ND	ND	ND	+	PC20
California redwood (Sequoia sempervirens)		Woodcarver	(328)	2	NA	-	ND	- Precipitin	+	
		Carpenter	(329)	1	NA	ND	ND	ND	+	
Cedar of Lebanon (Cedra		Jointer	(330)	6	NA	17% +	ND	100% - Precipitin	ND	
Spruce wood (unspecified)		Sawmill worker	(331)	1	NA	ND	+	ND	+	PEF +
Cocabolla (Dalbergia retusa)		Woodworker	(332)	3	NA	100% -	ND	ND	ND	Improvement on removal
Iroko (Chlorophora excelsa)		Carpenter	(333)	1	NA	+	ND	+ Precipitin	+	
		Carpenter	(334)	1	NA	ND	ND	ND	+	
		Woodworker	(335)	9	NA	4/9 with + Intradermal test	Negative	ND	+	PEF
Oak (Quercus robur)		Lumber Millworkwer	(336)	1	NA	-	ND	+	+	
		Construction, carpentry	(337)	3	NA	ND	ND	+ Precipitin	+	
Mahogany (unspecified)		Pattern maker (wood)	(336)	1	NA	-	ND	+ Precipitin	+	
Abiruana (Pouteria)		Furniture factory	(338)	2	NA	+	ND	- Precipitin	+	
African Maple (Triplochiton scleroxylon)		Construction, carpentry	(339)	2	NA	+	+	Passive transfer	+	
		Sauna building	(340)	2	NA	100% +	100% +		+	
		Maker of wooden plane model	(341)	1	NA	+	+	ND	+	
Tanganyika aningre		Woodworker	(342)	3	NA	100% +	100% -	100% - Precipitin	100% +	

- **Wood dust or bark**

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Mukali (Angineria robusta)		Furniture factory	(343)	1	NA	+	+	ND	+	
Central American Walnut (Juglans olanchana)		(?)	(344)	1	NA	-	-	- Precipitin	+	
Kejaat (Pterocarpus angolensis)		Wood-machinist	(345)	1	NA	+	ND	ND	ND	
African zebrawood (Microberlinia)		Wood-machinist	(346)	1	NA	+	+	ND	+	
Ramin (Gonystylus bancanus)		Woodworker	(347)	2	NA	+	+	ND	+	
Quillaja bark (Quillaja saponaria)		Saponin factory	(348)	1	NA	ND	+	ND	+	
Fernambouc (Caesalpinia echinata)		Bow making	(349)	36	33,3%	100% -	ND	ND	100% of 1 +	
White ash (Fraxinus		Sawmill	(350)	1	NA	-	-	ND	+	
Common ash (Fraxinus excelsior)		Furniture	(351)	1	NA	-	+	ND	+	
Pau Marfim (Balfourodendron riedelianum)		Woodworker	(352)	1	NA	+	+	ND	+	
Cabreuva (Myrocarpus fastigiatus Fr. All.)		Parquet floor layer	(353)	1	NA	ND	ND	ND	+	
Ebony wood (Diospyros crassiflora)		Carpenter	(354)	1	NA	-	ND	ND	+	
Kotibe wood (Nesogordonia papaverifera)		Cabinet maker	(355)	1	NA	+	ND	Passive transfer	+	
Cinnamon (Cinnamomum Zeylanicum)		Store	(356)	40	22,5%	ND	ND	ND	100% of 1 +	
Brazilian walnut (Imbuia)		Furniture	(357)	1	NA	ND	ND	+ Precipitin	+	Negative PEF
Blackwood (Acacia Melanoxylon)		Furniture	(358)	3	NA	ND	ND	ND	+	Positive PEF
African cherry (Makore)		Cabinet worker	(359)	1	NA	-	ND	ND	+	
Antiaris		Door manufacturer	(360)	1	NA	+	+	SDS-PAGE	+	
Sapele wood dust		Carpenter	(361)	1	NA	ND	ND	ND	ND	
Ipe (Tabebuia spp)		Sawyer	(362)	1	NA	ND	ND	ND	+	

• Wood dust or bark

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Angelim pedra (Hymenolobium petraeum)		Carpenter	(363)	1	NA	+	ND	SDS-PAGE	+	
Cedrorana (Cedrelinga catenaeformis Ducke)		Carpenter	(364)	1	NA	+	+	SDS-PAGE	+	
Falcata (Albizia falcataria)		Wood furniture	(365)	1	NA	+	ND	ND	+	
Chengal (Neobalanocarpus hemeii)		Carpenter	(366)	1	NA	ND	ND	ND	+	PEF
Unidentified agent		Sawmills of eastern Canada and USA	(367)	11	NA	ND	ND	ND	+	PEF

- **Metals**

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Platinum	7440-06-4	Platinum refinery	(368)	16	NA	62% +	ND	ND	62% +	
		Platinum refinery	(369)	136	29%	17% +	21% +	ND	ND	
Tetrachloroplatinate		Production of cytotoxic drugs (Cisplatin)	(370)	1	NA	not interpretable	ND	ND	+	
Nickel sulfate	7786-81-4	Metal plating	(371)	1	NA	+	ND	- Precipitin	+	
		Metal polisher	(372)	1	NA	+	ND	- Precipitin	+	
		Electroplating process	(373)	1	NA	+	+	ND	+	
Cobalt	7440-48-4	Hard metal grinder	(374)	4	NA	25% +	ND	ND	50% +	
		Diamond polisher	(375)	3	NA	ND	ND	ND	100% +	
Iron (unspecified)		Welders	(376)	3	NA	ND	ND	ND	+	Induced sputum
Palladium tetraamine dichloride	13815-17-3	Assembly line	(377)	1	NA	+	ND	ND	+	
Rhodium	7440-16-6	Electroplating	(378)	1	NA	+	ND	ND	+	
Zinc fumes		Solderer	(379)	2	NA	ND	ND	ND	+	
		Locksmith	(380)	1	NA	ND	ND	ND	+	
Tungsten carbide	12070-12-1	Metal grinder	(381)	1	NA	ND	ND	ND	ND	Recovery on removal
Chromium	7440-47-3	Printer	(382)	1	NA	+	ND	ND	ND	
Chromate	13907-45-4	Cement floorer	(383)	1	NA	ND	ND	ND	+	
		Plating	(384)	1	NA	+	ND	ND	ND	
		Various	(385)	4	NA	+	ND	ND	+	
Stellite (alloy containing ~60 % of cobalt, ~30 % of chromium, tungsten and carbon)		Machinist	(386)	1	NA	- to metals	ND	-	+	
Chromium & Nickel		Welder	(387)	5	NA	ND	ND	ND	100% of 2 +	
		Tanning	(388)	1	NA	-	+	ND	+	
		Electroplating	(389)	7	NA	Chrome: 29% + Nickel: 57% +	ND	ND	Chrome: 100% of 7 Nickel: 40% of 5	
Cobalt & Nickel		Hard metal plant	(390)	8	NA	Cobalt: 75% + Nickel: 62% +	Cobalt: 62% + Nickel: 50% +	ND	Both cobalt & nickel: 100% +	

- **Metals**

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Aluminum	7429-90-5	Soldering	(391)	1	NA	ND	ND	ND	+	
Manganese	7439-96-5	Welder	(392)	1	NA	ND	ND	ND	+	

• Drugs

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Penicillins & Ampicillin		Pharmaceutical	(393)	4	NA	100% -	ND	ND	75% +	
Penicillamine	52-67-5	Pharmaceutical	(394)	1	NA	ND	-	ND	+	PEF
Cephalosporins	11111-12-9	Pharmaceutical	(395)	2	NA	+	ND	ND	+	
		Pharmaceutical	(396)	91	8%	71% +	ND	ND	ND	Improvement off work
		Pharmaceutical	(397)	161	15.5% (symptoms)	3.1%	17.4%	ELISA INHIBITION	ND	ND
Colistin	1066-17-7	Pharmaceutical	(398)	1	NA	ND	ND	ND	+	
Thiamphenicol	15318-45-3	Pharmaceutical	(399)	3	NA	67 % +	67% +	ND	+	
7-aminocephalosporanic acid	957-68-6	Pharmaceutical	(400)	2	NA	+	+	RAST inhibition	+	
Phenylglycine acid chloride hydrochloride	39878-87-0	Pharmaceutical	(401)	24	29%	37% +	37% +	Passive transfer	100% of 2 +	
Psyllium	8063-16-9	Laxative manufacturer	(402)	3	NA	100% +	ND	ND	60% +	
		Pharmaceutical	(403)	130	4% *	19% of 120 +	26% of 118 +	ND	27% of 18 +	
		Nurse	(404)	5	NA	80% +	100% +	ND	100% +	
		Health personnel	(405)	193	4% *	3% +	12% of 162 +	ND	26% of 15 +	
Methyl dopa	555-30-6	Pharmaceutical	(406)	1	NA	-	ND	ND	+	
Spiramycin	8025-81-8	Pharmaceutical	(407)	1	NA	+	ND	ND	+	
		Pharmaceutical	(408)	51	8% *	100% -	ND	ND	25% of 12 +	
		Pharmaceutical	(409)	2	NA	ND	-	ND	+	
Salbutamol intermediate		Pharmaceutical	(410)	1	NA	-	ND	ND	+	
Amprolium hydrochloride	137-88-2	Poultry feed mixer	(411)	1	NA	ND	ND	ND	+	
Tetracycline	60-54-8	Pharmaceutical	(412)	1	NA	ND	ND	ND	+	
Isonicotinic acid hydrazide	54-85-3	Hospital pharmacy	(413)	1	NA	+	+	ND	+	
Hydralazine	86-54-4	Pharmaceutical	(414)	1	NA	-	-	- Specific IgG	+	
Tylosin tartrate	1405-54-5	Pharmaceutical	(415)	1	NA	ND	ND	ND	+	
Ipecacuanha	8012-96-2	Pharmaceutical	(416)	42	48%	52% of 19 +	66% of 18 +	ND	ND	
Cimetidine	51481-61-9	Pharmaceutical	(417)	4	NA	ND	ND	ND	25% +	

- **Drugs**

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Thiamine	59-43-8	Cereal manufacture	(418)	1	NA	ND	-	ND	+	
Aescin	6805-41-0	Pharmaceutical	(419)	1	NA	ND	ND	ND	+	
Lasamide (precursor of furosemide)	2736-23-4	Chemical worker	(420)	3	NA	3 +	ND	ND	+	
5-aminosalicylic acid	89-57-6	Pharmaceutical	(421)	1	NA	Neg	ND	ND	+	
Piperacillin	61477-96-1	Pharmaceutical	(422)	1	NA	+	ND	ND	+	
Ceftazidime	72558-82-8	Pharmaceutical	(423)	1	NA	ND	ND	ND	+	
Opiate compounds		Pharmaceutical	(424)	39	26%	+	ND	ND	ND	PEF
		Pharmaceutical	(425)	4	14%	+	+	ND	+	Pre-post shift FEV1
Amoxicillin	26787-78-0	Pharmaceutical	(426)	1	NA	-	-	ND	+	
Vancomycin	1404-90-6	Pharmaceutical	(427)	1	NA	ND	ND	ND	Histamine release	PEF
Mitoxantrone	65271-80-9	Nurse	(428)	1	NA	ND	ND	ND	+	PEF Alveolar lavage
Tafenoquine ((R)-N3-(2,6-Dimethoxy-4-methyl-5-(3-trifluoromethyl)phenoxy)quinolin-8-yl)pentane-1,4-diamine)		Pharmacist	(429)	1	NA	ND	Negative	ND	+	
Ranitidine (1,1-Ethenediamine, N-[2-[[[5-[(dimethylamino)methyl]-2-furanyl]methyl]thio]ethyl]-N'-methyl-2-nitro)		Pharmacist packaging pharmaceutical company	(430)	1	NA	-	ND	ND	+	
Minoxidil [38304-91-5]		Beautician	(431)	1	NA	negative	ND	ND	negative (but changes in induced sputum and PC20)	
Ferrimanitol ovalbumin		Worker pharmaceutical company	(431)	1	NA	negative	ND	immunoblotting	+	
Clarithromycin [81103-11-9]		Worker pharmaceutical company	(431)	1	NA	negative	ND	ND	+	
Glucosamine hydrochloride [66-84-2]		Cleaner	(431)	1	NA	negative	ND	ND	+	

• Reactive dyes

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Reactive dye		Reactive dyes manufacture	(432)	309	25%	7% + orange 8% + black	17% + orange 17% + black	ND	65% of 20 +	
		Wool dye house	(433)	6	NA	ND	83% +	100% +	ND	
		Textile dyehouse	(434)	162	NA	NA	85% of 5 +	ND	ND	
Levafix brilliant yellow E36		Preparation of dye solution	(435)	1	NA	+	ND	ND	+	
Drimaren brilliant yellow K-3GL	12226-52-7	Textile industry	(436)	1	NA	+	ND	ND	+	
Black henna (Indigofera argentea)		Herbal shop sales	(437)	1	NA	+	+	ND	ND	PEF
FD&C blue dye #2	860-22-0	Food industry	(438)	1	NA	-	-	ND	+	
Cibachrome brilliant scarlet 32		Textile industry	(436)	1	NA	+	ND	ND	+	
Drimaren brilliant blue K-BL		Textile industry	(436)	1	NA	+	ND	ND	+	
Lanasol Yellow 4G	12226-61-8	Dyer	(436)	1	NA	+	ND	ND	+	
Synozol Red-K 3BS		Textile worker	(439)	1	NA	+	+	ND	+	
Carmine	1390-65-4	Dye manufacture	(440)	10	NA	30% +	30% +	ND	100% of 1	
Monascus ruber		Delicatessen plant	(441)	1	NA	+	ND	+ Immunoblotting	+	PC20

• Biocides

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Hexachlorophene	70-30-4	Hospital staff (sterilizing agent)	(442)	1	NA	ND	ND	ND	+	
Chlorhexidine	55-56-1	Nurse	(443)	2	NA	ND	ND	ND	+	
Glutaraldehyde	111-30-8	Hospital endoscopy unit	(444)	9	89%	ND	ND	ND	ND	Questionnaire
		Endoscopy & Radiology	(445)	8	NA	ND	ND	ND	7/8 +	PEF
Ortho-Phthalaldehyde	643-79-8	Endoscopy unit	(446)	1	NA	ND	ND	ND	ND	Improvement while away from work
Hydroxylamine	7803-49-8	Paper recycling	(447)	2	NA	ND	ND	ND	1+	PEF
Peracetic acid-hydrogen peroxide mixture		Endoscopy unit	(448)	2	NA	ND	ND	ND	2+	PEF
Chloramine T	127-65-1	Chemical manufacturing	(449)	6	NA	100% +	ND	66% + passive transfer	ND	
		Brewery	(450)	7	NA	100% +	ND	ND	ND	Recovery with removal
		Janitor-cleaning	(451)	5	NA	100% of 4 +	ND	ND	100% of 3 +	
Chloramine (unspecified)		Lifeguard, Swimming teacher	(452)	3	NA	ND	ND	ND	+	PEF
Lauryl dimethyl benzyl ammonium chloride	139-07-1	Pharmacist	(453)	1	NA	ND	ND	ND	+	PEF
Isothiazolinone (unspecified)		Chemical plant	(454)	1	NA	ND	ND	ND	+	
Triclosan	3380-34-5	Nursery nurse	(455)	1	NA	ND	ND	ND	+	PEF

• Fungicides

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Tetrachloroisophthalonitrile	1897-45-6	Farmer	(456)	1	NA	ND	-	+ Patch test	+	FEV1 recording at work
Tributyl tin oxide	56-35-9	Venipuncture technician	(457)	1	NA	-	ND	ND	+	
Captafol	2425-06-1	Chemical manufacturing	(458)	1	NA	-	ND	ND	+	

- **Chemicals**

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Polyvinyl chloride (fumes)		Meat wrapper	(459)	96	69%	ND	ND	ND	27% of 11 +	
Polyvinyl chloride (fumes and powder)		Meat wrapper	(460)	3	NA	ND	ND	ND	ND	History only
Polyvinyl chloride (powder)	9002-86-2	Manufacture bottle caps	(461)	1	NA	ND	ND	ND	+	PEF
Organic phosphate insecticides		Chemical packaging plant	(462)	1	NA	ND	ND	ND	ND	History only
Tetramethrin	7696-12-0	Extermination	(463)	1	NA	-	ND	ND	+	PC20
Persulfate salts (ammonium, potassium, sodium)		Hairdressing	(464)	2	NA	+	ND	ND	+	
		Hairdressing	(465)	2	NA	+	ND	ND	+	
		Hairdressing	(466)	23	17%	4% +	ND	ND	100% of 4 +	
		Hairdressing	(467)	1	NA	-	ND	ND	+	
		Hairdressing	(468)	1	NA	ND	ND	ND	+	
Eugenol	97-53-0	Hairdressing	(469)	1	NA	-(prick) +patch	ND	Mononuclear proliferation	+	
Diazonium salt		Manufacture of photocopy paper	(470)	1	NA	ND	ND	ND	+	
		Manufacture of fluorine polymer precursor	(471)	45	56%	ND	20% +	ND	100% of 2	
Urea formaldehyde	9011-05-6	Resin	(472)	2	NA	-	ND	ND	+	
		Resin	(473)	3	NA	ND	ND	ND	100% of 3	
		Manufacture of foam	(474)	1	NA	ND	ND	ND	+	
Popcorn flavoring chemical		Popcorn makers	(475)	3	NA	ND	ND	ND	ND	
Freon (unspecified)		Refrigeration	(476)	1	NA	ND	ND	ND	+	
Furfuryl alcohol (furan based resin)		Foundry mold making	(477)	1	NA	ND	ND	ND	+	
Styrene	100-42-5	Plastics factory	(478)	2	NA	-	ND	ND	+	
Azobisformamide	123-77-3	Plastics, rubber	(479)	151	18,5%	ND	ND	ND	ND	Removal with improvement
		Plastic	(480)	2	NA	ND	ND	ND	+	
		Plastics	(481)	4	NA	ND	ND	ND	100% of 2 +	

- **Chemicals**

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Sodium isononanoyl oxybenzene sulfonate		Laboratory technician	(482)	1	NA	ND	ND	ND	+	
Peptide coupling reagent (TBTU and HBTU)		Laboratory technician	(483)	1	NA	+	Neg	ND	+	
3-amino-5-mercapto-1,2,4-triazole	16691-43-3	Herbicide production	(484)	6	NA	ND	ND	Specific IgG	ND	PEF
Tetrazene	31330-63-9	Detonator manufacturer	(485)	1	NA	ND	ND	ND	+	PEF
Polyethylene	9002-88-4	Paper packer	(486)	1	NA	ND	ND	ND	+	PEF
Tall oil	8002-26-4	Rubber tyre manufacturer	(487)	1	NA	-	ND	- Patch test	+	PEF
Sulfites (unspecified)		Water plant	(488)	1	NA	-	ND	ND	Oral +	
3-(Bromomethyl)-2-chloro-4-(methylsulfonyl)- benzoic acid (BCMBA)	120100-05-2	Chemical factory worker	(489)	2	2/92(2%)	+	ND	ND	+	FeNO
Sodium metabisulfite	7681-57-4	Food processor	(490)	1	NA	ND	ND	ND	+	
Sodium bisulfite	7631-90-5	Fishing industry	(491)	1	NA	ND	ND	ND	+	
Polypropylene	9003-07-0	Bag manufacturer	(492)	1	NA	ND	ND	ND	+	PEF
Polyester		Painter	(493)	1	NA	ND	ND	ND	+	Alveolitis
Glacial acetic acid	64-19-7	Pickling	(494)	1	NA	ND	ND	+	ND	
Ninhydrin	485-47-2	Laboratory worker	(495)	1	NA	ND	ND	ND	+	PEF
1,2-Benzisothiazolin-3-one	2634-33-5	Chemical worker	(496)	1	NA	ND	ND	ND	+	
Metabisulfite		Agricultural producer	(490)	1	NA	ND	ND	ND	ND	

• Health Care

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Ethylene oxide	75-21-8	Nurse	(497)	1	NA	ND	+	ND	+	Changes in PC20
Enflurane	13838-16-9	Hospital staff	(498)	1	NA	ND	ND	ND	+	
Sevoflurane + isoflurane		Anesthesiology staff	(499)	3	NA	ND	ND	ND	+	
Methyl blue	28983-56-4	Hospital staff	(500)	1	NA	ND	ND	ND	+	
Terpene		Hospital staff	(501)	1	NA	ND	ND	ND	+	
Radiographic fixative		Hospital staff	(502)	1	NA	ND	ND	ND	+	
Sulfathiazole	72-14-0	Hospital staff	(503)	2	NA	-	ND	ND	+	
Formaldehyde	50-00-0	Hospital staff	(504)	28	29% *	ND	ND	ND	50% of 4 +	
		Different industries	(505)	15	NA	ND	ND	ND	60% +	
		Different industries	(506)	230	5%	ND	ND	ND	5% +	
Methyl methacrylate & cyanoacrylates		Adhesive	(507)	7	NA	ND	ND	ND	86% +	PEF
		Nurse	(508)	1	NA	ND	ND	ND	+	
		Glue	(509)	1	NA	ND	ND	ND	+	PEF monitoring
		Fingernail	(510)	1	NA	ND	ND	ND	+	
Triacrylate (unspecified)		Printing	(511)	1	NA	ND	ND	ND	+	
Ethoxylated-2-bisphenol-A-diacrylate	64401-02-1	Autobody shop	(512)	1	NA	ND	ND	ND	+	

• Synthetic Material

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
Plexiglass		Factory	(513)	1		ND	ND	ND	+	Pre-post change in FEV1
Tooth enamel dust		Dentist	(514)	1	NA	ND	ND	ND	ND	
ECG ink		Laboratory nurse	(500)	1	NA	+	ND	ND	+	

• Unidentified

Agent	*CAS number*	*Occupation*	*References*	*Subjects (n)*	*Prevalence*	*Skin test*	*Specific IgE*	*Other immunological tests*	*Broncho provocation test*	*Other evidence*
(?)		Respiratory therapist	(515)	194	19%	ND	ND	ND	ND	Questionnaire
(?)		Mineral analysis laboratory	(516)	21	24% **	ND	ND	ND	ND	Questionnaire PC20
(?) Oil mist		Toolsetter	(517)	1	NA	ND	ND	ND	+	PEF
(?) Metal working fluid		Automobile plant	(518)	12	1,5%	ND	ND	ND	ND	PC20, FEV1
(?) Fluorine		Potroom	(519)	52	NA	ND	ND	ND	ND	History
(?) Aluminum		Potroom	(520)	227	7%	ND	ND	ND	ND	Questionnaire
		Potroom	(521)	35	NA	ND	ND	ND	ND	History
		Potroom	(522)	57	NA	ND	ND	ND	ND	History
		Potroom	(523)	1	NA	ND	ND	ND	+	PEF
Aluminium tetrafluorides (Potassium aluminium tetrafluoride)		Production line (using a flux)	(524)	5	NA	ND	ND	ND	+	
Aluminium chloride	7446-70-0	Foundry worker	(525)	1	NA	ND	ND	ND	+	PEF
(?) Pulverized fuel ash		Power station attendant	(526)	1	NA	ND	ND	ND	+	PEF
Acrylonitrile-Butadiene Styrene filaments-(ABS)	9003-56-9	Self employed (3D printing)	(527)	1	NA	ND	ND	ND	ND	Worsening at Works

Legends

† : Subjects with symptoms

* : Based on challenge data

** : Presence of bronchial hyperresponsiveness

NA : not applicable ND : not done

The number of subjects tested is not specified if it included all subjects; otherwise it is mentioned.

All proportions including 3 or more as the denominator are expressed as %.

BAL : Bronchoalveolar lavage.

FEV1 : Forced expiratory volume in 1 second.

PCA : Passive cutaneous anaphylaxis.

PC20 : Provocative concentration of methacholine causing a 20% fall of FEV1.

PEF : Peak expiratory flow.

PFR : Peak flow rate.

PK : Prausnitz-Küstner reaction or PK test or passive transfer test.

PPI : Polymethylene polyphenylisocyanate.

SDS-PAGE : «Sodium dodecyl sulfate - polyacrylamide gel electrophoresis».

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