

## Agents Causing Occupational Asthma With Key References

### High-molecular-weight agents

#### • Animal-derived antigens

<i>Agent</i>	<i>CAS number</i>	<i>Occupation</i>	<i>References</i>	<i>Subjects (n)</i>	<i>Prevalence</i>	<i>Skin test</i>	<i>Specific IgE</i>	<i>Other immunological tests</i>	<i>Broncho provocation test</i>	<i>Other evidence</i>
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	<a href="#">Link</a>	Dairy industry	(15)	1	NA	+	ND	+ Basophil degranulation	+	
Raw beef		Cook	(16)	1	NA	+	ND	SDS-PAGE	+	
Bovine serum albumin	<a href="#">Link</a>	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)	<a href="#">Link</a>	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	

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				(n)	Prevalence					
Ivory dust		Ivory worker	(23)	1	NA	Negative	ND	ND	+	FEV1 at work
Nacre dust		Nacre buttons	(24)	1	NA	+	ND	Negative precipitins	+	
Sericin	<a href="#">Link</a> 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 ( <i>Actinia equina</i> )		Fisherman and worker in a seafood processing plant	(29)	2	NA	+	+	Immunoblotting	+	Improvement away from work

## Agents Causing Occupational Asthma With Key References

### • Crustacea, seafoods, fish

Agent	CAS number	Occupation	References	Subjects		Skin test	Specific IgE	Other immunological tests	Broncho provocation test	Other evidence
				(n)	Prevalence					
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

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• **Crustacea, seafoods, fish**

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

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### • Arthropods

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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 (Phryganeidae)		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	

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**• Arthropods**

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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	
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	
Dermeestidae 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 plamosus)		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	+	

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• **Acarians**

Agent	CAS number	Occupation	References	Subjects		Skin test	Specific IgE	Other immunological tests	Broncho provocation test	Other evidence
				(n)	Prevalence					
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 ( <i>Panonychus ulmi</i> )		Apple grower	(95)	4	NA	+	ND	Negative precipitins	ND	
Citrus red mite ( <i>Panonychus citri</i> )		Citrus farmer	(96)	16	NA	+	+	RAST inhibition	+ (One)	
McDaniel spider mite ( <i>Tetranychus macdanieli</i> )		Vine grower	(97)	35	11% (4/35)	100%	ND	ND	ND	
Two spotted spider mite ( <i>Tetranychus urticae</i> )		Farmer	(98)	16	35% (16/46)	100%	100%	ND	ND	
Various insects used in biological pest control		Greenhouse workers	(99)	2	NA	+	+	ND	+	

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### • Molds

Agent	CAS number	Occupation	References	Subjects		Skin test	Specific IgE	Other immunological tests	Broncho provocation test	Other evidence
				(n)	Prevalence					
Dictyostelium discoideum (mold)		Technician	(100)	1	NA	+	+	ND	Workplace +	
Aspergillus niger	<a href="#">Link</a> 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	<a href="#">Link</a> 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	+	



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### • Mushrooms

<i>Agent</i>	<i>CAS number</i>	<i>Occupation</i>	<i>References</i>	<i>Subjects</i>		<i>Skin test</i>	<i>Specific IgE</i>	<i>Other immunological tests</i>	<i>Broncho provocation test</i>	<i>Other evidence</i>
				<i>(n)</i>	<i>Prevalence</i>					
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)	<a href="#">Link</a> 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
Various		Mushroom farm	(121)	1	NA	+	ND	Immunoblotting	ND	PEF

### • Algae

<i>Agent</i>	<i>CAS number</i>	<i>Occupation</i>	<i>References</i>	<i>Subjects</i>		<i>Skin test</i>	<i>Specific IgE</i>	<i>Other immunological tests</i>	<i>Broncho provocation test</i>	<i>Other evidence</i>
				<i>(n)</i>	<i>Prevalence</i>					
Chlorella		Pharmacist	(122)	1	NA	+	ND	ND	+	PEF
Algae (specie unspecified)		Thalassotherapist	(123)	1	NA	ND	ND	ND	ND	+

## Agents Causing Occupational Asthma With Key References

### • Flours

<i>Agent</i>	<i>CAS number</i>	<i>Occupation</i>	<i>References</i>	<i>Subjects (n)</i>	<i>Prevalence</i>	<i>Skin test</i>	<i>Specific IgE</i>	<i>Other immunological tests</i>	<i>Broncho provocation test</i>	<i>Other evidence</i>
Wheat, rye and soya flour		Baker	(124)	279	35%	9% + (cereals)	ND	ND	ND	FEV1, PC20
		Baker	(125)	7	100%	100% +	100% +	100% negative	57% +	
		Baker	(126)	9	100%	ND	100% +	Western blotting, etc.	ND	
Hydrolyzed wheat protein	70084-87-6	Hairdressers	(127)	2	NA	+ (laudimonium hydroxypropyl)	Neg with flours and gliadin	ND	+ in one	+ nasal challenge in one subject
White pea flour (Lathyrus sativus)	<a href="#">Link</a> 92128-86-4	Flour handler	(128)	1	NA	+	ND	+ Precipitins	+	
Buckwheat flour	<a href="#">Link</a>	Baker	(129)	3	NA	100% +	ND	ND	ND	
Konjac flour	<a href="#">Link</a>	Flour handler	(130)	1	NA	+	+	RAST inhibition	+	
White Lupin flour (Lupinus albus)	<a href="#">Link</a>	Food processing	(131)	1	~2%	+	+	ND	+	
Marigold flour (Tagetes erecta)		Animal fodder	(132)	1	NA	+	+	Immunoblotting	ND	+ Nasal challenge
Quinoa seed flour		Milling	(133)	1	NA	+	ND	ND	ND	Increased FeNO
Corn flour	<a href="#">Link</a>	Feed store	(134)	1	NA	ND	+	ND		

## Agents Causing Occupational Asthma With Key References

### • Pollens

Agent	CAS number	Occupation	References	Subjects		Skin test	Specific IgE	Other immunological tests	Broncho provocation test	Other evidence
				(n)	Prevalence					
Bell pepper		Greenhouse worker	(92)	472	13.3%	35.4%	18.6%	ND	ND	
Brassica oleracea (cauliflower and broccoli)		Vegetable plant	(135)	54	38%	39%	58%	ND	ND	
Sunflower (Helianthus spp)	<a href="#">Link</a>	Laboratory worker	(136)	1	NA	+	+	RAST inhibition	+	
Helianthus annuus		Processing worker	(137)	102	16.6%	23.5%	ND	ND	ND	
Canari island date palm (Phoenix canariensis)		Gardener	(138)	1	NA	+	+	ND	+	
White mustard (Sinapis alba)		Olive farmers	(139)	11	NA	+	+	ND	ND (nasal challenge)	
Cyclamen		Florist	(140)	2	NA	+	+	ND	ND	
Eggplant (Solanum melongena)		Greenhouse worker	(141)	1	NA	+	ND	ND	+ conjunctival	PEF
Chrysanthemum		Greenhouse worker	(142)	104	9%	20,2%	+ in some	ND	ND	
Bell of Ireland (Molucella laevis)		Grower	(143)	1	NA	+	+	ND	+	
Rose		Culture of roses	(144)	290	6,2%	ND	19,5%	Immunoblotting	ND	
Thale cress (Arabidopsis thaliana)		Research student	(145)	1	NA	+	ND	ND	+	PEF

## Agents Causing Occupational Asthma With Key References

### • 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	(146)	610	~40%	9% +	ND	Negative precipitins	ND	Spirometry pre-post shift
		Grain elevator	(147)	502	47%	~ 50% of 51 exposed +	ND	ND	ND	FEV1, volumes
		Grain elevator	(148)			of 51 exposed +				
		Grain elevator	(149)	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	(150)	1	NA	+	+	Immunoblotting	ND	Spirometry ( at work, off work)
Rice		Rice mill worker	(151)	3	NA	+(3)	+	IgE inhibition test	+	
Vetch (Vicia sativa)		Farmer	(152)	1	NA	+	+	+ Precipitins, passive transfer	+	
Coffee bean		Food processor	(153)	372	34%	24% +	12% +	ND	ND	Lung function
		Emptying	(154)	45	9%	9-40% +	ND	ND	ND	Spirometry
		Roastery	(155)	22	NA	82% +	50% +	ND	67% of 12 +	PC20 + in 14
Castor bean	<a href="#">Link</a>	Oil industry	(156)	14	NA	100% +	100% +	ND	ND	
Green bean (Phaseolus multiflorus)		Cook	(157)	1	NA	+	+	Histamine	+	
Carob bean		Jam factory	(158)	1	NA	-	+	ND	+	
Lima bean (Phaseolus lunatus)		Cake processor	(159)	1	NA	+	ND	+ basophil activation	+	
Soybean (Glycine maxima)		Soyabean processers	(160)	144	20.8%	ND	ND	ND	ND	
Almond shell dust		Sheller	(161)	1	NA	-	-	ND	+	
Tea plant dust (Camellia sinensis)		Tea processor	(162)	3	NA	+	+	+ PCA with catechin	+	
Herbal tea		Herbal tea processor	(163)	1	NA	ND	Negative	ND	+	
Tobacco leaf	84961-66-0	Tobacco manufacturer	(164)	1	NA	+	+	ND	+	
		Tobacco manufacturer	(165)	16	69%	ND	ND	ND	ND	PEF

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### • Plants

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Wonji ( <i>Polygala tenuifolia</i> )		Herbal manufacture	(166)	1	NA	+	+	SDS-PAGE	+	
Copperleaf ( <i>Acalypha wikesiana</i> )		Gardener	(167)	1	na	+	neg	Immunoblotting	+	
Hops		Brewery chemist	(168)	1	NA	+	ND	ND	ND	
Baby's breath ( <i>Gypsophila paniculata</i> )		Florist	(169)	1	NA	+	+	Histamine release	+	
Freesia ( <i>Freesia hybride</i> ) and paprika ( <i>Capricum anuum</i> )		Horticulture	(170)	2	NA	+	+	Histamine release	ND	
Flower (various)		Flower industry	(171)	40	7.7%	+ (21%, flowers) ND		ND	3 subjects +	
Amaryllis ( <i>Hippeastrum</i> sp)		Greenhouse worker	(172)	1	NA	+	+	ND	+	PEF
Chamomile (uspecified)		Cosmetician	(173)	1	NA	+	ND	ND	+ Nasal challenge	
		Tea-packing worker	(174)	1	NA	+	+	ND	+	
Easter lily ( <i>Lilium longiflorum</i> )		Floral shop worker	(175)	1	ND	+	+	Inhibition de RAST	+	Débit de pointe
Statice ( <i>Limonium tartaricum</i> )		Floral worker	(176)	1	NA	+	+	ND	ND	PEF
Sea lavender ( <i>Limonium sinuatum</i> )		Owner of greenhouse	(177)	1	NA	+	+	Immunoblotting	+	
Decorative flower		Floral worker	(178)	4	NA	+ 2/4	+ 2/4	ND	+ 3/4	
Safflower ( <i>Carthamus tinctorius</i> ) and yarrow ( <i>Achillea millefolium</i> )		Floral worker	(179)	1	NA	+	+	Immunoblotting	+	
Spathe flower		Floral worker	(180)	1	NA	+	+	Immunoblotting	Negative (done 8 months later)	
Peach		Factory worker	(181)	1	NA	+	+	ND	+	
Peach leaf		Fruit grower	(182)	1	NA	+	+	Immunoblotting	+	
Ivy ( <i>Hedera helix</i> )		Florist	(183)	1	NA	-	ND	ND	+	PEF
Madagascar jasmine sap ( <i>Stephanotis floribunda</i> )		Greenhouse worker	(184)	4	50%	+	+	ND	+ In one	PEF

## Agents Causing Occupational Asthma With Key References

### • Plants

Agent	CAS number	Occupation	References	Subjects		Skin test	Specific IgE	Other immunological tests	Broncho provocation test	Other evidence
				(n)	Prevalence					
Herb material		Herbal worker	(185)	1	NA	+	+	Identification of 3 protein fractions	+	
Umbrella tree (Schefflera)		Landscape gardener	(186)	1	NA	+	+	ND	ND	
Passion flower (Passiflora alata) & Cascara sagrata (Rhamnus purshiana)		Technician pharmacy	(187)	1	NA	+	+	Immunoblotting	+	
Sarsaparilla root		Herbal tea worker	(188)	1	NA	+	+	ND	+	
Olive oilcake		Oil industry	(189)	1	NA	+	ND	ND	+	
Brazil ginseng (Pfaffia paniculata)		Medicinal plant processor	(190)	1	NA	+	+	Negative precipitins	+	
Sanyak (Dioscorea batatas) and Korean ginseng (Panax ginseng)		Herbal merchant	(191)	1	NA	+	+	Immunoblotting	+	
Voacanga Africana seed dust		Chemist' spouse	(192)	1	NA	+	+	Negative precipitins	+	
Tampico fiber in agave leaves		Brusk-makers	(193)	2	NA	+	ND	Immunoblotting	+	
Onion <a href="#">Link</a>		Homemakers	(194)	3	NA	+	+	ND	+	
Onion seeds (Allium cepa, red onion) <a href="#">Link</a>		Seed packing	(195)	1	NA	+	+	Immunoblotting	+	
Feenel seed		Sausage processing	(196)	1	NA	ND	+	Immunoblotting	ND	
Sesame seed		Baker	(197)	1	NA	+	+	Immunoblotting	+	
Linseed oilcake		Chemist	(198)	1	NA	+	+	ND	+	
Grass juice		Gardener	(199)	1	NA	+	+	Immunoblotting	+	
Potato		Housewife	(200)	2	NA	+	+	Histamine release	+	
Citrus food handling (d,l-limonene, citronellol and dichloroprene)		Labourer	(201)	1	NA	-	+	ND	ND	

## Agents Causing Occupational Asthma With Key References

### • Plants

Agent	CAS number	Occupation	References	Subjects		Skin test	Specific IgE	Other immunological tests	Broncho provocation test	Other evidence
				(n)	Prevalence					
Carrot ( <i>Daucus carota</i> L.)		Cook	(202)	1	NA	+	+	SDS-PAGE	+	
Asparagus		Food processor	(203)	1	NA	+	+	Immunoblotting	+	
Courgette		Fruit warehouse	(204)	1	NA	+	+	ND	ND	
Cauliflower and cabbage		Restaurant	(205)	1	NA	+	+	ND	+	
Spinach powder		Pasta factory	(206)	1	NA	+	+	Lymphocyte activation test	+	Eosinophils in BAL
Swiss chard ( <i>Beta vulgaris</i> L. <i>cycla</i> )		Housewife	(207)	1	NA	+	+	Histamine release	+	
Cacoon seed ( <i>Entage gigas</i> )		Decorator	(208)	1	NA	+	ND	ND	ND	
Dusts from seeds of Sacha Inchi ( <i>Plukenetia volubis</i> )		Cosmetic factory	(209)	1	NA	+	ND	SDS-PAGE	+	
Chicory		Vegetable wholesaler	(210)	1	NA	+	+	Immunoblotting	ND	
Rose hip		Pharmaceutical	(211)	9	NA	67% +	67% +	ND	50% of 4 +	
Garlic dust	<a href="#">Link</a>	Food packaging	(212)	1	NA	+	+	ND	+	
		Food packaging	(213)	1	NA	+	+	RAST inhibition	+	
Liquorice roots ( <i>Glycyrrhiza</i> spp)		Herbalist	(214)	1	NA	+	+	ND	+	
Esparto ( <i>Stipa tenacissima</i> and <i>Lygeum spartum</i> )		Stucco handler	(215)	1	NA	+	+	Immunoblotting	ND	PEF
Spice		Spices processing	(216)	1	NA	+	+	ND	ND	
Saffron ( <i>Crocus sativus</i> )	<a href="#">Link</a> 89899-18-3	Saffron processor	(217)	5	10%	6%+	26%	Immunoblotting RAST inhibition	+ In one	
Aromatic herb		Butcher	(218)	1	NA	+	+	ND	+	PEF
Lycopodium powder	<a href="#">Link</a>	Powder	(219)	30	7%	ND	ND	ND	2/2 +	
Weeping fig ( <i>Ficus benjamina</i> )		Plant keeper	(220)	84	7%	21% +	21%	ND	100% of 6 +	PC20
Henna (unspecified)		Hairdresser	(221)	2	NA	+	+	ND	1/2 +	

## Agents Causing Occupational Asthma With Key References

### • Plants

Agent	CAS number	Occupation	References	Subjects		Skin test	Specific IgE	Other immunological tests	Broncho provocation test	Other evidence
				(n)	Prevalence					
Fenugreek	<a href="#">Link</a> 68990-15-8	Food industry	(222)	1	NA	+	+	ND	ND	
Aniseed		Food industry	(223)	1	NA	+	+	ND	+	
Kapok		Sewer	(224)	1	NA	-	-	ND	+	Lung function
Argan (Argania spinosa)		Cosmetic factory	(225)	3	33.3% (3/9)	+ in one	negative	Immunoblotting	+	
Miracle tree (Moringa oleifera) seed		Technician (cosmetic factory)	(226)	1	NA	+	ND	+ SDS-Page	+	PEF
Melon	68649-66-1	Agricultural worker	(227)	1	NA	+	ND	Immunoblotting	+	
Cellulose [9004-34-6]		Operator sanitary pad production	(228)	1	NA	negative	negative	Immunoblotting	+	PEF

### • Plant-derived natural products

Agent	CAS number	Occupation	References	Subjects		Skin test	Specific IgE	Other immunological tests	Broncho provocation test	Other evidence
				(n)	Prevalence					
Gluten	<a href="#">Link</a> 8002-80-0	Baker	(229)	1	NA	+	+	RAST inhibition	+	
Soybean lecithin	<a href="#">Link</a> 8002-43-5	Baker	(230)	2	NA	+	+	ND	+	
Pectin	<a href="#">Link</a> 9000-69-5	Christmas candy maker	(231)	1	NA	+	-	Specific IgG4	+	
Latex		Glove manufacturer	(232)	81	6%	11%+	ND	ND	ND	PEF
		Health professional	(233)	7	2,5%	4,7% +	ND	ND	+	
Rose oil	<a href="#">Link</a> 8007-01-0	Rose extraction	(234)	52	NA	+	ND	ND	ND	



## Agents Causing Occupational Asthma With Key References

### • Biologic enzymes

Agent	CAS number	Occupation	References	Subjects (n)	Prevalence	Skin test	Specific IgE	Other immunological tests	Broncho provocation test	Other evidence
Bacillus subtilis	<a href="#">Link</a> 68038-70-0	Detergent industry	(235)	1642	3,2% (over 7 years)	4,5-75% +	26% of 248 +	ND	ND	Lung function
		Factory worker	(236)	38	NA	66% +	ND	Passive transfer, 100% of 5 + Precipitin (nonspecific)	90% +	Lung function
Trypsin	<a href="#">Link</a> 9002-07-7	Plastic, pharmaceutical	(237)	14	29%	+	+	ND	75 % of 4 +	
Papain	<a href="#">Link</a> 9001-73-4	Pharmaceutical	(238)	29	45%	34% +	34% +	ND	89% of 9 +	
Pepsin	<a href="#">Link</a> 9001-75-6	Pharmaceutical	(239)	1	NA	+	+		+	
Pancreatin	<a href="#">Link</a> 8049-47-6	Pharmaceutical	(240)	14	NA	93% +	100% of 3 +	ND	100% of 8 +	Lung function
Flaviastase	<a href="#">Link</a>	Pharmaceutical	(241)	3	NA	+	+	+ Precipitin	ND	
Bromelin	<a href="#">Link</a> 9001-00-7	Pharmaceutical	(242)	76	11%	25% +	ND	ND	ND	
		Pharmaceutical	(243)	2	NA	+	ND	ND	2/2 +	
Egg lysosyme	<a href="#">Link</a> 12650-88-3	Pharmaceutical agent	(244)	1	NA	+	+	ND	+	PEF
Fungal amylase	<a href="#">Link</a> 9013-01-8	Baker	(245)	118	NA	100% of 10 +	2% exposed 34% occup. asthma +	ND	ND	
		Baker	(246)	1	NA	+	+	ND	+	
Phytase from Aspergillus niger	<a href="#">Link</a> 37288-11-2	Technician	(247)	53	36%	ND	+	SDS-PAGE	ND	
Fungal amyloglucosidase and hemicellulase		Baker	(248)	140	NA	ND	5-24%	ND	ND	
Serratial peptidase and lysozyme chloride		Pharmaceutical	(249)	1	NA	ND	+	Immunoblotting	+	
Esperase	<a href="#">Link</a> 9073-77-2	Detergent industry	(250)	667	NA	ND	5%	ND	ND	
Xylanase	<a href="#">Link</a> 37278-89-0	Laboratory worker	(251)	2	NA	2	2	ND	ND	PEF
Pectinase and glucanase		Fruit processor	(252)	3	NA	ND	Pos	Immunoblotting	ND	PEF
Lactase	<a href="#">Link</a> 9031-11-2	Pharmaceutical	(253)	207	4%	31% +	ND	ND	ND	
Empynase (pronase B)		Hospital personnel	(254)	154	3.9%	20%	+	Immunoblotting	ND	

## Agents Causing Occupational Asthma With Key References

### • Biologic enzymes

<i>Agent</i>	<i>CAS number</i>	<i>Occupation</i>	<i>References</i>	<i>Subjects (n)</i>	<i>Prevalence</i>	<i>Skin test</i>	<i>Specific IgE</i>	<i>Other immunological tests</i>	<i>Broncho provocation test</i>	<i>Other evidence</i>
Various enzymes in rennet production (proteases, pepsine, chymosines)		Cheese producer	(255)	35	17%	40%+	ND	ND	ND	
Lallzyme EX-V (from <i>Aspergillus niger</i> )		Wine cellar	(256)	1	NA	+	ND	Immunoblotting	+	
Protease	<a href="#">Link</a> 9001-92-7	Operator in a dishwashing tablet factory	(257)	1	NA	+	+	ND	+	FeNO
Chymosine	9001-98-3	Cheese maker	(258)	1	NA	+ (rennet)	+	Immunoblotting	ND	Improvement away from work

### • Vegetable Gums

<i>Agent</i>	<i>CAS number</i>	<i>Occupation</i>	<i>References</i>	<i>Subjects (n)</i>	<i>Prevalence</i>	<i>Skin test</i>	<i>Specific IgE</i>	<i>Other immunological tests</i>	<i>Broncho provocation test</i>	<i>Other evidence</i>
Acacia	<a href="#">Link</a> 9000-01-5	Printer	(259)	63	19% of 31 (selection)	ND	ND	ND		
		Printer	(260)	10	NA	+	ND	Passive transfer (3 +)	ND	
Tragacanth	<a href="#">Link</a> 9000-65-1	Gum importer	(261)	1	NA	+	ND	ND	ND	
Karaya	<a href="#">Link</a> 9000-36-6	Hairdresser	(262)	9	4%	+	ND	Passive transfer	ND	
Guar	<a href="#">Link</a> 9000-30-0	Carpet manufacturing	(263)	162	2%	5% +	8% +	ND	67% of 3 +	PC20
Gutta-percha	<a href="#">Link</a> 9000-32-2	Dental hygienist	(264)	1	NA	+	ND	ND	ND	

## Agents Causing Occupational Asthma With Key References

### Low-molecular-weight agents

#### • Diisocyanates

<i>Agent</i>	<i>CAS number</i>	<i>Occupation</i>	<i>References</i>	<i>Subjects (n)</i>	<i>Prevalence</i>	<i>Skin test</i>	<i>Specific IgE</i>	<i>Other immunological tests</i>	<i>Broncho provocation test</i>	<i>Other evidence</i>
Toluene diisocyanate	<a href="#">Link</a> 26471-62-5	Polyurethane	(265)	112	12,5%	3% +	0% +	0%+	45% of 11+ PCA	
		Plastics	(266)	26	NA	ND	19% +	ND	100% +	
		Varnish	(267)	195	28%	ND	5% +	ND	70% of 17+	
		(?)	(268)	91	NA	NA	ND	0% +	ND	Specific IgG
		(?)	(269)	162 †	NA	ND	ND	ND	57% +	
Diphenylmethane diisocyanate	<a href="#">Link</a> 26447-40-5	Foundry	(270)	11	NA	ND	27% +	36% + Specific IgG	54,5% +	
		Foundry	(271)	76	13%	ND	3% +	7% + Specific IgG	ND	
		Steel foundry	(272)	26	27%	4% +	4% +	15% + Specific IgG	ND	
1,5-Naphthylene diisocyanate	<a href="#">Link</a> 3173-72-6	Manufacture rubber	(273)	3	NA	ND	ND	ND	100%+	
Isophorone diisocyanate	<a href="#">Link</a> 4098-71-9	Spray painter	(274)	1	NA	ND	ND	ND	+	
Prepolymers of TDI		Floor varnisher	(275)	2	NA	ND	0% +	Specific IgG negative	+	
Prepolymers of HDI		Spray painter	(276)	9	45%	ND	33% +	56% +	+	

## Agents Causing Occupational Asthma With Key References

### • Combination of diisocyanates

Agent	CAS number	Occupation	References	Subjects		Skin test	Specific IgE	Other immunological tests	Broncho provocation test	Other evidence
				(n)	Prevalence					
TDI, MDI, HDI, PPI		Spray painters	(277)	51	11,8% *	ND	ND	ND	60% of 10 + to PPI	
TDI, MDI, HDI		Various industries	(278)	24	NA	ND	ND	ND	70% + to TDI 33% + to MDI 33% of 9 + to HDI	
		Chemical manufacturing	(279)	247 †	NA	60% of 53 + 14% +	ND	ND		
		Paint shop	(280)	62	NA	ND	15% +	47%+ Specific IgG	6% + to TDI 16% to MDI 24% to HDI	
TDI, MDI		Chemical manufacturing	(281)	28	NA	ND	27% of 22 + TDI-HSA 83% of 6 + MDI-HSA	ND	100%+	

### • Other hardeners

Agent	CAS number	Occupation	References	Subjects		Skin test	Specific IgE	Other immunological tests	Broncho provocation test	Other evidence
				(n)	Prevalence					
Triglycidyl isocyanurate	<a href="#">Link</a> 2451-62-9	Spray painter	(282)	1	NA	ND	ND	ND	+	PEF
Polyfunctional aziridine		Hardener in paints	(283)	7	NA	33% of 7	ND	ND	+ ln 7	
Bisphenol A diglycidyl ether (BADGE)	<a href="#">Link</a> 1675-54-3	Epoxy resin	(284)	1	NA	+	+	ND	+	
			(285)	2	NA	ND	ND	ND	+	

## Agents Causing Occupational Asthma With Key References

### • Anhydrides

Agent	CAS number	Occupation	References	Subjects (n)	Prevalence	Skin test	Specific IgE	Other immunological tests	Broncho provocation test	Other evidence
Phthalic anhydride	<a href="#">Link</a> 85-44-9	Plastics	(286)	1	NA	+	+	ND	+	
		Toolsetter, resin plant agent	(287)	3	NA	ND	ND	ND	100% +	
		Production of resins	(288)	118	28%	18% of 11 +	ND	ND		
		Production of resins	(289)	60	14%	ND	7% +	17% + Specific IgG	ND	
Trimellitic anhydride	<a href="#">Link</a> 552-30-7	Epoxy resins, plastics	(290)	4	NA	100% +	75% +	100% +	100% of 1 +	
Tetrachlorophthalic anhydride	<a href="#">Link</a> 117-08-8	Epoxy resins, plastics	(291)	5	NA	ND	ND	ND	100% +	
		Factory (plastic coating)	(292)	7	NA	100% +	100% +	ND	100% +	
Pyromellitic dianhydride	<a href="#">Link</a> 89-32-7	Epoxy adhesive	(293)	7	NA	ND	ND	ND	30% +	
Methyl tetrahydrophthalic anhydride (MTHPA)	<a href="#">Link</a> 11070-44-3	Curing agent	(294)	1	NA	+	+	Negative Specific IgG	ND	Improvement with removal
Hexahydrophthalic anhydride (HHPA)	<a href="#">Link</a> 85-42-7	Chemical worker	(295)	1	NA	ND	ND	ND	+	PEF
		Electrical plant	(296)	109	5,4%	ND	15,4%	ND	6/17	
Himic anhydride	<a href="#">Link</a> 2746-19-2	Manufacture of flame retardant	(297)	20	35%	ND	40% of 7 +	RAST inhibition	ND	
Chlorendic anhydride	<a href="#">Link</a> 115-27-5	Mechanic	(298)	1	NA	+	+	ND	+	PEF
Maleic anhydride	<a href="#">Link</a> 108-31-6	Polyester resin production	(299)	1	NA	ND	ND	ND	+	
Dioctyl-phthalate	<a href="#">Link</a> 117-81-7	Production of PVC	(300)	1	NA	ND	ND	ND	ND	PEF

## Agents Causing Occupational Asthma With Key References

### • Aliphatic amines (ethyleamines)

Agent	CAS number	Occupation	References	Subjects		Skin test	Specific IgE	Other immunological tests	Broncho provocation test	Other evidence
				(n)	Prevalence					
Ethylene diamine	<a href="#">Link</a> 107-15-3	Shellac handler	(301)	7	NA	100% +	ND	ND	100% +	
		Photography	(302)	1	NA	ND	ND	ND	+	
Ethylene diamine tetraacetic acid (EDTA) sodium salts		Cleaners and health care professionals	(303)	8	NA	ND	ND	ND	+ (nasal)	PC20
Isophorone diamine (IPDA)	<a href="#">Link</a> 2855-13-2	Epoxy floor coater	(304)	1	ND	Négative	ND	ND	+	PC20, FeNO
Hexamethylene tetramine	<a href="#">Link</a> 100-97-0	Lacquer handler	(301)	7	NA	100% +	ND	ND	100% +	
		Chemical factory	(305)	12	33,3%	ND	ND	ND	100% of 2 +	
Triethylene tetramine	<a href="#">Link</a> 112-24-3	Aircraft filter	(287)	1	NA	ND	ND	ND	+	
Mixture of trimethyl-hexanediamine and isophorondiamine		Floor covering material, salesman	(306)	1	NA	-	ND	ND	+	BAL

### • Aliphatic amines (ethanolamines)

Agent	CAS number	Occupation	References	Subjects		Skin test	Specific IgE	Other immunological tests	Broncho provocation test	Other evidence
				(n)	Prevalence					
Monoethanolamine	<a href="#">Link</a> 141-43-5	Beauty culture	(301)	10	100% +	ND	ND	ND	100% +	
Triethanolamine	<a href="#">Link</a> 102-71-6	Metal worker	(307)	2	NA	ND	ND	ND	100% of 2	
Aminoethylethanolamine	<a href="#">Link</a> 111-41-1	Soldering	(308)	3	NA	ND	ND	ND	100% +	
		Cable jointer	(309)	2	NA	ND	ND	ND	+	
Dimethylethanolamine	<a href="#">Link</a> 108-01-0	Spray paint	(310)	1	NA	-	ND	ND	+	

### • Aliphatic amines (others)

Agent	CAS number	Occupation	References	Subjects		Skin test	Specific IgE	Other immunological tests	Broncho provocation test	Other evidence
				(n)	Prevalence					
3-(Dimethylamino)propylamine (3-DMAPA)	<a href="#">Link</a> 109-55-7	Ski manufacture	(311)	34	11,7%	ND	ND	ND	ND	Cross-shift change in FEV1

## Agents Causing Occupational Asthma With Key References

### • Heterocyclic amines

<i>Agent</i>	<i>CAS number</i>	<i>Occupation</i>	<i>References</i>	<i>Subjects (n)</i>	<i>Prevalence</i>	<i>Skin test</i>	<i>Specific IgE</i>	<i>Other immunological tests</i>	<i>Broncho provocation test</i>	<i>Other evidence</i>
Piperazine hydrochloride	<a href="#">Link</a> 142-64-3	Chemist	(312)	2	NA	50% +	ND	ND	100%	
		Pharmaceutical	(313)	131	11,4%	ND	ND	ND	100% of 1 +	
		Chemical plant	(314)	2	NA	50% +	100% +	ND	ND	
N-Methylmorpholine	<a href="#">Link</a> 109-02-4	Chemical manufacturing	(315)	48	16,6% **	ND	ND	ND	ND	
4,4-methylene-bis-morpholine		Machine tool setter operator	(316)	1	NA	+	ND	ND	+	PEF

### • Aromatic amines

<i>Agent</i>	<i>CAS number</i>	<i>Occupation</i>	<i>References</i>	<i>Subjects (n)</i>	<i>Prevalence</i>	<i>Skin test</i>	<i>Specific IgE</i>	<i>Other immunological tests</i>	<i>Broncho provocation test</i>	<i>Other evidence</i>
Paraphenylene diamine	<a href="#">Link</a> 106-50-3	Fur dyeing	(317)	80	37,0%	66% +	ND	ND	74% +	
		Hair dyers	(318)	5	NA	neg	ND	ND	+	

### • Quaternary amines

<i>Agent</i>	<i>CAS number</i>	<i>Occupation</i>	<i>References</i>	<i>Subjects (n)</i>	<i>Prevalence</i>	<i>Skin test</i>	<i>Specific IgE</i>	<i>Other immunological tests</i>	<i>Broncho provocation test</i>	<i>Other evidence</i>
Benzalkonium chloride	<a href="#">Link</a> 8001-54-5	Cleaning product	(319)	1	NA	+	ND	ND	+	

### • Mixture of amines

<i>Agent</i>	<i>CAS number</i>	<i>Occupation</i>	<i>References</i>	<i>Subjects (n)</i>	<i>Prevalence</i>	<i>Skin test</i>	<i>Specific IgE</i>	<i>Other immunological tests</i>	<i>Broncho provocation test</i>	<i>Other evidence</i>
EPO 60		Mould maker	(320)	1	NA	ND	ND	ND	+	

## Agents Causing Occupational Asthma With Key References

### • Fluxes

<i>Agent</i>	<i>CAS number</i>	<i>Occupation</i>	<i>References</i>	<i>Subjects</i>		<i>Skin test</i>	<i>Specific IgE</i>	<i>Other immunological tests</i>	<i>Broncho provocation test</i>	<i>Other evidence</i>
				<i>(n)</i>	<i>Prevalence</i>					
Colophony	<a href="#">Link</a> 8050-09-7	Electronic worker	(321)	34	NA	ND	ND	ND	100% +	
		Manufacture solder flux	(322)	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	(323)	2	NA	ND	ND	ND	+	PC20
95% Alkylaryl polyether alcohol +5% polypropylene glycol		Electronic assembler	(324)	1	NA	ND	ND	ND	+	
Adipic acid	<a href="#">Link</a> 124-04-9	Solderer	(325)	1	NA	ND	ND	ND	+	PEF
Lipophilic resin		Aerospace plant	(326)	1	NA	ND	ND	ND	ND	Improvement



## Agents Causing Occupational Asthma With Key References

### • Wood dust or bark

Agent	CAS number	Occupation	References	Subjects		Skin test	Specific IgE	Other immunological tests	Broncho provocation test	Other evidence	
				(n)	Prevalence						
Western red cedar ( <i>Thuja plicata</i> )	<a href="#">Link</a>	Carpentry	(327)	35	NA	ND	ND	ND	ND	Improvement on removal	
		Furniture making	(328)	1320	3,4%	1,9% +	ND	ND	ND	Improvement on removal	
		Cabinetmaking, carpentry	(329)	22			100% -	ND	100% - Precipitin	82% +	
		Sawmill	(330)	185			100% -	ND	ND	100% +	
		Cedar sawmill	(331)	652	4,1%		100% -	ND	ND	ND	Questionnaire
Eastern white cedar ( <i>Thuja occidentalis</i> )	<a href="#">Link</a>	Sawmill	(332)	3	4 to 7%	ND	ND	ND	+	PC20	
California redwood ( <i>Sequoia sempervirens</i> )	<a href="#">Link</a>	Woodcarver	(333)	2	NA	-	ND	- Precipitin	+		
		Carpenter	(334)	1	NA	ND	ND	ND	+		
Cedar of Lebanon ( <i>Cedra libani</i> )	<a href="#">Link</a>	Jointer	(335)	6	NA	17% +	ND	100% - Precipitin	ND		
Spruce wood (unspecified)		Sawmill worker	(336)	1	NA	ND	+	ND	+	PEF +	
Cocabolla ( <i>Dalbergia retusa</i> )	<a href="#">Link</a>	Woodworker	(337)	3	NA	100% -	ND	ND	ND	Improvement on removal	
Iroko ( <i>Chlorophora excelsa</i> )	<a href="#">Link</a>	Carpenter	(338)	1	NA	+	ND	+ Precipitin	+		
		Carpenter	(339)	1	NA	ND	ND	ND	+		
		Woodworker	(340)	9	NA	4/9 with + Intradermal test	Negative	ND	+	PEF	
Oak ( <i>Quercus robur</i> )	<a href="#">Link</a>	Lumber Millworkwer	(341)	1	NA	-	ND	+	+		
		Construction, carpentry	(342)	3	NA	ND	ND	+ Precipitin	+		
Mahogany (unspecified)		Pattern maker (wood)	(341)	1	NA	-	ND	+ Precipitin	+		
Abiruana ( <i>Pouteria</i> )	<a href="#">Link</a>	Furniture factory	(343)	2	NA	+	ND	- Precipitin	+		
African Maple ( <i>Triplochiton scleroxylon</i> )	<a href="#">Link</a>	Construction, carpentry	(344)	2	NA	+	+	Passive transfer	+		
		Sauna building	(345)	2	NA	100% +	100% +		+		

## Agents Causing Occupational Asthma With Key References

### • Wood dust or bark

Agent	CAS number	Occupation	References	Subjects		Skin test	Specific IgE	Other immunological tests	Broncho provocation test	Other evidence
				(n)	Prevalence					
		Maker of wooden plane model	(346)	1	NA	+	+	ND	+	
Tanganyika aningre	<a href="#">Link</a>	Woodworker	(347)	3	NA	100% +	100% -	100% - Precipitin	100% +	
Mukali (Angineria robusta)	<a href="#">Link</a>	Furniture factory	(348)	1	NA	+	+	ND	+	
Central American Walnut (Juglans olanchana)	<a href="#">Link</a>	(?)	(349)	1	NA	-	-	- Precipitin	+	
Kejaat (Pterocarpus angolensis)	<a href="#">Link</a>	Wood-machinist	(350)	1	NA	+	ND	ND	ND	
African zebrawood (Microberlinia)	<a href="#">Link</a>	Wood-machinist	(351)	1	NA	+	+	ND	+	
Ramin (Gonystylus bancanus)	<a href="#">Link</a>	Woodworker	(352)	2	NA	+	+	ND	+	
Quillaja bark (Quillaja saponaria)	<a href="#">Link</a>	Saponin factory	(353)	1	NA	ND	+	ND	+	
Fernambouc (Caesalpinia echinata)	<a href="#">Link</a>	Bow making	(354)	36	33,3%	100% -	ND	ND	100% of 1 +	
White ash (Fraxinus americana)	<a href="#">Link</a>	Sawmill	(355)	1	NA	-	-	ND	+	
Common ash (Fraxinus excelsior)	<a href="#">Link</a>	Furniture	(356)	1	NA	-	+	ND	+	
Pau Marfim (Balfourodendron riedelianum)	<a href="#">Link</a>	Woodworker	(357)	1	NA	+	+	ND	+	
Cabreuva (Myrocarpus fastigiatus Fr. All.)	<a href="#">Link</a>	Parquet floor layer	(358)	1	NA	ND	ND	ND	+	
Ebony wood (Diospyros crassiflora)	<a href="#">Link</a>	Carpenter	(359)	1	NA	-	ND	ND	+	
Kotibe wood (Nesogordonia papaverifera)	<a href="#">Link</a>	Cabinet maker	(360)	1	NA	+	ND	Passive transfer	+	
Cinnamon (Cinnamomum Zeylanicum)	<a href="#">Link</a>	Store	(361)	40	22,5%	ND	ND	ND	100% of 1 +	

## Agents Causing Occupational Asthma With Key References

### • Wood dust or bark

Agent	CAS number	Occupation	References	Subjects		Skin test	Specific IgE	Other immunological tests	Broncho provocation test	Other evidence
				(n)	Prevalence					
Brazilian walnut (Imbuia)	<a href="#">Link</a>	Furniture	(362)	1	NA	ND	ND	+ Precipitin	+	Negative PEF
Blackwood (Acacia Melanoxylon)	<a href="#">Link</a>	Furniture	(363)	3	NA	ND	ND	ND	+	Positive PEF
African cherry (Makore)	<a href="#">Link</a>	Cabinet worker	(364)	1	NA	-	ND	ND	+	
Antiaris	<a href="#">Link</a>	Door manufacturer	(365)	1	NA	+	+	SDS-PAGE	+	
Sapele wood dust	<a href="#">Link</a>	Carpenter	(366)	1	NA	ND	ND	ND	ND	
Ipe (Tabebuia spp)	<a href="#">Link</a>	Sawyer	(367)	1	NA	ND	ND	ND	+	
Angelim pedra (Hymenolobium petraeum)	<a href="#">Link</a>	Carpenter	(368)	1	NA	+	ND	SDS-PAGE	+	
Cedrorana (Cedrelinga catenaeformis Ducke)	<a href="#">Link</a>	Carpenter	(369)	1	NA	+	+	SDS-PAGE	+	
Falcata (Albizia falcataria)	<a href="#">Link</a>	Wood furniture	(370)	1	NA	+	ND	ND	+	
Chengal (Neobalanocarpus hemeii)		Carpenter	(371)	1	NA	ND	ND	ND	+	PEF
Unidentified agent		Sawmills of eastern Canada and USA	(372)	11	NA	ND	ND	ND	+	PEF

## Agents Causing Occupational Asthma With Key References

### • Metals

Agent	CAS number	Occupation	References	Subjects (n)	Prevalence	Skin test	Specific IgE	Other immunological tests	Broncho provocation test	Other evidence
Platinum	<a href="#">Link</a> 7440-06-4	Platinum refinery	(373)	16	NA	62% +	ND	ND	62% +	
		Platinum refinery	(374)	136	29%	17% +	21% +	ND	ND	
Tetrachloroplatinate		Production of cytotoxic drugs (Cisplatin)	(375)	1	NA	not interpretable	ND	ND	+	
Nickel sulfate	<a href="#">Link</a> 7786-81-4	Metal plating	(376)	1	NA	+	ND	- Precipitin	+	
		Metal polisher	(377)	1	NA	+	ND	- Precipitin	+	
		Electroplating process	(378)	1	NA	+	+	ND	+	
Cobalt	<a href="#">Link</a> 7440-48-4	Hard metal grinder	(379)	4	NA	25% +	ND	ND	50% +	
		Diamond polisher	(380)	3	NA	ND	ND	ND	100% +	
Iron (unspecified)		Welders	(381)	3	NA	ND	ND	ND	+	Induced sputum
Palladium tetraamine dichloride	<a href="#">Link</a> 13815-17-3	Assembly line	(382)	1	NA	+	ND	ND	+	
Rhodium	<a href="#">Link</a> 7440-16-6	Electroplating	(383)	1	NA	+	ND	ND	+	
Zinc fumes		Solderer	(384)	2	NA	ND	ND	ND	+	
		Locksmith	(385)	1	NA	ND	ND	ND	+	
Tungsten carbide	<a href="#">Link</a> 12070-12-1	Metal grinder	(386)	1	NA	ND	ND	ND	ND	Recovery on removal
Chromium	<a href="#">Link</a> 7440-47-3	Printer	(387)	1	NA	+	ND	ND	ND	
Chromate	<a href="#">Link</a> 13907-45-4	Cement floorer	(388)	1	NA	ND	ND	ND	+	
		Plating	(389)	1	NA	+	ND	ND	ND	
		Various	(390)	4	NA	+	ND	ND	+	
Stellite (alloy containing ~60 % of cobalt, ~30 % of chromium, tungsten and carbon)		Machinist	(391)	1	NA	- to metals	ND	-	+	
Chromium & Nickel		Welder	(392)	5	NA	ND	ND	ND	100% of 2 +	
		Tanning	(393)	1	NA	-	+	ND	+	
		Electroplating	(394)	7	NA	Chrome: 29% + Nickel: 57% +	ND	ND	Chrome: 100% of 7 Nickel: 40% of 5	

## Agents Causing Occupational Asthma With Key References

### • Metals

<i>Agent</i>	<i>CAS number</i>	<i>Occupation</i>	<i>References</i>	<i>Subjects</i>		<i>Skin test</i>	<i>Specific IgE</i>	<i>Other immunological tests</i>	<i>Broncho provocation test</i>	<i>Other evidence</i>
				<i>(n)</i>	<i>Prevalence</i>					
Cobalt & Nickel		Hard metal plant	(395)	8	NA	Cobalt: 75% + Nickel: 62% +	Cobalt: 62% + Nickel: 50% +	ND	Both cobalt & nickel: 100% +	
Aluminum	<a href="#">Link</a> 7429-90-5	Soldering	(396)	1	NA	ND	ND	ND	+	
Manganese	<a href="#">Link</a> 7439-96-5	Welder	(397)	1	NA	ND	ND	ND	+	

## Agents Causing Occupational Asthma With Key References

### • Drugs

Agent	CAS number	Occupation	References	Subjects		Skin test	Specific IgE	Other immunological tests	Broncho provocation test	Other evidence
				(n)	Prevalence					
Penicillins & Ampicillin		Pharmaceutical	(398)	4	NA	100% -	ND	ND	75% +	
Penicillamine	52-67-5	Pharmaceutical	(399)	1	NA	ND	-	ND	+	PEF
Cephalosporins	<a href="#">Link</a> 11111-12-9	Pharmaceutical	(400)	2	NA	+	ND	ND	+	
		Pharmaceutical	(401)	91	8%	71% +	ND	ND	ND	Improvement off work
		Pharmaceutical	(402)	161	15.5% (symptoms)	3.1%	17.4%	ELISA INHIBITION	ND	ND
Colistin	1066-17-7	Pharmaceutical	(403)	1	NA	ND	ND	ND	+	
Thiamphenicol	<a href="#">Link</a> 15318-45-3	Pharmaceutical	(404)	3	NA	67% +	67% +	ND	+	
7-aminoccephalosporanic acid	<a href="#">Link</a> 957-68-6	Pharmaceutical	(405)	2	NA	+	+	RAST inhibition	+	
Phenylglycine acid chloride hydrochloride	<a href="#">Link</a> 39878-87-0	Pharmaceutical	(406)	24	29%	37% +	37% +	Passive transfer	100% of 2 +	
Psyllium	<a href="#">Link</a> 8063-16-9	Laxative manufacturer	(407)	3	NA	100% +	ND	ND	60% +	
		Pharmaceutical	(408)	130	4% *	19% of 120 +	26% of 118 +	ND	27% of 18 +	
		Nurse	(409)	5	NA	80% +	100% +	ND	100% +	
		Health personnel	(410)	193	4% *	3% +	12% of 162 +	ND	26% of 15 +	
Methyl dopa	<a href="#">Link</a> 555-30-6	Pharmaceutical	(411)	1	NA	-	ND	ND	+	
Spiramycin	<a href="#">Link</a> 8025-81-8	Pharmaceutical	(412)	1	NA	+	ND	ND	+	
		Pharmaceutical	(413)	51	8% *	100% -	ND	ND	25% of 12 +	
		Pharmaceutical	(414)	2	NA	ND	-	ND	+	
Salbutamol intermediate		Pharmaceutical	(415)	1	NA	-	ND	ND	+	
Amprolium hydrochloride	137-88-2	Poultry feed mixer	(416)	1	NA	ND	ND	ND	+	
Tetracycline	<a href="#">Link</a> 60-54-8	Pharmaceutical	(417)	1	NA	ND	ND	ND	+	
Isonicotinic acid hydrazide	<a href="#">Link</a> 54-85-3	Hospital pharmacy	(418)	1	NA	+	+	ND	+	
Hydralazine	<a href="#">Link</a> 86-54-4	Pharmaceutical	(419)	1	NA	-	-	- Specific IgG	+	

## Agents Causing Occupational Asthma With Key References

### • Drugs

Agent	CAS number	Occupation	References	Subjects		Skin test	Specific IgE	Other immunological tests	Broncho provocation test	Other evidence
				(n)	Prevalence					
Tylosin tartrate	<a href="#">Link</a> 1405-54-5	Pharmaceutical	(420)	1	NA	ND	ND	ND	+	
Ipecacuanha	<a href="#">Link</a> 8012-96-2	Pharmaceutical	(421)	42	48%	52% of 19 +	66% of 18 +	ND	ND	
Cimetidine	<a href="#">Link</a> 51481-61-9	Pharmaceutical	(422)	4	NA	ND	ND	ND	25% +	
Thiamine	<a href="#">Link</a> 59-43-8	Cereal manufacture	(423)	1	NA	ND	-	ND	+	
Aescin	6805-41-0	Pharmaceutical	(424)	1	NA	ND	ND	ND	+	
Lasamide (precursor of furosemide)	<a href="#">Link</a> 2736-23-4	Chemical worker	(425)	3	NA	3 +	ND	ND	+	
5-aminosalicylic acid	<a href="#">Link</a> 89-57-6	Pharmaceutical	(426)	1	NA	Neg	ND	ND	+	
Piperacillin	61477-96-1	Pharmaceutical	(427)	1	NA	+	ND	ND	+	
Ceftazidime	72558-82-8	Pharmaceutical	(428)	1	NA	ND	ND	ND	+	
Opiate compounds		Pharmaceutical	(429)	39	26%	+	ND	ND	ND	PEF
		Pharmaceutical	(430)	4	14%	+	+	ND	+	Pre-post shift FEV1
Amoxicillin	<a href="#">Link</a> 26787-78-0	Pharmaceutical	(431)	1	NA	-	-	ND	+	
Vancomycin	1404-90-6	Pharmaceutical	(432)	1	NA	ND	ND	ND	Histamine release	PEF
Mitoxantrone	<a href="#">Link</a> 65271-80-9	Nurse	(433)	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	(434)	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	(435)	1	NA	-	ND	ND	+	
Minoxidil [38304-91-5]		Beautician	(436)	1	NA	negative	ND	ND	negative (but changes in induced sputum and PC20)	

## Agents Causing Occupational Asthma With Key References

### • Drugs

Agent	CAS number	Occupation	References	Subjects		Skin test	Specific IgE	Other immunological tests	Broncho provocation test	Other evidence
				(n)	Prevalence					
Ferrimanitol ovalbumin		Worker pharmaceutical company	(436)	1	NA	negative	ND	immunoblotting	+	
Clarithromycin [81103-11-9]		Worker pharmaceutical company	(436)	1	NA	negative	ND	ND	+	
Glucosamine hydrochloride [66-84-2]		Cleaner	(436)	1	NA	negative	ND	ND	+	

### • Reactive dyes

Agent	CAS number	Occupation	References	Subjects		Skin test	Specific IgE	Other immunological tests	Broncho provocation test	Other evidence
				(n)	Prevalence					
Reactive dye		Reactive dyes	(437)	309	25%	7% + orange 8% + black	17% + orange 17% + black	ND	65% of 20 +	
		Wool dye house	(438)	6	NA	ND	83% +	100% +	ND	
		Textile dyehouse	(439)	162	NA	NA	85% of 5 +	ND	ND	
Levafix brilliant yellow E36		Preparation of dye solution	(440)	1	NA	+	ND	ND	+	
Drimaren brilliant yellow K-3GL	12226-52-7	Textile industry	(441)	1	NA	+	ND	ND	+	
Black henna (Indigofera argentea)		Herbal shop sales	(442)	1	NA	+	+	ND	ND	PEF
FD&C blue dye #2	<a href="#">Link</a> 860-22-0	Food industry	(443)	1	NA	-	-	ND	+	
Cibachrome brilliant scarlet 32		Textile industry	(441)	1	NA	+	ND	ND	+	
Drimaren brilliant blue K-BL		Textile industry	(441)	1	NA	+	ND	ND	+	
Lanasol Yellow 4G	12226-61-8	Dyer	(441)	1	NA	+	ND	ND	+	
Synozol Red-K 3BS		Textile worker	(444)	1	NA	+	+	ND	+	
Carmine	<a href="#">Link</a> 1390-65-4	Dye manufacture	(445)	10	NA	30% +	30% +	ND	100% of 1	
Monascus ruber		Delicatessen plant	(446)	1	NA	+	ND	+ Immunoblotting	+	PC20



## Agents Causing Occupational Asthma With Key References

### • Biocides

<i>Agent</i>	<i>CAS number</i>	<i>Occupation</i>	<i>References</i>	<i>Subjects (n)</i>	<i>Prevalence</i>	<i>Skin test</i>	<i>Specific IgE</i>	<i>Other immunological tests</i>	<i>Broncho provocation test</i>	<i>Other evidence</i>
Hexachlorophene	<a href="#">Link</a> 70-30-4	Hospital staff (sterilizing agent)	(447)	1	NA	ND	ND	ND	+	
Chlorhexidine	<a href="#">Link</a> 55-56-1	Nurse	(448)	2	NA	ND	ND	ND	+	
Glutaraldehyde	<a href="#">Link</a> 111-30-8	Hospital endoscopy unit	(449)	9	89%	ND	ND	ND	ND	Questionnaire
		Endoscopy & Radiology	(450)	8	NA	ND	ND	ND	7/8 +	PEF
Ortho-Phthalaldehyde	<a href="#">Link</a> 643-79-8	Endoscopy unit	(451)	1	NA	ND	ND	ND	ND	Improvement while away from work
Hydroxylamine	<a href="#">Link</a> 7803-49-8	Paper recycling	(452)	2	NA	ND	ND	ND	1+	PEF
Peracetic acid-hydrogen peroxide mixture		Endoscopy unit	(453)	2	NA	ND	ND	ND	2+	PEF
Chloramine T	<a href="#">Link</a> 127-65-1	Chemical manufacturing	(454)	6	NA	100% +	ND	66% + passive transfer	ND	
		Brewery	(455)	7	NA	100% +	ND	ND	ND	Recovery with removal
		Janitor-cleaning	(456)	5	NA	100% of 4 +	ND	ND	100% of 3 +	
Chloramine (unspecified)		Lifeguard, Swimming teacher	(457)	3	NA	ND	ND	ND	+	PEF
Lauryl dimethyl benzyl ammonium chloride	<a href="#">Link</a> 139-07-1	Pharmacist	(458)	1	NA	ND	ND	ND	+	PEF
Isothiazolinone (unspecified)		Chemical plant	(459)	1	NA	ND	ND	ND	+	
Triclosan	<a href="#">Link</a> 3380-34-5	Nursery nurse	(460)	1	NA	ND	ND	ND	+	PEF

### • Fungicides

<i>Agent</i>	<i>CAS number</i>	<i>Occupation</i>	<i>References</i>	<i>Subjects (n)</i>	<i>Prevalence</i>	<i>Skin test</i>	<i>Specific IgE</i>	<i>Other immunological tests</i>	<i>Broncho provocation test</i>	<i>Other evidence</i>
Tetrachloroisophthalonitrile	<a href="#">Link</a> 1897-45-6	Farmer	(461)	1	NA	ND	-	+ Patch test	+	FEV1 recording at work
Tributyl tin oxide	<a href="#">Link</a> 56-35-9	Venipuncture technician	(462)	1	NA	-	ND	ND	+	
Captafol	<a href="#">Link</a> 2425-06-1	Chemical manufacturing	(463)	1	NA	-	ND	ND	+	

## Agents Causing Occupational Asthma With Key References

### • Chemicals

<i>Agent</i>	<i>CAS number</i>	<i>Occupation</i>	<i>References</i>	<i>Subjects (n)</i>	<i>Prevalence</i>	<i>Skin test</i>	<i>Specific IgE</i>	<i>Other immunological tests</i>	<i>Broncho provocation test</i>	<i>Other evidence</i>
Polyvinyl chloride (fumes)		Meat wrapper	(464)	96	69%	ND	ND	ND	27% of 11 +	
Polyvinyl chloride (fumes and powder)		Meat wrapper	(465)	3	NA	ND	ND	ND	ND	History only
Polyvinyl chloride (powder)	<a href="#">Link</a> 9002-86-2	Manufacture bottle caps	(466)	1	NA	ND	ND	ND	+	PEF
Organic phosphate insecticides		Chemical packaging plant	(467)	1	NA	ND	ND	ND	ND	History only
Tetramethrin	<a href="#">Link</a> 7696-12-0	Extermination	(468)	1	NA	-	ND	ND	+	PC20
Persulfate salts (ammonium, potassium, sodium)		Hairdressing	(469)	2	NA	+	ND	ND	+	
		Hairdressing	(470)	2	NA	+	ND	ND	+	
		Hairdressing	(471)	23	17%	4% +	ND	ND	100% of 4 +	
		Hairdressing	(472)	1	NA	-	ND	ND	+	
		Hairdressing	(473)	1	NA	ND	ND	ND	+	
Yellow and red henna		Hairdressing	(474)	1	NA	+	ND	ND	+	+ Rhinométrie acoustique
Eugenol	<a href="#">Link</a> 97-53-0	Hairdressing	(475)	1	NA	-(prick) +patch	ND	Mononuclear proliferation	+	
Diazonium salt		Manufacture of photocopy paper	(476)	1	NA	ND	ND	ND	+	
		Manufacture of fluorine polymer precursor	(477)	45	56%	ND	20% +	ND	100% of 2	
Urea formaldehyde	<a href="#">Link</a> 9011-05-6	Resin	(478)	2	NA	-	ND	ND	+	
		Resin	(479)	3	NA	ND	ND	ND	100% of 3	
		Manufacture of foam	(480)	1	NA	ND	ND	ND	+	
Popcorn flavoring chemical		Popcorn makers	(481)	3	NA	ND	ND	ND	ND	
Freon (unspecified)		Refrigeration	(482)	1	NA	ND	ND	ND	+	
Furfuryl alcohol (furan based resin)		Foundry mold making	(483)	1	NA	ND	ND	ND	+	

## Agents Causing Occupational Asthma With Key References

### • Chemicals

Agent	CAS number	Occupation	References	Subjects		Skin test	Specific IgE	Other immunological tests	Broncho provocation test	Other evidence
				(n)	Prevalence					
Styrene	<a href="#">Link</a> 100-42-5	Plastics factory	(484)	2	NA	-	ND	ND	+	
Azobisformamide	<a href="#">Link</a> 123-77-3	Plastics, rubber	(485)	151	18,5%	ND	ND	ND	ND	Removal with improvement
		Plastic	(486)	2	NA	ND	ND	ND	+	
		Plastics	(487)	4	NA	ND	ND	ND	100% of 2 +	
Sodium isononanoyl oxybenzene sulfonate	<a href="#">Link</a>	Laboratory technician	(488)	1	NA	ND	ND	ND	+	
Peptide coupling reagent (TBTU and HBTU)		Laboratory technician	(489)	1	NA	+	Neg	ND	+	
3-amino-5-mercapto-1,2,4-triazole	<a href="#">Link</a> 16691-43-3	Herbicide production	(490)	6	NA	ND	ND	Specific IgG	ND	PEF
Tetrazene	<a href="#">Link</a> 31330-63-9	Detonator manufacturer	(491)	1	NA	ND	ND	ND	+	PEF
Polyethylene	<a href="#">Link</a> 9002-88-4	Paper packer	(492)	1	NA	ND	ND	ND	+	PEF
Tall oil	<a href="#">Link</a> 8002-26-4	Rubber tyre manufacturer	(493)	1	NA	-	ND	- Patch test	+	PEF
Sulfites (unspecified)		Water plant	(494)	1	NA	-	ND	ND	Oral +	
3-(Bromomethyl)-2-chloro-4-(methylsulfonyl)-benzoic acid (BCMBA)	120100-05-2	Chemical factory worker	(495)	2	2/92(2%)	+	ND	ND	+	FeNO
Sodium metabisulfite	<a href="#">Link</a> 7681-57-4	Food processor	(496)	1	NA	ND	ND	ND	+	
Sodium bisulfite	<a href="#">Link</a> 7631-90-5	Fishing industry	(497)	1	NA	ND	ND	ND	+	
Polypropylene	<a href="#">Link</a> 9003-07-0	Bag manufacturer	(498)	1	NA	ND	ND	ND	+	PEF
Polyester		Painter	(499)	1	NA	ND	ND	ND	+	Alveolitis
Glacial acetic acid	<a href="#">Link</a> 64-19-7	Pickling	(500)	1	NA	ND	ND	+	ND	
Ninhydrin	<a href="#">Link</a> 485-47-2	Laboratory worker	(501)	1	NA	ND	ND	ND	+	PEF
1,2-Benzisothiazolin-3-one	<a href="#">Link</a> 2634-33-5	Chemical worker	(502)	1	NA	ND	ND	ND	+	
Metabisulfite		Agricultural producer	(496)	1	NA	ND	ND	ND	ND	

## Agents Causing Occupational Asthma With Key References

### • Health Care

<i>Agent</i>	<i>CAS number</i>	<i>Occupation</i>	<i>References</i>	<i>Subjects</i>		<i>Skin test</i>	<i>Specific IgE</i>	<i>Other immunological tests</i>	<i>Broncho provocation test</i>	<i>Other evidence</i>
				<i>(n)</i>	<i>Prevalence</i>					
Ethylene oxide	<a href="#">Link</a> 75-21-8	Nurse	(503)	1	NA	ND	+	ND	+	Changes in PC20
Enflurane	<a href="#">Link</a> 13838-16-9	Hospital staff	(504)	1	NA	ND	ND	ND	+	
Sevoflurane + isoflurane		Anesthesiology staff	(505)	3	NA	ND	ND	ND	+	
Methyl blue	<a href="#">Link</a> 28983-56-4	Hospital staff	(506)	1	NA	ND	ND	ND	+	
Terpene		Hospital staff	(507)	1	NA	ND	ND	ND	+	
Radiographic fixative		Hospital staff	(508)	1	NA	ND	ND	ND	+	
Sulfathiazole	<a href="#">Link</a> 72-14-0	Hospital staff	(509)	2	NA	-	ND	ND	+	
Formaldehyde	<a href="#">Link</a> 50-00-0	Hospital staff	(510)	28	29% *	ND	ND	ND	50% of 4 +	
		Different industries	(511)	15	NA	ND	ND	ND	60% +	
		Different industries	(512)	230	5%	ND	ND	ND	5% +	
Methyl methacrylate & cyanoacrylates		Adhesive	(513)	7	NA	ND	ND	ND	86% +	PEF
		Nurse	(514)	1	NA	ND	ND	ND	+	
		Glue	(515)	1	NA	ND	ND	ND	+	PEF monitoring
		Fingernail	(516)	1	NA	ND	ND	ND	+	
Triacrylate		Printing	(517)	1	NA	ND	ND	ND	+	
Ethoxylated-2-bisphenol-A-diacrylate	<a href="#">Link</a> 64401-02-1	Autobody shop	(518)	1	NA	ND	ND	ND	+	

### • Synthetic Material

<i>Agent</i>	<i>CAS number</i>	<i>Occupation</i>	<i>References</i>	<i>Subjects</i>		<i>Skin test</i>	<i>Specific IgE</i>	<i>Other immunological tests</i>	<i>Broncho provocation test</i>	<i>Other evidence</i>
				<i>(n)</i>	<i>Prevalence</i>					
Plexiglass		Factory	(519)	1		ND	ND	ND	+	Pre-post change in FEV1
Tooth enamel dust		Dentist	(520)	1	NA	ND	ND	ND	ND	
ECG ink		Laboratory nurse	(506)	1	NA	+	ND	ND	+	

## Agents Causing Occupational Asthma With Key References

### • Unidentified

Agent	CAS number	Occupation	References	Subjects		Skin test	Specific IgE	Other immunological tests	Broncho provocation test	Other evidence
				(n)	Prevalence					
(?)		Respiratory therapist	(521)	194	19%	ND	ND	ND	ND	Questionnaire
(?)		Mineral analysis laboratory	(522)	21	24% **	ND	ND	ND	ND	Questionnaire PC20
(?) Oil mist		Toolsetter	(523)	1	NA	ND	ND	ND	+	PEF
(?) Metal working fluid		Automobile plant	(524)	12	1,5%	ND	ND	ND	ND	PC20, FEV1
(?) Fluorine		Potroom	(525)	52	NA	ND	ND	ND	ND	History
(?) Aluminum		Potroom	(526)	227	7%	ND	ND	ND	ND	Questionnaire
		Potroom	(527)	35	NA	ND	ND	ND	ND	History
		Potroom	(528)	57	NA	ND	ND	ND	ND	History
		Potroom	(529)	1	NA	ND	ND	ND	+	PEF
Aluminium tetrafluorides ( Potassium aluminium tetrafluoride)		Production line (using a flux)	(530)	5	NA	ND	ND	ND	+	
Aluminium chloride	<a href="#">Link</a> 7446-70-0	Foundry worker	(531)	1	NA	ND	ND	ND	+	PEF
(?) Pulverized fuel ash		Power station attendant	(533)	1	NA	ND	ND	ND	+	PEF
Acrylonitrile-Butadiene Styrene filaments- (ABS)	<a href="#">Link</a> 9003-56-9	Self employed (3D printing)	(534)	1	NA	ND	ND	ND	ND	Worsening at Works

### Non encore spécifié

#### • Unidentified

Agent	CAS number	Occupation	References	Subjects		Skin test	Specific IgE	Other immunological tests	Broncho provocation test	Other evidence
				(n)	Prevalence					
Aluminium hydroxide	<a href="#">Link</a> 21645-51-2	Manufacture of wipers	(532)	1	NA	negative	ND	ND	+	

## **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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