

Table 1: Allergenic agents reported to cause occupational asthma																											
Agents [synonyms] CAS no.	Reference	Study type	Occupationally exposed subjects studied, n	Allergic asthma cases, n (prevalence, %)	EVIDENCE (pathological results)															Remarks							
					WORK-RELATED SYMPTOMS				LFT		BHR		PFT		SIC			SPT			Spec. IgE						
					Asthma		Rhinitis		n/n	%	n/n	%	n/n	%	n/n	%	n/n	%	i		l	d	n	n/n	%	n/n	%
					n/n	%	n/n	%	n/n	%	n/n	%	n/n	%	n/n	%	n/n	%	(n)		(n)	(n)	(n)	n/n	%	n/n	%
Animals (Animalia)																											
Joint-Legs (Arthropods)																											
Arachnids (Arachnida)																											
Mites (Acarina)																											
Predatory mites (Phytoseiidae)																											
Thrips mite (<i>Amblyseius cucumeris</i>)	Groenewoud, Veld et al., 2002	Cross-sectional	472	28 (25.7)	28/109*	25.7	78/109	71.6	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	109/472	23.1	63/109	57.8	Greenhouse employees in bell pepper horticulture, co-exposed and co-sensitized to both sweet bell pepper pollen and/or plant (80/109 SPT+) and <i>Tyrophagus putrescentiae</i> (62/472 SPT+). *WRS listed for sensitized subjects only; nasal Ch in 23 sensitized employees: those with WR-rhinitis had sign. higher responses than employees without WR rhinitis, individual results not listed				
Spider mites (Tetranychidae)																											
Spider mites	Kim, Lee et al., 1999	Survey	725	37 (5.1)	119/725	16.4	129/725	17.8	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	118/465*	25.4	nd	nd	Apple-cultivating farmers. * SPT+ with at least one spider mite; sign. increased prevalence of asthma among SPT+ subjects; 37/118 SPT+ were asthmatics				
European red mite (<i>Panonychus ulmi</i>)				48															108/465	23.2							
Two-spotted spider mite (<i>T. urticae</i>)																			77/465	16.6							
Mould mite (<i>T. putrescentiae</i>)				32															98/465	21.1							
Citrus red mite (<i>Panonychus citri</i>)	Kim, Son et al., 1999	Case series	16	16 (100)	16/16		15/16		9/16		7/7*	nd		1/1		1			16/16		16/16		Farmers cultivating citrus fruit. *BHR in all subjects with normal LFT				
European red mite (<i>Panonychus ulmi</i>)	Michel, Guin et al., 1977	Case series	5	2	2/5		4/5		nd		nd	nd		nd					5/5*	100	nd	nd	Apple growers. *IC				
MacDaniel spider mite (<i>Tetranychus macdanieli</i>)	Carbonnelle, Lavaud et al., 1986	Case series	7	4	4/7		4/7		nd		nd	nd		nd					7/7		nd	nd	Wine growers				
Two-spotted spider mite (<i>Tetranychus urticae</i>)	Navarro, Delgado et al., 2000	Cross-sectional	246		17/246	6.9	43/246	17.5	nd		nd	nd		nd					61/241	25.3	29/110		Greenhouse workers. Sign. correlation between time of exposure and number of sensitized symptomatics (n=46); specific sensitization sign. increased among exposed; sensitized asthmatics not listed				
*	Astarita, Franzese et al., 1994	Case series	46	16	19/46	41.3	46/46	100	nd		nd	19/46*	41.3	nd					36/46	78.3	36/46	78.3	Farm workers: 30 fields workers, 16 greenhouse workers. *PEFR+ all asthmatics; 16 asthmatics also sensitized				
*	Cisteró-Bahima, Enrique et al., 2000	Case series	1	1	1/1		-		0/1		1/1	1/1		nd					1/1		1/1		Flower cultivator with simultaneous OA to carnation				
Storage mites (Acaridae, Glycyphagidae) (see also bakery confinement)																											
Storage mites: Flour mite (<i>Acarus siro</i>), Fodder mite (<i>Lepidoglyphus destructor</i>), Mould mite (<i>Tyrophagus putrescentiae</i>)	Koistinen, Ruoppi et al., 2006	Case control	12		1/12	8.3	12/12		nd		nd	nd		nd					6/12*		0/12		The entire personnel of a moisture-damaged grocery store. *6/12 SPT+ with <i>T. putrescentiae</i> as most reactive; 4/6 SPT+ nasal Ch+; sensitized asthmatics not listed				
Storage mites	Blainey, Topping et al., 1989	Survey	133	21 (15.8)***	43/133	32.3	-		11/116	68.8	24/116	20.7	nd		1/1*		1		32/130*	24.6	30/128*	23.4	Grain-store workers. *SIC with storage mite mix; ** SPT and IgE results with at least one storage mite; ***21 asthmatics SPT+ and 15 asthmatics IgE+; sign. association between WRS and sensitization; also 13/130 SPT+ with at least one				
Flour mite (<i>Acarus siro</i>)																			20/130	15.4	9/128	7					
Fodder mite (<i>G. destructor</i>)																			13/130	10	12/128	9.4					
House itch mite (<i>G. domesticus</i>)																			12/130	9.2	12/128	9.4					
Mould mite (<i>T. putrescentiae</i>)																			21/130	16.2	21/128	16.4					
<i>Acarus farris</i>																			4/130	3.1	15/128	11.7					
Storage mites	Cuthbert, Jeffrey et al., 1984	Cross-sectional	290	27 (9.3)	36/290	12.4	72/290	24.8	nd		nd	nd		nd					108/290	37.2	42/219	19.2	Farm workers. 27/36 asthmatics SPT+				
Flour mite (<i>Acarus siro</i>)																			69/290								
Fodder mite (<i>G. destructor</i>)																			103/290								
Seed mite (<i>Tyrophagus longior</i>)																			74/290								
Storage mites	Cuthbert, Brostoff	Survey	38	11 (28.9)	11/38	28.9	12/28	42.9	nd		nd	nd		nd					38/38	100			13 farmers and their 25 family				

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					WORK-RELATED SYMPTOMS				LFT		BHR		PFT		SIC				SPT		Spec. IgE				
					Asthma		Rhinitis		n/n	%	n/n	%	n/n	%	n/n	%	Reaction				n/n	%		n/n	%
					n/n	%	n/n	%									i	l	d	n					
Prawn (<i>Nephrops norvegicus</i>), Norway lobster	Gaddie, Legge et al., 1980	Cross-sectional	50	7 (14.0)	18/50	36	11/50	22	12/18	66.7	nd	nd	nd	2/2	1	1	1	1	13/50	26	8/50	16	Prawn processors. 7/18 asthmatics had SPT+ and IgE+, the other 11 asthmatics were not sensitized		
Shrimp, <i>Gammarus</i>	Baur, Huber et al., 2000	Case report	1	1	1/1		-		1/1		1/1		nd					1/1			1/1	Employee in a fish-food factory. Also IgE+ with Chi t 1-9 of <i>C. thummi</i>			
Shrimp	Goetz, Whisman et al., 2000	Case report	1	1	1/1		-		nd		1/1		1/1					1/1			1/1	Restaurant seafood handler. See scallop			
*	Desjardins, Malo et al., 1995	Survey	57	1 (1.8)	2/57	3.5	3/57	5.3	nd		4/8		nd		1/3	33.3	1		9/57	15.8	8/55	14.5	Food company workers including index case, co-exposed to clam. BHR and SIC in sensitized only; 1/2 asthmatics during shrimp-production period had SPT+, IgE+ and SIC+ to shrimp; see also clam		
Shrimp meal (<i>Penaeus</i> shrimp, brine shrimp <i>Artemia salina</i>)	Carino, Elia et al., 1985	Case report	1	1	1/1		1/1		0/1		1/1		nd		1/1			1	1/1			1/1	Technician for experimental aquaculture		
Snow crab (<i>Chionoecetes opilis</i>)	Cartier, Malo et al., 1984a	Cross-sectional	303	27 (8.9)	64/303	21.1	+		13/298	4.4	62/114	54.4	12/14**		33/46	71.7	1	23	9	65/298	21.8	nd	Snow crab processors. *55/303 (18.2%) WR rhinitis and/or conj.; **Serial PEFR before and after return to work; SIC, PFT, BHR in asthmatics only; 46 had OA, defined as +SIC (n=33) or at least 2 of the following: sign.changes in PEFR, PC20 and/or FEV1 after return to work (n=13); 27 out of 46 subjects with OA had SPT+		
Hoya (sea-squirt)	Jyo, Kohmoto et al. (1980)	Cross-sectional	1413	410 (29)	511/1413	36.2									nd				*419/511	82	160/180	89	Workers of oyster farm. *SPT in asthmatics only.		
Nacre dust	Zedda (1967)	Case report	1												1/1				1/1			nd	nacre buttons		
*	Orriols, Aliaga et al. (1977)																								
Red soft coral	Onizuka, Inoue et al. (1990)	Cross-sectional	74	9											nd				2/2			nd	Fishermen		
*	Onizuka, Kamiya et al. (2001)																								
Snow crab	Malo, Chretien et al. (1997)																								
*	Cartier, Malo et al. (1986b)	Cross-sectional	303						nd						nd				65/119	54.6	62/115	53.9	Data collection over several years; no information about symptoms		
Mollusks (Mollusca)																									
Clam	Desjardins, Malo et al., 1995	Survey	57	2 (3.5)	2/57	3.5	4/57	7.0	nd		4/8		nd		2/2	100	1		1	4/57	7.0	4/55	7.3	Food company workers including the index case, co-exposed to shrimp. BHR and SIC in sensitized subjects only; both asthmatics during clam-production period had SPT+, IgE+ and SIC+ to clam; see also shrimp	
Cuttle-fish	Tomaszunas, Weclawik et al., 1988	Case series	66	61	61/66		-		nd		nd		nd		nd							nd	Deep-sea fishermen. *Estimated annual incidence of allergic reactions (5 year survey)		
Scallop	Goetz, Whisman et al., 2000	Case report	1	1	1/1		-		nd		1/1		1/1		1/1				1/1			1/1	Restaurant seafood handler. Co-exposure to shrimp; significant cross-reactivity between scallop and shrimp		
Sponges (Porifera)																									
Marine sponge, powdered (<i>Dysidea herbacea</i>)	Baldo, Krilis et al., 1982	Case report	1	1	1/1		-		1/1		nd		nd		nd							1/1	Laboratory worker. Also IgE+ with 7 other sponge and 2 soft coral species; HR+ to <i>D. herbacea</i>		
Spinal cords (Chordata), Vertebrata																									
Fish (Pisces)																									

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					WORK-RELATED SYMPTOMS				LFT		BHR		PFT		SIC				SPT		Spec. IgE						
					Asthma		Rhinitis		n/n	%	n/n	%	n/n	%	n/n	%	n/n	%	Reaction					n/n	%	n/n	%
					n/n	%	n/n	%											i	(n)	l	(n)					
Atlantic salmon (<i>Salmo salar</i>)	Douglas, McSharry et al., 1995	Cross-sectional	291	15 (5.2)	70/291	24.1	+*		nd		nd		24/291**	8.2	nd					nd		25/291	8.6	Employees of a salmon-processing plant. *Prevalence of indiv. WRS not listed; **serial PEFR over several weeks: 24 subjects showed marked changes in daily mean PEFR levels, of whom 15 were sensitized and had asthmatic WRS, the other 9 PFT+ not sensitized to salmon			
Fish: anchovy, Atlantic pomfret, hake, plaice, salmon, sardine, sole, trout, tuna	Rodríguez, Reaño et al., 1997	Case reports	2	2	2/2		1/2		nd		1/1		2/2*		2/2		2			2/2		2/2		Fish-processing workers. *Serial PEFR for 2 weeks at work and away from work; subject 1: SPT+ with raw and cooked plaice, salmon, hake, tuna; IgE+ with salmon; SIC+ with raw hake, salmon, plaice, tuna; subject 2: SPT+ with raw and cooked anchovy, sardine, trout, salmon, sole, Atlantic pomfret; IgE+ with trout, anchovy, salmon; SIC+ with raw salmon			
Fishmeal: pickling, herring, cod, shell fish, plaice, eel, sardine, tunny-fish (tuna), salmon, shrimp, mussel	Droszcz, Kowalski et al., 1981	Cross-sectional	51	1 (2.0)	1/51	2.0	-		17/51	33.3	nd		nd		2/51**		1			12/51*	23.5	nd		Fish meal factory workers. *IC with a mix of 10 fish species; **nasal Ch induced a 20% decrease in FEV1 in asthmatic subject			
Trout, rainbow	Sherson, Hansen et al., 1989	Cross-sectional	8	5	6/8	75	3/8	37.5	1/8		7/8		4/6*	66.7	nd					nd		8/8**	100	Production workers of trout-processing factory. *PEFR at work, PFT was not done bei 1 asthmatic with +BHR; **IgE done with trout-contaminated water containing 1 µg endotoxin/mL			
Birds (Aves)																											
Birds (budgerigar, parrot, canary)	Tauer-Reich, Fruhmman et al., 1994	Case series	5	5	5/5		2/5		2/5		5/5		nd		nd					nd		5/5*			Bird fanciers. *IgE with sera and feathers; SDS-PAGE: cross-reactivity between serum and feather allergen of diff. bird species		
Chicken and turkey	Schwartz, 1994	Case report	1	1	1/1		1/1		0/1		nd		nd		nd					1/1*		nd			Food processing. *SPT+ with raw chicken and raw turkey		
"	Perfetti, Cartier et al., 1997	Case reports	4	4	4/4		3/4		nd		nd		4/4*		nd					4/4**	100	nd			Poultry-slaughterhouse workers. **SPT with feathers; *FEV1 at work and off-work		
Mammals (Mammalia)																											
Black bat (<i>Tadarida [chaerephon] major</i>)	El-Ansary, Gordon et al., 1987	Case series	7	7	7/7		6/7		nd		nd		nd		nd					7/7*	100	7/7*	100		6 employees and 1 housewife exposed to bat droppings from cracked ceiling in Sudan. *Clinical tests with bat guano/droppings		
Bat	Senti, Lundberg et al., 2000	Case report	1	1	1/1		1/1		0/1		0/1		nd		nd					1/1		1/1			Zoologist. Clinical test with bat guano: co-exposure and co-sensitization to <i>Tenebrio molitor</i> (bat feed)		
Bat (Chiroptera)	Spiewak, Johansson et al., 1996	Case report	1	1	1/1		-		1/1		nd		nd		nd					1/1		1/1			Bat scientist. Clinical tests with bat hair		
Cow	Ylönen, Mäntyjärvi et al., 1992	Case series, comparative study	49	49	49/49		-		nd		nd		nd		49/49*					x**		x**			Dairy farmers with diagnosed bovine asthma. *Type of reaction not listed; **49/49 either IgE+ or SPT+; 30/51 IgE+ with BEA (bovine epithelial allergen), 26/51 IgE+ with BUA (bovine urinary antigen); sign. higher anti-BEA IgE		
"	Walusiak, Krawczyk-Adamus et al., 2004	Case-control	100		38/100	38	41/100	41	nd		x*		nd		11/100*					7/41**		4/41**			Farmers. Sign. risk factor of 38 OA cases was SPT+ with storage mites and cereals. *SIC or nasal Ch with cow; **SPT and IgE with animal allergens in symptomatics		
Deer	Nahm, Park et al., 1996	Case report	1	1	1/1		1/1		nd		1/1		nd		1/1		1			1/1*		1/1			Farmer raising red deer. *SPT+ with dander of deer, goat, sheep, camel, cow, deer		

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					WORK-RELATED SYMPTOMS				LFT		BHR		PFT		SIC				SPT		Spec. IgE							
					Asthma		Rhinitis		n/n	%	n/n	%	n/n	%	n/n	%	n/n	%	Reaction			n/n		%	n/n	%		
					n/n	%	n/n	%											i	l	d						n	
Frog (<i>Rana esculenta</i>)	Armentia, Martin-Santos et al., 1988	Case report	1	1	1/1		1/1		nd		nd		nd		nd					1/1*		1/1*	Frog catcher with prev. diagn. of seasonal asthma. *Clinical tests with venom extract					
Mink (<i>Mustela vison</i>)	Jimenez Gomez, Anton et al., 1996	Case report	1	1	1/1		1/1		1/1		1/1		nd		1/1*		1			1/1*		0/1*	Worker at a mink farm. *Clinical tests with mink urine					
Monkey (Cotton top tamarin)	Petry, Voss et al., 1985	Case reports	2	2	2/2		1/2		nd		nd		nd		nd					2/2*		2/2*	Research psychology professor and his assistant. *Clinical tests with monkey dander					
Mouse	Newman Taylor, Longbottom et al., 1977	Case reports	4	4	4/4		4/4		nd		nd		nd		4/4*		3	1		4/4*		4/4*	Laboratory workers co-exposed and co-sensitized to rats. *Clinical tests with urine; see rats					
													4/4		3	1	3/4		3/4		3/4		nd		Laboratory workers co-exposed and co-sensitized to rats. *Clinical tests with urine; see rats			
Pig	Brennan, 1985	Case report	1	1	1/1		-		1/1		nd		1/1*		nd					nd		1/1**	Butcher. *Serial PEFR at work and off work for 2 weeks. **IgE+ with pig urine, pig skin					
Rat	Davies, Thompson et al., 1983	Case series	32	12 (37.5)	13/32		21/32		3/29		nd		nd		nd					20/32*		17/32*	Laboratory animal workers who previously reported allergic symptoms. *With urine; 12/13 asthmatics had SPT+ and IgE+					
		Prospective study	148	2 (1.4)**	3/148	2.0**	-		nd		nd		nd		nd					14/29*	48.3**	16/148	10.8**	Laboratory animal workers in their 1. year of work. *Only IgE+ subjects and symptomatics underwent SPT; 2/3 asthmatics sensitized; **incidence in 1 year of employment				
*	Newman Taylor, Longbottom et al., 1977	Case reports	5	5	5/5		5/5		nd		nd		nd		5/5*		3	2		3/5*		5/5*	Laboratory workers. Co-exposure and co-sensitization to mice; *with urine; see mice					
															2/5		1	1		3/5		2/5		nd	Rat serum			
*	Cullinan, Cook et al., 1999	Nested case-control	342	17/342 (5.0)**	36/342	10.5**	84/342	24.6**	nd		nd		nd		nd					54/342*	15.8**	nd	Laboratory animal workers. Cohort study of 7 years and case-referent analysis within the cohort; *with urine; 46% of asthmatics SPT+; sign. exposure-response relationship with sensitisation and chest symptoms within the first 2 years of exposure; **incidence in 3 years					
Various laboratory animals, urinary rat and mouse proteins and rabbit dander	Gautrin, Infante-Rivard et al., 2001	Prospective cohort study over 3-4 years.	373	28 (7.5)*	22/373	5.9*	99/373	26.5*	nd		53/203	26.1	nd		nd					129/373	34.6*	nd	Animal laboratory apprentices. Peak incidents of skin reactions are max. 1-2 years after exposure beginning, and that of OA throughout the first 3 yrs; OA cases: subjects with SPT+ and 3.2 fold decrease in PC20, only 8/28 OA cases had asthmatic WRS; *incidence in 3-4 years					
Various laboratory animals (urine)	Venables, Tee et al., 1988	Cross-sectional	138	12 (8.7)	15/138	10.9	51/138	37	nd		nd		nd		nd					17/133*	12.8	49/130*	37.7	Employees in a pharmaceutical company. *SPT+ and IgE+ with at least one urine extract; 7/15 asthmatics SPT+ and 12/15 asthmatics IgE+				
																						10/133		23/130				
																							7/133		40/130			
																							6/133		20/130			
Various laboratory animals: dander extracts of guinea pig, mouse, rat etc.	Slovak and Hill, 1981	Cross-sectional	146	13 (8.9)	15/146	10.3	48/146	32.9	x*		nd		nd		nd					22/48**	45.8	nd	Employees in a pharmaceutical company. *Sign. decrease in FEV1/FVC in asthmatics; **SPT with animal dander in symptomatics only; 13/15 asthmatics sensitized					
Animal products																												
Bovine serum albumin (BSA) powder	Joliat and Weber, 1991	Case report	1	1	1/1		1/1		0/1		nd		nd		1/1**		1			0/1*		nd	Laboratory technician co-exposed and co-sensitized to lab animals. *IC+ with BSA; SIC+ with aqueous BSA					
Endocrine glands (ovaries, testes, pancreas, adrenal glands) of bovine origine	Breton, Leneutre et al., 1989	Case report	1	1	1/1		1/1		1/1		nd		nd		1/1*		1			1/1		nd	Pharmacist. *SIC with powdered bovine testes and adrenal glands					
Honey	Johnson, Dittrick et al., 1999	Case report	1	1	1/1		-		0/1		1/1		1/1		1/1		1			1/1		1/1	Worker in a cereal-producing company					

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					Asthma		Rhinitis		n/n	%	n/n	%	n/n	%	n/n	%	n/n	%	Reaction			n/n		%	n/n	%	
					n/n	%	n/n	%											i	l	d						(n)
Ivory (<i>Loxodonta africana</i>)	Armstrong, Neill et al., 1988	Case report	1	1	1/1		-			nd		nd		1/1*		1/1				1			0/1		nd	Worker in an ivory carving shop. *Serial FEV1 at work and off work for 2 weeks	
Milk proteins																											
Alpha-lactalbumin	Bernaola, Echechipia et al., 1994	Case report	1	1	1/1		1/1			0/1		1/1		nd		1/1				1			1/1		1/1	Chocolate candy maker. Conj Ch+	
Casein (main milk protein)	Olaguibel, Hernandez et al., 1990	Case report	1	1	1/1		1/1			nd		1/1		nd		1/1				1			1/1		1/1	Tannery worker	
Milk proteins (casein, lactoglobulin)	Vargiu, Vargiu et al., 1994	Case report	1	1	1/1		1/1			nd		nd		nd		nd							1/1		1/1	Cattle farmer	
Egg proteins																											
Egg white, lysozyme, ovalbumin, ovomucoid, egg yolk	Smith, Bernstein et al., 1990	Survey	188	14 (7.4)	58/188	30.9	-			nd		nd		19/86	22	nd							29/86	33.7	34/86	39.5	Employees of egg products production plant. 44/58 symptomatics and 44 asymptomatics underwent SPT, IgE, PFT; asthma cases defined by dual concordance between the physician diagnosis of asthma plus WRS plus SPT+ with = 2 egg proteins
Egg proteins	Escudero, Quirce et al., 2003	Case reports	4	4	4/4		4/4			1/4		4/4		nd									4/4		4/4	Bakery workers, all sensitized to wheat, rye and barley	
Egg white																							2/4		2/4		
Egg yolk																							4/4		2/4		
Lysozyme (Gal d 4)														4/4		4							2/4		3/4		
Ovalbumin (Gal d 2)														2/2		2							1/4		2/4		
Ovomucoid (Gal d 1)														1/1		1							1/4		2/4		
Egg lysozyme	Bernstein, Kraut et al., 1993	Case report	1	1	1/1		-			nd		1/1		1/1*		1/1				1			1/1		1/1	Lysozyme production worker. *PEFR for 2 weeks at work. Also SPT+ and IgE+ with conalbumin, ovomucoid, ovalbumin	
Plants (Plantae)																											
Flowers, ornamental plants																											
Amaryllis (<i>Amaryllis hippeastrum</i>), hybrid cultivate of hippeastrum	Jansen, Visser et al., 1996	Case report	1	1	1/1		1/1			1/1		1/1		1/1*		1/1**				1			1/1***		1/1***	Greenhouse worker. *PEFR of work days and off work; **SIC+ with pollen; ***SPT+ and IgE+ with pollen, stem, petal	
Baby's breath (<i>Gypsophila paniculata</i>)	Antépara, Jáuregui et al., 1994	Case report	1	1	1/1		1/1			0/1		nd		nd		1/1				1			1/1		1/1	Florist	
"	Schroeckenstein, Meier-Davis et al., 1990	Case report	1	1	1/1		1/1			0/1		nd		nd		1/1				1			1/1		1/1	Florist	
"	Twiggs, Yunginger et al., 1982	Case report	1	1	1/1		1/1			nd		nd		nd		1/1				1			1/1		1/1	Florist	
Banha (<i>Pinellia ternata</i>)	Park, Kim et al., 1994	Case report	1	1	1/1		1/1			nd		0/1		nd		1/1				1			1/1		0/1	Employee of herbal medicine pharmacy. Co-exposure and co-sensitization to Sanyak; see Sanyak	
Bells of Ireland, pollen of (<i>Molucella laevis</i>)	Miesen, van der Heide et al., 2003	Case report	1	1	1/1		1/1			0/1		1/1		1/1*		1/1				1			1/1		1/1	Greenhouse employee. 18% decline of FEV1 during seasonal exposure; *serial PEFR for 1 week	
Bishop's weed (<i>Ammi majus</i>), Queen Anne's lace	Kiistala, Mäkinen-Kiljunen et al., 1999	Case report	1	1	1/1		1/1			0/1		0/1		nd		nd							1/1		1/1	Florist. Nasal Ch+	
Canari palm pollen (<i>Phoenix canariensis</i>)	Blanco, Carrillo et al., 1995	Case report	1	1	1/1		1/1			0/1		1/1		nd		1/1				1			1/1		1/1	Gardener. Sign.cross-reactivity btw. P. c. pollen and date palm (<i>P. dactylifera</i>) pollen	
Carnation (<i>Dianthus caryophyllus</i>)	Sanchez-Guerrero, Escudero et al., 1999	Case series	16	13	15/16		15/16			nd		15/16		13/14*		nd							15/16		11/14	Employees in indoor carnation cultivation. *Serial PEFR for 2 weeks at work and 2 weeks off work	
"	Cisteró-Bahima, Enrique et al., 2000	Case report	1	1	1/1		-			0/1		1/1		nd		1/1				1			1/1		1/1	Flower cultivator co-exposed and co-sensitized to <i>Tetrazychnus urticae</i>	
"	Sánchez-Fernández, González-Gutiérrez et al., 2004	Case report	1	1	1/1		1/1			nd		1/1		nd		1/1				1			1/1		1/1	Flowershop worker	

Agents [synonyms] CAS no.	Reference	Study type	Occupation- ally exposed subjects studied, n	Allergic asthma cases, n (prevalence, %)	EVIDENCE (pathological results)																Remarks						
					WORK-RELATED SYMPTOMS				LFT		BHR		PFT		SIC				SPT			Spec. IgE					
					Asthma		Rhinitis		n/n	%	n/n	%	n/n	%	n/n	%	n/n	%	Reaction				n/n	%	n/n	%	
					n/n	%	n/n	%											i	l		n					d
Camomile (<i>Matricaria chamomilla</i>)	Rudzki, Rapiejko et al., 2003	Case report	1	1	1/1		1/1		nd		nd		nd		nd		1/1		nd		Cosmetician co-exposed and co-sensitized to lime flower. *Nasal Ch+						
Chrysanthemum (<i>Chrysanthemum</i>)	Groenewoud, Jong et al., 2002b	Cross-sectional	104	8 (7.7)	8/104	7.7	50/104	48.1	nd		nd		nd		nd		21/104	20.2	11/104	10.6	Greenhouse employees. Cross-reaction between C. and mugwort.						
"	Piirilä, Keskinen et al., 1994	Case report	1	1	1/1		-		1/1		1/1		1/1*		1/1		1/1				Florist. *Serial PEFR or FEV1 at home and at work						
Cyclamen pollen	Bolhaar and van Ginkel, 2000	Case reports	2	1	1/2		2/2		nd		nd		nd		nd		2/2		2/2		Floriculturists						
Daffodil (<i>Narcissus pseudonarcissus</i>), Trumpet narcissus	Gonçalo, Freitas et al., 1987	Case report	1	1	1/1		1/1		nd		nd		nd		nd		0/1*				Flower grower. *SPT with <i>N.p.</i> juice; patch test+ with flower and leaf of <i>N.p.</i>						
Easter Lily (<i>Lilium longiflorum</i>)	Piirilä, Kanerva et al., 1999	Case report with follow-up	1	1	1/1		1/1		0/1		1/1		1/1		1/1		1	1/1		1/1	Floral shop worker. Also IgE+ and SPT+ with tulip						
Flowers	Jong de Vermeulen et al., 1998	Case series	14		10/14		14/14		nd		nd		nd		nd						Flower industry workers						
Ageratum																	7/14										
Alstroemeria																	6/14										
Asclepias																	4/14										
Aster																	2/14										
Chrysanthemum																	8/14		10/11								
Dianthus																	5/14										
Euphorbia																	6/13										
Eustoma																	7/14										
Freesia																	6/14										
Gerbera																	4/13										
Helianthus																	6/13										
Limonium																	0/13										
Matricaria																	11/14										
Narcissus																	3/13										
Pelargonium																	3/13										
Saintpaulia																	5/14										
Solidago																	12/14		11/11								
Flowers	Goldberg, Confino-Cohen et al., 1998	Cross-sectional	75		+		+		nd		nd		nd		nd		39/75	52	nd		Rural flower growers. * Individual symptoms not listed; SPT results with individual flowers in symptomatics only						
Asteraceae																	36/39	92									
Gentianaceae																	7/39	18									
Liliaceae																	7/39	18									
Ranunculaceae																	5/39	13									
Scrophulariaceae																	9/39	23									
Freesia (<i>Freesia hybride</i>)	Toorenenbergen van and Dieges, 1984	Case report	1	1	1/1		-		nd		nd		nd		nd		1/1			1/1	Greenhouse worker. Clinical tests done with flower and stem						
"	Piirilä, Keskinen et al., 1994	Case report	1		1/1		-		0/1		1/1		1/1*		0/1		0/1			nd	Gardener. *PEFR or FEV1 at home and at work						
Hyacinth (<i>Hyacinthus orientalis</i>)	Piirilä, Hannu et al., 1998	Case report	1		1/1		1/1		0/1		0/1		1/1		1/1		1	0/1		nd	Gardener						
Lily (<i>Lilium longiflorum</i>)	Lahti, 1986	Case report	1	1	1/1		1/1		nd		nd		nd		nd		1/1			nd	Florist co-exposed and co-sensitized to tulips						
Lime flower	Rudzki, Rapiejko et al., 2003	Case report	1	1	1/1		1/1		nd		nd		nd		nd		1/1			nd	Cosmetician co-exposed and co-sensitized to camomile. *Nasal Ch+						
Madagascar jasmine (<i>Stephanotis floribunda</i>)	Zee van der, de Jager et al., 1999	Survey	34	4	4/34	11.8	-		0/3		1/3		2/2		1/1		1	4/8		9/34***	26.5	Greenhouse employees of 5 nurseries including 4 index cases. **5 subjects with "airway and skin symptoms" and 4 index cases with asthma; ***only symptomatics had IgE+					
Poppy (<i>Papaver somniferum</i>)	Moneo, Alday et al., 1993	Cross-sectional	28	6 (21.4)	6/28	21.4	-		nd		nd		nd		4/4*		4	6/28	21.4	6/28	21.4	Workers of pharmaceutical factory. 6/6 asthmatics sensitized; *SIC only in asthmatics					
Rose hips (<i>Rosa rugosa</i>)	Kwaselow, Rowe et al., 1990	Case series	13	2	9/13		5/13		nd		nd		nd		2/4*		2	7/13		7/13	13 symptomatic employees of vitamin manufact. plant, 1 with work aggrav. asthma. *SIC in sensitized asthmatics						
Rose (<i>Rosa rugosa</i>)	Demir, Karakaya et al., 2002	Survey	290	18 (6.2)	69/290*	23.8	38/290*	13.1	x		nd		nd		nd			12/70	17.1	8/41	19.5	Rose cultivators. *New-onset and aggravated symptoms, 18/290 (6.2%) new-onset asthma					
Spathe flower (<i>Spathiphyllum wallisii</i>)	Kanerva, Mäkinen-Kiljunen et al., 1995	Case report	1		1/1		1/1		0/1		0/1		nd		0/1*			1/1		1/1	Caretaker of plants, co-exposed and co-sensitized to <i>Dracaena fragrans</i> . *Subject 8 months not exposed						

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					WORK-RELATED SYMPTOMS				LFT		BHR		PFT		SIC				SPT			Spec. IgE					
					Asthma		Rhinitis		n/n	%	n/n	%	n/n	%	n/n	%	n/n	%	Reaction				n/n	%	n/n	%	
					n/n	%	n/n	%											i	l		d					n
Stachys (<i>Limonium tataricum</i>), see lavender	Quirce, Garcia-Figueroa et al., 1993	Case report	1	1	1/1		1/1		0/1		1/1		1/1*		1/1		1		1/1		1/1		1/1		Floral industry worker. *Serial PEFR at work and at home for 4 weeks		
Sunflower pollen (<i>Helianthemum annuus</i>)	Bousquet, Dhivert et al., 1985	Case report	1	1	1/1		1/1		nd		0/1		nd		1/1		1		1/1		1/1		1/1		Employee in the agricultural department		
*	Atis, Tutluoglu et al., 2002	Cross-sectional	102		17/102	16.6	+		x**		nd		nd		nd				24/102		23.5		nd		Sunflower-processing factory. *Allergic symptoms (rhinitis, conj., skin) 29/102 (28.4%); ** LFT parameters significantly lower in highly exposed workers than in unexposed group; sensitized asthmatics not listed		
Tulip (<i>Tulipa</i>)	Piiriä, Keskinen et al., 1994	Case reports	2	2	2/2		2/2		1/2		1/1		1/2*		1/1		1		1/2		1/1		1/1		Gardener and florist. *Serial PEFR or FEV1 at work and at home; SPT- with Tuliposide-A		
*	Lahti, 1986	Case report	1	1	1/1		1/1		nd		nd		nd		nd				1/1		nd		nd		Florist co-exposed and co-sensitized to lily		
Umbrella tree (<i>Schefflera</i>)	Grob, Wüthrich et al., 1998	Case report	1	1	1/1		1/1		nd		nd		nd		nd				1/1		1/1		1/1		Indoor gardener. Co-exposure and co-sensitization to <i>Ficus benjamina</i> .		
Wall rocket pollen (<i>Diploptaxis erucoides</i>)	Brito, Mur et al., 2001	Case reports	2	1	1/2		2/2		nd		1/1		1/1		1/1		1		2/2		2/2		2/2		Vineyard farmers		
Weeping fig (<i>Ficus benjamina</i>)	Axelsson, Johansson et al., 1987	Survey	84	6	6/84	7.1	17/84	20.2	nd		6/9		nd		6/6*	100	4	2	18/84		21.4	18/84	21.4	21.4	Plant keepers, greenhouse workers. *SIC in sensitized asthmatics; 9/9 rhinocconj. Ch+		
*	Grob, Wüthrich et al., 1998	Case report	1	1	1/1		1/1		nd		nd		nd		nd				1/1		1/1		1/1		Indoor gardener. See umbrella tree		
Vegetables, legumes, other plants																											
Aniseed dust (<i>Pimpinella anisum</i>)	Fraj, Lezaun et al., 1996	Case report	1	1	1/1		-		-		1/1		1/1*		1/1		1		1/1		1/1		1/1		Butcher. *Serial PEFR at work and off work for 2 weeks		
Artichoke, globe (<i>Cynara scolymus</i>)	Quirce, Tabar et al., 1996	Case report	1		1/1		1/1		0/1		0/1		nd		0/1				1/1		1/1		1/1		Worker in a vegetable-processing plant		
Asparagus (<i>Asparagus officinalis</i>)	Lopez-Rubio, Rodriguez et al., 1998	Case report	1	1	1/1		1/1		0/1		1/1		nd		1/1		1		1/1		1/1		1/1		Harvesting worker. Oral Ch- with raw asparagus		
Brazil ginseng root (<i>Pfafia paniculata</i>)	Subiza, Subiza et al., 1991	Case report	1	1	1/1		1/1		nd		1/1		nd		1/1		1		1/1		1/1		1/1		Laboratory worker		
Cacao beans (<i>Theobroma cacao</i>)	Perfetti, Lehrer et al., 1997	Case report	1	1	1/1		1/1		0/1		1/1		1/1*		1/1**		1		1/1		1/1		1/1		Confectionery worker. *Serial PEFR and FEV1; **SIC with cocoa powder		
Carob bean flour (<i>Ceratonia siliqua</i>)	Brempt van der, Ledent et al., 1992	Case report	1	1	1/1		1/1		1/1		nd		1/1		1/1		1		nd		nd		1/1		Employee in a jam factory co-exposed and co-sensitized to guar gum		
Castor beans (<i>Ricinus communis</i>)	Merget, Heger et al., 1994	Case report	1	1	1/1		1/1		0/1		1/1		nd		1/1*		1		1/1		1/1		1/1		Agricultural products merchant. *SIC with extract of castor bean fertilizer		
*	Panzani, Johansson et al., 1986	Case series	15		+		+		nd		nd		nd		nd				0/15		2/15		2/15		15 farmers. *Asthma or allergic rhinitis		
Chicory (<i>Cichorium intybus</i>)	Cadot, Kochuyt et al., 1996	Case report	1	1	1/1		1/1		nd		nd		nd		nd				1/1		1/1		1/1		Vegetable wholesaler		
Coffee bean dust (<i>Cafe arabica</i>), green	Jones, Hughes et al., 1982	Survey	372	7 (1.9)	7/372*	1.9	-		x**		nd		x***		nd				93/362*		25.7	39/331	11.8	11.8	Coffee-processing plant workers. *New-onset asthma; **sign. association between length of exposure and FEV1 decline as compared to those with roasted coffee exposure; IgE+ subjects had sign. declines of FEV1, FEV1/FVC and FEF25-75; ***PFT before and after shift: The mean change in FEV1 for all 66 tested subjects was -0.024 L; ****SPT with collector dust		
*	Zuškin, Valic et al., 1981	Survey	45	2 (4.4)	4/45	8.9	+		nd		nd		x**		nd				5/45***		12		nd		Coffee workers. *17/45 rhinitis or conj.; **sign. mean decrease in FEV50 over Monday shift; ***IC; also 4/5 IC with roasted coffee and 18/45 IC with coffee bag dust		
*	Zuškin, Kanceljak et al., 1985	Case series	9	4	6/9		9/9		4/9		nd		nd		4/9		4		6/9*		nd		nd		Coffee workers. * IC; 1/9 SPT+ with roasted coffee; all SIC+ had SPT+		

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					WORK-RELATED SYMPTOMS				LFT		BHR		PFT		SIC		SPT		Spec. IgE				
					Asthma		Rhinitis		n/n	%	n/n	%	n/n	%	n/n	%	n/n	%	n/n	%	n/n	%	
					n/n	%	n/n	%	n/n	%	n/n	%	n/n	%	n/n	%	n/n	%	n/n	%	n/n	%	
*	Osterman, Johansson et al., 1985	Case series	22	8	11/22		20/22		nd		14/22		x*		8/22**		6	2	18/22		11/22		Coffee roastery workers. *Serial PEFR at work and off-work for 1 week; PEFR in subjects with SPT+ sign. declined; **all SIC+ sensitized asthmatics
, roasted	Lemiere, Malo et al., 1996	Case report	1	1	1/1		1/1		1/1		nd		1/1		1/1		1		1/1		1/1		Coffee production worker. *Serial PEFR at work and off work; also SPT+ and IgE+ with green coffee
Coriander (<i>Coriandrum sativum</i>)	Sastre, Olmo et al., 1996	Case report	1	1	1/1		1/1		nd		1/1		nd		1/1		1		1/1		1/1		Butcher co-exposed to mace and paprika. See mace and paprika
Courgette (<i>Cucurbita pepo</i>)	Miralles, Negro et al., 2000	Case report	1	1	1/1		1/1		nd		nd		nd		nd				1/1		1/1		Worker in the fruit and vegetable warehouse. Nasal Ch+
Eggplant pollen (<i>Solanum melongena</i>)	Gil, Hogendijk et al., 2002	Case report	1	1	1/1		1/1		1/1		nd		nd		nd				1/1		nd		Agricultural worker. Conj. Ch+ with pollen
Esparto grass (<i>Stipa tenacissima</i>)	Baz, Hinojosa et al., 1999	Case report	1	1	1/1		1/1		0/1		1/1		nd		1/1			1	1/1		1/1		Stucco maker, co-exposed and co-sensitized to <i>Aspergillus fumigatus</i> ; SIC+ with <i>A. fumigatus</i>
Fennel seed (<i>Foeniculum vulgare</i>)	Schwartz, Jones et al., 1997	Case report	1	1	1/1		1/1		1/1		nd		nd		nd				1/1		1/1		Sausage-processing worker
Garlic dust (<i>Allium sativa</i>)	Falleroni, Zeiss et al., 1981	Case report	1	1	1/1		1/1		1/1		nd		nd		1/1		1		1/1		1/1		Employee with work-aggravated asthma in a firm packaging spices. Co-exposure and co-sensitization to onion
Grass juice (<i>Lolium perenne</i>)	Subiza, Subiza et al., 1995	Case report	1	1	1/1		1/1		0/1		1/1		nd		1/1			1	1/1		1/1		Gardener
Green bean (<i>Phaseolus multiflorus</i>)	Igea, Fernandez et al., 1994	Case report	1	1	1/1		1/1		0/1		1/1		nd		1/1		1		1/1		1/1		Homemaker exposed to vapor of boiling green beans. SPT- with cooked green beans
*	Parra, Lázaro et al., 1993	Case report	1	1	1/1		1/1		0/1		1/1		nd		1/1			1	1/1		1/1		Housewife inhaling vapors of boiling GB, co-exposed and co-sensitized to Swiss chard
Guar gum (<i>Cyamopsis tetragonolobus</i>) 9000-30-0	Malo, Cartier et al., 1990b	Cross-sectional	162	3 (1.9)	37/162	22.8	59/162	36.4	3/40	7.5	11/40*	27.5	0/5**		2/4***	50	2		8/162	4.9	11/133	8.3	Employees of a carpet manufact. plant. *BHR in symptomatics or sensitized only; **Serial PEFR for 2 weeks at work in SPT- and BHR+ subjects; ***SIC only in asthmatics with SPT+ and BHR+
Henna, black (<i>Indigofera argentea</i>)	Scibilia, Galdi et al., 1997	Case report	1	1	1/1		1/1		1/1		1/1		1/1		nd				1/1		1/1		Herbal shop worker.
Henna (roots of <i>Lawsonia inermis</i>)	Pepys, Hutchcroft et al., 1976	Case report	1		1/1		1/1		0/1		nd		nd		0/1				1/1		nd		Hairdresser, co-exposed to persulphates. SIC+ with persulfate salts (late)
*	Starr, Yunginger et al., 1982	Case reports	2	1	2/2		2/2		0/2		nd		nd		1/2		1		2/2		2/2		Beauticians
Herbal tea (containing chaparral, red clover, mint etc.)	Blanc, Trainor et al., 1986	Case report	1	1	1/1		-		1/1		nd		nd		1/1		1		nd		nd		Worker processing herbal tea
Herbs, aromatic (thyme, rosemary, bay leaf, garlic)	Lemière, Cartier et al., 1996	Case report	1	1	1/1		1/1		0/1		1/1		1/1		1/1		1		1/1		1/1		Butcher. SIC+ and SPT+ with garlic, rosemary, thyme, bayleaf. IgE+ with garlic, bay leaf
Hops (<i>Humulus lupulus</i>)	Newmark, 1978	Case report	1	1	1/1		1/1		nd		nd		nd		nd				1/1*		nd		Brewery worker. *Scratch test+ with hops flowers
Ipecacuanha (<i>Cephaelis ipecacuanha</i> and/or <i>Cephaelis acuminata</i>)	Luczynska, Marshall et al., 1984	Cross-sectional	42		nd		nd		nd		nd		nd		nd				12/39	30.8	12/32**	37.5	Workers packing Ipecacuanha tablets. *Allergic symptoms (rhinitis, conjunctivitis and chest tightness, not further differentiated); ** all IgE+ subjects were symptomatic
Kapok (<i>Ceiba pentandra</i> Gaertner)	Kern und Kohn, 1994	Case report with follow-up	1		1/1		-		1/1		nd		nd*		1/1		1		0/1		0/1		Sewer. *0/9 PFT+ co-workers
Latex (<i>Hevea brasiliensis</i>)	Bousquet, Flahault et al., 2006	Systematic review of cross-sectional studies	9056			OR: 1.55		OR: 2.73											CP: 7.09		CP: 6.30		Health care workers. Sensitization sign. assoc. with asthma (OR 3.95)
*	Grzybowski, Ownby et al., 1996	Cross-sectional	741		27/741	3.6	99/741	13.4	nd		nd		nd		nd				nd		65/741	8.8	Registered nurses. 56 symptomatics IgE+; sensitized asthmatics not listed; WRS sign. associated with IgE+

Agents [synonyms] CAS no.	Reference	Study type	Occupationally exposed subjects studied, n	Allergic asthma cases, n (prevalence, %)	EVIDENCE (pathological results)																		Remarks			
					WORK-RELATED SYMPTOMS				LFT		BHR		PFT		SIC				SPT		Spec. IgE					
					Asthma		Rhinitis		n/n	%	n/n	%	n/n	%	n/n	%	n/n	%	Reaction			n/n		%	n/n	%
					n/n	%	n/n	%											i	l	d					
*	Vandenplas, Delwiche et al., 1995	Cross-sectional	273	7 (2.6)	5/273	1.8	25/273	9.2	1/12*		12/12*		nd		7/12*		4		3	13/273	4.8	nd		Hospital employees. *Only sensitized subjects underwent clinical tests; in addition to 5 asthmatics 2 other subjects had SIC+, BHR+ and SPT+		
*	Baur, Chen et al., 1995	Cross-sectional	111	3 (2.7)	4/111	3.6	12/111	10.8	nd		nd		nd		nd					nd		17/111	15.3	Hospital staff. WRS sign. associated with IgE+; 3/4 asthmatics sensitized		
*	Tarlo, Wong et al., 1990	Survey	69	3	42/69	60.9	52/68	76.5	1/1		6/12		6/51		nd					8/65	10.9	nd		Employees of a surgical glove manufacturing plant. Results include 1 index case; 3 subjects had asthmatic WRS, SPT+, BHR+, and PFT+; not all asthmatics underwent clinical tests		
	Vandenplas, Binard-van-Cangh et al., 2001	Case series	45	31	36/45		43/45		x		44/45		nd		31/45					42/45		nd		45 latex-exposed subjects. All SIC+ were also SPT+		
	Liquorice roots (<i>Glycyrrhiza glabra</i>)	Cartier, Malo et al., 2002	Case report	1	1	1/1		1/1		1/1		1/1		1/1		1			1/1		nd			Herbalist co-exposed and co-sensitized to echinacea, nettle, hop, thistle		
	Lupine seed flour (<i>Lupinus albus</i>)	Crespo, Rodríguez et al., 2001	Cross-sectional	7	1 (14.3)	1/7	14.3	2/7	28.6	nd		1/1		nd		1/7	14.3	1		3/7	42.9	2/7	28.6	Employees at legume laboratories		
	Mace (<i>Myristicia fragrans</i>), nutmeg	Sastre, Olmo et al., 1996	Case report	1	1	1/1		1/1		nd		1/1		nd		1/1		1		1/1		1/1		Butcher co-exposed to paprika and coriander. See also paprika and coriander		
	Oilseed rape (<i>Brassica napus</i> spp., oleifera)	Suh, Park et al., 1998	Case report	1	1	1/1		-		nd		0/1		nd		1/1		1		1/1		1/1		Employee in the animal feed industry		
	Onion	Valdivieso, Subiza et al., 1994	Case reports	4	1	1/4		4/4		nd		1/2		nd		1/2		1		4/4		3/4		3 homemakers and 1 cook		
	Onion seeds, red (<i>Allium cepa</i>)	Navarro, del Pozo et al., 1995	Case report	1	1	1/1		1/1		0/1		nd		nd		1/1		1		1/1		1/1		Worker packing red onion seeds. SPT+ with Italian, white and violet onion seed; IgE- with onion		
	Paprika (<i>Capsicum annum</i>)	Groenewoud, de Jong et al., 2002a	Cross-sectional	472	42 (8.9)	63/472	13.3	233/472	49.4	nd		nd		x*		nd				167/472	35.4	88/472	18.6	Greenhouse employees. Clinical test with pollen, stamen, juice, leaf and/or stem; *PEFR twice/day for 2 weeks in 436 subjects showed sign. lower PEF MEAN in those with asthmatic symptoms; 42/472 sensitized asthmatics		
*	Toorenenbergen van and Dieges, 1984	Case report	1	1	1/1		1/1		nd		nd		nd		nd				1/1		1/1			Greenhouse worker. Clinical tests with flower, leaf and stem		
*	Sastre, Olmo et al., 1996	Case report	1	1	1/1		1/1		nd		1/1		nd		1/1		1		1/1		1/1			Butcher co-exposed to mace and coriander. See mace and coriander		
	Paprika (<i>Capsicum tetragonum</i>)	Toorenenbergen van and Dieges, 1985	Case report	1	1	1/1		1/1		nd		nd		nd		nd				1/1		1/1		Employee in a spice factory		
	Passion flower leaves (<i>Passiflora alata</i>), maracuja	Giavina-Bianchi, Castro et al., 1997	Case report	1	1	1/1		1/1		0/1		1/1		nd		1/1		1		1/1		1/1		Pharmacy worker co-exposed and co-sensitized to <i>Rhamnus purshiana</i> bark		
	Pea, perennial (<i>Lathyrus odoratus</i>), sweetpea	Jansen, Vermeulen et al., 1995	Case report	1	1	1/1		1/1		nd		1/1		1/1*		nd				1/1**		1/1***		Greenhouse worker. *Serial PEFR at work and off work for 4 weeks; **SPT+ with whole plant; IgE+ with pollen		
	Pectin (carbohydrate of plant cells)	Cohen, Forse et al., 1993	Case report	1	1	1/1		1/1		0/1		1/1		1/1*		nd				1/1		nd		Worker manufacturing jam. *Serial PEFR at work and at home for 5 weeks		
*	Kraut, Peng et al., 1992	Case report	1	1	1/1		1/1		1/1		1/1		nd		1/1		1			1/1		0/1		Candy maker. Positive pectin-specific IgG		
	Potato (<i>Solanum tuberosum</i>)	Quirce, Gómez et al., 1989	Case reports	2	2	2/2		2/2		0/2		2/2		nd		2/2		2		2/2		2/2		Housewives		

Agents [synonyms] CAS no.	Reference	Study type	Occupation- ally exposed subjects studied, n	Allergic asthma cases, n (prevalence, %)	EVIDENCE (pathological results)																Remarks							
					WORK-RELATED SYMPTOMS				LFT		BHR		PFT		SIC				SPT			Spec. IgE						
					Asthma		Rhinitis		n/n	%	n/n	%	n/n	%	n/n	%	n/n	%	i	l		n	d	n	n/n	%	n/n	%
					n/n	%	n/n	%	n/n	%	n/n	%	n/n	%	n/n	%	n/n	%	(n)	(n)		(n)	(n)	n/n	%	n/n	%	
Psyllium	Malo, Cartier et al., 1990a	Cross-sectional	197	8 (4.1)	24/197	12.2	65/197	33	2/10*	20	20/70*	28.6	nd			8/10**	80	3		5	10/191	5.2	24/166	14.5	Health personnel of 4 hospitals. 4 preceding cases of OA integrated in cross-sectional study of 193 subjects; *LFT and BHR only in symptomatics or sensitized; individual LFT parameter listed for 10 individuals only; **SIC in symptomatics, sensitized, and BHR+			
*	Göransson and Michaelson, 1975	Survey	64		6/64	9.4	26/64	40.6	nd		nd		nd		x*						28/64**	43.8	nd		Employees of a pharmaceutical factory. *18/35 either conj., nasal or inhalative Ch+; **IC; sensitized asthmatics not listed			
*	Cartier, Malo et al., 1987	Case series	5	5	5/5		5/5		1/5		4/5		nd		5/5		2		3		4/4		5/5		Nurses. 4/5 SIC+ and 1/5 had to be intubated, FEV1 could not be measured			
*	Busse and Schoenwetter, 1975	Case reports	3	2	3/3		2/3		nd		nd		nd		2/3		2				3/3*		nd		Workers of pharmaceutical firm. *3/3 IC+ with plantain and with psyllium husk			
*	Vaswani, Hamilton et al., 1996	Case report	1	1	1/1		1/1		nd		nd		nd		nd						1/1		1/1		Nurse with an episode of anaphylaxis after P. ingestion			
Saffron pollen (<i>Crocus sativus</i>)	Feo, Martinez et al., 1997	Cross-sectional	50	1 (2)	3/50	6	8/50	16	nd		1/1*		nd		1/1*		1				3/50	6	3/50	6	Saffron workers. *BHR and SIC in sensitized asthmatic subject; 2/2 conj Ch+			
Sanyak (<i>Dioscorea batatas</i>)	Park, Kim et al., 1994	Case report	1	1	1/1		1/1		nd		0/1		nd		1/1				1		1/1		1/1		Employee of herbal medicine pharmacy co-exposed and co-sensitized to Banha. See Banha			
Sarsaparilla root dust (family <i>Lilacea</i> , order <i>Smilax</i>)	Vandenplas, Depelchin et al., 1996	Case report	1	1	1/1		1/1		1/1		1/1		nd		1/1		1				1/1		1/1		Herbal tea worker			
Senna (<i>Cassia angustifolia</i> , <i>C. acutifolia</i> or <i>C. senna</i>)	Helin and Mäkinen-Kiljunen, 1996	Case report	1	1	1/1		1/1		0/1		1/1		nd		1/1				1		1/1		1/1		Worker in a company manufacturing hair dyes			
Sesame seeds (<i>Sesame indicum</i>)	Alday, Curriel et al., 1996	Case report	1	1	1/1		1/1		nd		nd		1/1		1/1				1		1/1		1/1		Baker with previous diagnosis of wheat allergy. SPT+ with wheat, rye			
Spices: Coriander (<i>Coriandrum sativum</i>) and other spices: mace (<i>Myristica fragrans</i>), ginger (<i>Zingiber officinale</i>), paprika (<i>Capsicum tetragonum</i>), curry.	Toorenenbergen van and Dieges, 1985	Case report	1	1	1/1		1/1		nd		nd		nd		nd						1/1		1/1		Employee in a spice factory. SPT+ with curry, coriander, mace. IgE+ with curry, coriander, mace, ginger, paprika; no cross-reaction between spices detected			
Sunflower seeds	Vandenplas, Van der Borghet et al., 1998	Case report	1	1	1/1		1/1		1/1		1/1		nd		1/1		1				1/1		1/1		Baker. SPT+ with alpha-amylase and SIC+ with flour			
Swiss chard (<i>Beta vulgaris L. cycla</i>)	Parra, Lázaro et al., 1993	Case report	1	1	1/1		1/1		0/1		1/1		nd		1/1				1		1/1		1/1		Housewife inhaling vapors of boiling Swiss chard			
Tea, dust (<i>Camellia sinensis</i>)	Cartier and Malo, 1990	Case reports	3		3/3		2/3		0/3		3/3		2/3*		2/3	66.7		2			0/3		0/2		Teapackers. *Serial PEFR at work and off work for 3 weeks			
, green	Shirai, Sato et al., 1994	Case reports	3	3	3/3		3/3		nd		3/3		nd		3/3		3				3/3		3/3**		Employees in green tea factories. *IC; IC and SIC with epigallocatechin gallate; 3/3 IC+ and 1/1 SIC+ with oolong and black tea; 1/3 oral Ch+; **PK			
Tobacco leaf dust (<i>Nicotiana tabacum</i>)	Viegi, Paggiaro et al., 1986	Survey	223		10/223	4.5	20/223	9.0	x*		nd		nd		nd						14/182*	7.7	nd		Workers of a cigar and cigarette factory. *LFT in older women, FEV75-85 in younger women and in men lower than reference; **SPT in men and younger women only; sensitized asthmatics not listed			
*	Lander and Gravesen, 1988	Cross-sectional	16	8 (50)	11/16	68.8	-		x**		nd		8/16*		nd						nd		nd		Workers of tobacco plant. *PEFR before and after work for at least 1 week: sign. greater diurnal change; **sign. lower FVC and FEV1			
*	Gleich, Welsh et al., 1980	Case report	1	1	1/1		1/1		nd		nd		nd		1/1		1				1/1		1/1		Tobacco manufacturer			
*	Baur, 1993	Case report	1	1	1/1		1/1		1/1		nd		nd		nd						1/1		1/1		Worker of a tobacco plant. Nasal Ch+			
Vetch (<i>Vicia sativa</i>)	Picón, Carmona et al., 1991	Case report	1	1	1/1		-		nd		1/1		nd		1/1		1				1/1		1/1*		Farmer. *PK			

Agents [synonyms] CAS no.	Reference	Study type	Occupation- ally exposed subjects studied, n	Allergic asthma cases, n (prevalence, %)	EVIDENCE (pathological results)																Remarks										
					WORK-RELATED SYMPTOMS				LFT		BHR		PFT		SIC				SPT			Spec. IgE									
					Asthma		Rhinitis		n/n	%	n/n	%	n/n	%	n/n	%	Reaction					n/n	%	n/n	%						
					n/n	%	n/n	%									i	l	n	d						n					
Voacanga africana seed dust	Hinojosa, Moneo et al., 1987	Case report	1	1	1/1		1/1		0/1		nd		nd		1/1		1		1/1		1/1		Housewife indirectly exposed through her husband's clothing, a chemist in a pharmaceutical plant								
Alkaline hydrolysis wheat gluten derivative (AHGD)	Lachance, Cartier et al., 1988	Case report	1	1	1/1		1/1		0/1		0/1		nd		1/1		1		1/1		1/1		Employee of a biscuits-producing company. SPT- with individual extracts of cereals; SIC- with wheat								
Animal feed	Vanhanen, Tuomi et al., 2001	Cross-sectional	140		6/140	4.3	22/140	15.7	nd		nd		nd		nd				10/140	7.1	3/140	2.1	Workes of animal feed factory								
Enzymes																					7/140	5.0		6/140	4.3						
Flours																						26/140		18.6	9/140	6.4					
Storage mites																															
Bakery confinement/flour/other allergens																															
Bakery	Houba, Heederik et al., 1998	Cross-sectional	393		29/393	7.4	83/393	21.1	nd		nd		nd		nd								Bakery workers. 15/91 asthmatics and/or with rhinitis were IgE+; asthmatics with IgE+ not given								
Wheat flour																										26/346	7.5				
Bakery	Cullinan, Lowson et al., 1994	Cross-sectional	344		46/322	14.3	92/322	28.6	nd		nd		nd		nd								Bakery and flour mill workers. *New WRS in subjects without previous occup. exposure to flour; WRS were related to exposure intensity; 5								
Wheat flour																											36/346	10.4			
Alpha-amylase																						18/355		5.4							
Mixed flour																						17/355		5.1							
Lepidoglyphus destructor					5 (1.5)														58/335	17.3											
Bakery	Brant, Berriman et al., 2005	Survey	239		9 (3.8)*	37/239	15.5	63/239	26.4	nd		nd		nd					x **		27/210	12.8	Supermarket bakery workers. *9/34 asthmatics IgE+ to either flour or alpha-amylase; ** no data available								
Alpha-amylase																										9/210	4.0				
Wheat flour																											24/210	11.4			
Bakery and pastry	De Zotti, Larese et al., 1994	Cross-sectional	226		11/226	4.9	31/226	13.7	nd		nd		nd		nd								Bakers and pastry makers. Sign. correlation between WRS and sensitization to wheat or alpha-amylase; *SPT+ with Acarus siro, Glycophagus domesticus, Lepidoglyphus destructor and/or								
Alpha-amylase																											17/226	7.5			
Flours (wheat, rye, barley)																												49/226	21.7		
Wheat flour																													27/226	11.9	
Storage mites																													40/226*	17.7	
Bakery	Musk, Venables et al., 1989	Survey	279		30/234*	12.8	44/234	18.8	22/239	9.2	81/249	32.5	nd		nd						99/259	38.2	nd	Bakers. *WRS in main exposure group							
Acarus siro																									58/259	22.4					
Glycophagus destructor																									59/259	22.8					
Glycophagus domesticus																									46/259	17.8					
Tyrophagus longior																									62/259	23.9					
Tyrophagus putrescentiae																									45/259	17.4					
Tribolium confusum																									28/259	10.8					
Mixed flour																									14/259	5.4					
Wheat grain																									9/259	3.5					
Mould mix																									6/259	2.3					
Baker's yeast																									3/259	1.2					
Aspergillus fumigatus																									1/259	0.04					
Bakery					Storaas, Steinsvag et al., 2005	Cross-sectional	183		27/180	15.0	76/180	42.2	nd		nd		nd		nd							37/183*	20.2	Bakery workers. *SPT with a least one storage mite			
Acarus siro																															
Lepidoglyphus destructor																											9/183		4.9		
Wheat flour																											7/183		3.8		
Rye flour																													2/183	1.1	
Barley flour																													6/183	3.3	
Oats flour																													1/183	0.5	
Alpha-amylase																													13/183	7.1	
																														4/183	2.2
Bakery	Baur, Degens et al., 1998a	Comparative survey	89		31/83	37.3	32/83	38.6	13/76	17.1	10/76	13.2	nd								25/88*	28.4	49/89*	55.1	Bakers. *with at least 1 bakery allergen; 41/142 symptomatics not sensitized						
Wheat flour																												14/88	15.9		
Rye flour																													10/88	11.4	
Alpha-amylase																													17/88	19.3	
Soy bean flour																														1/88	1.1
Bakery		Case series	104	57	58/103		92/103		26/94		18/94		nd		63/89							62/104*		69/104*							
Wheat flour																													49/104	64/104	
Rye flour																														38/104	51/103
Alpha-amylase																														25/104	10/81
Soy bean flour																															11/103
Bakery	Baur, Sauer et al., 1989	Case series	261		+		+		nd		nd		nd		nd						nd			Bakers. *Individual WRS (asthma, rhinitis and/or conjunctivitis) not listed; also 3/261 IgE+ with papain and 3/261 IgE+ with Bacillus subtilis protease							
Alpha-amylase of A. oryzae																												60/261			
Glucoamylase of A. niger																													13/261		
Hemicellulase of A. niger																														26/261	
Rye flour																														149/261	
Soybean flour components																														1	
Wheat flour																									84/261						
																									149/261						
																									1						

Agents [synonyms] CAS no.	Reference	Study type	Occupationally exposed subjects studied, n	Allergic asthma cases, n (prevalence, %)	EVIDENCE (pathological results)																Remarks						
					WORK-RELATED SYMPTOMS				LFT		BHR		PFT		SIC				SPT			Spec. IgE					
					Asthma		Rhinitis		n/n	%	n/n	%	n/n	%	n/n	%	Reaction					n/n	%	n/n	%		
					n/n	%	n/n	%									i	l	(n)	d						(n)	
Bakery	Sander, Merget et al., 2004	Case series	115		24				nd		nd		nd			33/51			17/40*		33/51	Bakers with WR respiratory symptoms. *SPT+ with at least one extract of 3 companies; 24/29 SIC+ with wheat had IgE+; 34/47 SIC+ with rye were IgE+					
Wheat flour					34													47/69			13/40*			38/69			
Rye flour																											
Bakery	Sandiford, Tee et al., 1994	Case series	30	30	30/30	-			nd		nd		nd								nd	Bakers. RAST: level of cereal amylase IgE correlated with level of wheat or barley IgE					
Alpha-amylase of <i>A. oryzae</i>																									16/30		
Barley flour																										30/30	
Barley beta-amylase																										30/30	
Barley alpha-amylase																										29/30	
Wheat flour																						30/30					
Bakery	Block, Tse et al., 1983	Case series	7	5	5/7	3/7			4/7		3/7		nd									Bakers					
Wheat flour																		2/2	2				6/7		5/7		
Rye flour															4/7	4						6/7					
Bakery	Quirce, Polo et al., 2000	Case reports	4	4	4/4	4/4			1/4		4/4		nd									Bakers, confectioners					
Alpha-amylase of <i>A. oryzae</i>																										2/4	
Soybean flour (<i>Glycine max</i>)																			4/4	3	1						4/4
Trypsin inhibitor of soybean																											2/4
Wheat flour																						4/4					
Buckwheat (<i>Fagopyrum esculentum</i>)	Park and Nahm, 1996	Case report	1	1	1/1	1/1			nd		nd		nd		1/1	1						1/1	Buckwheat flour noodle maker. Also IgE+ and SPT+ with wheat flour				
Soybean lecithin	Lavaud, Perdu et al., 1994	Case reports	2	2	2/2	2/2			-		nd		nd		2/2	2						2/2	2/2*	Bakery employees. *IgE+ with soybean flour; additionally 2/2 SPT+ with soybean dust, flour, pulp; 1/2 SPT+ with wheat, bakery dust; 2/2 IgE+ with soybean flour; 1/2 IgE+ with wheat			
Soybean trypsin inhibitor	Quirce, Fernández-Nieto et al., 2002b	Case reports	2	2	2/2	-			nd		2/2		nd		2/2	2						2/2	2/2	Bakers. Also 2/2 SPT+, IgE+, SIC+ with wheat flour and soybean flour			
Wood dust																											
Abiruana	Booth, LeFoldt et al., 1976	Case reports	2	2	2/2	1/2			nd		nd		nd		2/2*	1	1	2/2**				nd	Workers of a furniture factory. *SIC with aqueous extract; **1/1 IC+, 1/1 scratch test+				
African cherry wood (Makore)	Obata, Dittrick et al., 2000	Case report	1		1/1	-			0/1		1/1		nd		1/1	1*	1**	0/1				nd	Carpenter. *SIC with wood dust; **SIC with aqueous extract				
African maple (<i>Triplochiton scleroxylon</i>), Whitewood, Samba, Obeche, Wawa	Quirce, Hinojosa et al., 2000	Case series	5	5	5/5	5/5			nd		nd		2/2*		3/3	3						5/5	5/5	Woodworkers. *2 subjects who didn't undergo SIC had PFT+			
"	Hinojosa, Losada et al., 1986	Case reports	4	4	4/4	4/4			nd		nd		nd		4/4	4						4/4	4/4	2 sawmill workers co-exposed to Ramin, 1 woodcarver, and 1 carpenter. REIA: cross-reactivity with Ramin; see also Ramin			
"	Hinojosa, Moneo et al., 1984	Case reports	2	2	2/2	2/2			1/2		nd		nd		1/1	1						2/2	2/2	Woodworker and construction worker with tracheotoma			
"	Reijula, Kujala et al., 1994	Case reports	2	2	2/2	2/2			1/2		1/2		nd		2/2	2						2/2	2/2	Carpenters			
African zebra wood (<i>Microberlinia</i>)	Bush, Yunginger et al., 1978	Case report	1	1	1/1	-			0/1		nd		nd		1/1		1	1/1*				1/1	1/1	Woodshop worker. * IC			
Antiaris (<i>Antiaris africana</i> or <i>Antiaris toxicaria</i>)	Higuero, Zabala et al., 2001	Case report	1	1	1/1	1/1			0/1		1/1		nd		1/1		1	1/1				1/1	1/1	Woodworker			
Ash (<i>Fraxinus americana</i>)	Maio and Cartier, 1989	Case report	1		1/1	1/1			0/1		1/1		1/1		1/1	1						nd	0/1	Furniture-maker			
Ash (<i>Fraxinus excelsior</i>)	Fernández-Rivas, Pérez-Carral et al., 1997	Case report	1	1	1/1	1/1			0/1		1/1		1/1*		1/1		1	1/1**				1/1	1/1	Furniture factory worker. *Serial PEFR at work and off work for 2 weeks; **SPT-, IC+			
Blackwood (<i>Acacia melanoxylon</i>)	Wood-Baker and Markos, 1997	Case reports	3	3	3/3	1/3			2/3		3/3		3/3		3/3		2	1				nd	nd	Cabinet-maker, furniture-makers			
Brazilian walnut (<i>Phoebe porosa</i>), Imbuia	Jeebhay, Prescott et al., 1996	Case report	1		1/1	1/1			1/1		nd		x*		1/1	1						nd	0/1	Joinery worker. *Serial PEFR for 2 weeks showed substantial variability, but no specific work-related pattern			
Cabreuva (<i>Mycarpus fastigiatus</i> Fr. All.)	Innocenti, Romeo et al., 1991	Case report	1	1	1/1	-			0/1		0/1		nd		1/1	1						nd	nd	Parquet floor layer			
California redwood (<i>Sequoia sempervirens</i>)	Chan-Yeung and Abboud, 1976	Case reports	2		2/2	2/2			1/2		nd		nd		2/2		2	0/2				nd	nd	Carpenter and furniture-maker			
"	doPico, 1978	Case report	1		1/1	1/1			1/1		nd		nd		1/1	1						nd	nd	Retired carpenter			
Cascara sagrada bark (<i>Rhamnus purshiana</i>)	Giavina-Bianchi, Castro et al., 1997	Case report	1	1	1/1	1/1			0/1		1/1		nd		1/1		1	1/1				1/1	1/1	Pharmacy worker co-exposed and co-sensitized to <i>Pasiflora alata</i>			
Cedar	Sosman, Schlueter et al., 1969	Case reports	2		2/2	-			nd		nd		nd		1/1	1						nd	nd	Carpenters. See also oak and mahogany			

Agents [synonyms] CAS no.	Reference	Study type	Occupation- ally exposed subjects studied, n	Allergic asthma cases, n (prevalence, %)	EVIDENCE (pathological results)																		Remarks		
					WORK-RELATED SYMPTOMS				LFT		BHR		PFT		SIC				SPT		Spec. IgE				
					Asthma		Rhinitis		n/n	%	n/n	%	n/n	%	n/n	%	Reaction				n/n	%		n/n	%
					n/n	%	n/n	%									i	l	d	n					
Cedar of Lebanon (<i>Cedra libani</i>)	Greenberg, 1972	Case series	6	1	6/6		2/6		0/5		nd		nd		nd		1/6		nd	Workers at joinery works					
Central American walnut (<i>Juglans olanchana</i>)	Bush and Clayton, 1983	Case report	1		1/1		1/1		nd		1/1		nd		1/1		1		0/1*	0/1	Woodworker. *IC				
Cocobolla (<i>Dalbergia retusa</i>)	Eaton, 1973	Case reports	3	1	2/3		3/3		2/3		nd		nd		nd				2/3		nd	Billiard cue manufacturing workers			
Coniferous trees (Black spruce (<i>Picea mariana</i>), balsam fir (<i>Abies balsamea</i>), jack pine (<i>Pinus baksiana</i>), Eastern white cedar (<i>Thuja occidentalis</i>)	Malo, Cartier et al., 1986	Case series	11	11	11/11		6/11		2/11		11/11		11/11*		0/4				nd		nd	Sawmill employees. *Sign. changes in PEFR at work as compared with periods off work			
"	Malo, Cartier et al., 1994b	Cross-sectional	42	3 (7.1)	25/42	59.5	-		0/42	0	18/42	42.9	nd		3/12*	25	1	1		nd	nd	Sawmill workers. *SIC in BHR+ only, 1/10 SIC+ with plicatic acid (immediate), 1/3 SIC+ with western red cedar (late), 1 subject underwent SIC to both of these agents, 1 subject had sign. changes in PC20 when exposed to <i>Th. occ.</i> but no changes in FEV1			
"	Cartier, Chan et al., 1986	Case report	1	1	1/1		-		0/1		1/1		1/1*		1/1**		1		nd		1/1***	Sawmill worker. *Serial PEFR at work and off work for 6 weeks; **SIC with plicatic acid and with western red cedar; ***IgE with plicatic acid			
Ebony wood (<i>Diospyros crassiflora</i>)	Maestrelli, Marcer et al., 1987	Case report	1		1/1		-		0/1		1/1		nd		1/1		1		0/1*		nd	Carpenter. *IC			
Fernambouc (<i>Caesalpinia echinata</i> or <i>Guilandia echinata</i>)	Hausen and Herrmann, 1990	Survey	36	1 (2.8)	9/36	25	6/36	16.7	nd		1/1		nd		1/1*		1		1/12*	8.3	0/12	Music instruments-makers. *SPT and SIC in symptomatology			
Iroko (<i>Cholophora excelsa</i>)	Azofra and Olaquibel, 1989	Case report	1		1/1		1/1		0/1		1/1		nd		1/1			1	0/1		nd	Carpenter			
"	Pickering, Batten et al., 1972	Case report	1	1	1/1		-		0/1		nd		nd		1/1		1*	1**		1/1		nd	Carpenter. *Aqueous extract; ** wood dust		
Kejaat (<i>Pterocarpus angolensis</i>)	Ordman, 1949	Case report	1	1	1/1		-		nd		nd		nd		nd				1/1*		nd	Wood-machinist. Improvement of asthmatic symptoms after desensitization with an extract of Kejaat; * IC			
Locust wood (<i>Robinia pseudoacacia</i> L.)	Kespohl, Merget et al., 2006	Case reports	2	2	2/2		1/2		1/2		1/1		nd		1/1		1		1/1		2/2	Mechanic with 1 high-exposure incident to Locust wood and 1 carpenter			
Mahogany	Sosman, Schlueter et al., 1969	Case report	1		1/1		-		1/1		nd		nd		1/1			1	0/1		nd	Patternmaker. See also cedar and oak			
Oak (<i>Quercus robur</i>)	Sosman, Schlueter et al., 1969	Case report	1		1/1		1/1		0/1		nd		nd		1/1		1		0/1		nd	Lumber-mill worker. See also cedar and mahogany			
"	Malo, Cartier et al., 1995a	Case reports	3		3/3		1/3		1/1		3/3		1/1		3/3		1		2	0/3		nd	Carpenters.		
Pau marlin (<i>Balfourodendron riedelianum</i>)	Basomba, Burches et al., 1991	Case report	1	1	1/1		1/1		1/1		nd		nd		1/1		1		1/1*		1/1	Carpenter. * IC			
Pine (<i>Pinus sylvestris</i>)	Skovsted, Schlünssen et al., 2000	Case report	1	1	1/1		1/1		0/1		nd		1/1*		nd					1/1		nd	Furniture maker. *Serial PEFR at work and off work		
Ramin (<i>Gonystylus bancanus</i>)	Hinojosa, Losada et al., 1986	Case reports	2	2	2/2		2/2		nd		nd		nd		2/2		2		2/2		nd	Sawmill workers. Co-exposure to African maple			
Soapbark (<i>Quillaja saponaria</i>)	Raghuprasad, Brooks et al., 1980	Case report	1	1	1/1		1/1		0/1		1/1		nd		1/1		1		nd		1/1	Saponin-production worker. RAST: cross-reactivity with gum acacia and gum tragacanth			
Tanganyika aningré	Paggiaro, Cantalupi et al., 1981	Case reports	3	2	3/3		2/3		1/3		2/2		nd		2/3		2		3/3*		0/3	Woodworkers. *IC			
Western red cedar (<i>Thuja plicata</i>)	Chan-Yeung, Vedal et al., 1984	Cross-sectional	652	1 (0.2)	27/652	4.1	-		x*		94/485	19.4	nd		nd				1/652	0.15	nd	Cedar mill workers. Exposed had sign. higher prevalence of asthma and BHR+ and *sign. lower FEV1/FVC			
"	Chan-Yeung, Lam et al., 1982	Case series with follow-up	125	125	125/125		50/125		27/125		55/55		nd		125/125		12	54	59	nd	nd	125 subjects with OA re-examined after 1-9 years: all 50 still exposed and 37/75 no longer exposed remained asthmatic; persistence of symptoms related to longer duration of both exposure and symptoms prior to diagnosis, and also to higher bronchial responsiveness			

Agents [synonyms] CAS no.	Reference	Study type	Occupation- ally exposed subjects studied, n	Allergic asthma cases, n (prevalence, %)	EVIDENCE (pathological results)																		Remarks			
					WORK-RELATED SYMPTOMS				LFT		BHR		PFT		SIC			SPT		Spec. IgE						
					Asthma		Rhinitis		n/n	%	n/n	%	n/n	%	n/n	%	n/n	%	Reaction			n/n		%	n/n	%
					n/n	%	n/n	%											i	l	d					
	Ishizaki, Shida et al., 1973	Cross-sectional	1320	22 (1.7)	45/1320	3.4	124/1320	9.4	nd		nd		nd		nd		nd		22/26*	85	nd		Furniture factory workers. *IC in asthmatics			
	Côté, Kennedy et al., 1990	Case series	23	14	18/23		-		nd		11/23*		13/23**		14/23***		14		nd		nd		Sawmill workers. *Sign. decline in PC20 after returning to work in SIC+; **serial PEFR for 2 weeks off work and for 3 weeks at work: sign. decrease at work in SIC+; ***SIC with plicatic acid			
	Chan-Yeung, Barton et al., 1973	Case series with follow-up	22	3	18/22		12/22		12/18		nd		nd		18/22	81.8	4	8	6	3/22	13.6	nd	Woodworkers. 0/22 SPT+ with plicatic acid; 18/16 SIC+ with plicatic acid (4 immediate, 5 late, 7 dual)			
	Chan-Yeung and Desjardins, 1992	Case reports with follow-up	4		4/4		2/4		0/4		4/4		nd		4/4*		3		1	nd		0/4*	Sawmill workers. *SIC and IgE with plicatic acid			
	Pickering, Batten et al., 1972	Case report	1		1/1		1/1		0/1		nd		nd		1/1				1	0/1		nd	Carpenter			
Mushrooms, Moulds (Fungi)																										
Edible mushrooms																										
	<i>Psallata hortensis</i> , <i>Boletus edulis</i> , <i>Champignon de Paris</i>	Symington, Kerr et al., 1981	Case series	8	4	+*	+*		1/1		nd		nd		4/8		4			5/8	62.5	nd	Employees in a food-manufacturing factory. *Individual WRS not listed; clinical tests with dried mushroom extract			
	<i>Pleurotus cornucopiae</i>	Michils, De Vuyst et al., 1991	Case report	1	1	1/1	-		0/1		1/1		1/1*		nd					nd		1/1	Worker of a factory producing a single type of mushroom. *Serial PEFR at work and off work for 1 week			
	<i>Boletus edulis</i>	Torricelli, Johansson et al., 1997	Case reports	3	3	3/3	1/3		0/2		1/1		nd		2/2		1		1	3/3		3/3	Office worker in food company, indirectly exposed, cook, and housewife			
Yeast																										
	<i>Saccharomyces cerevisiae</i> , powdered dehydrated yeast	Belchi-Hernandez, Mora-Gonzalez et al., 1996	Case report	1	1	1/1	1/1				1/1		1/1*		1/1		1			1/1		1/1	Baker not sensitized to other baking allergens/additives; SIC- with other baking additives; *serial PEFR at work and off work for 2 weeks			
Molds, other fungi																										
	<i>Aspergillus mix</i>	Klaustermeyer, Bardana et al., 1977	Case report	1	1	1/1	-		1/1		nd		nd		1/1				1	1/1*		nd	Baker. *IC+ with rye and various molds (<i>Aspergillus</i> most reactive); SIC- with rye			
	<i>Aspergillus niger</i>	Seaton and Wales, 1994	Survey with follow-up	261	3 (1.1)	10/261	3.8	-	nd		nd		nd		nd				25/261	9.6	nd		261 original and 76 new employees of biotechnology plant. 78/261 original and 5/76 new employees had respiratory WRS; 3/10 asthmatics had SPT+			
	<i>Aspergillus fumigatus</i>	Almers, Huber et al., 1997	Case report	1	1	1/1	-		0/1		nd		nd		1/1		1			1/1		1/1	Refuse collection worker co-exposed and co-sensitized to other fungi. Diagnosis: ABPA (allergic bronchopulmonary aspergillosis)			
	<i>Alternaria</i>	Klaustermeyer, Bardana et al., 1977	Case report	1	1	1/1	-		nd		nd		nd		1/1		1		1/1*		nd		Baker. * IC+ with <i>Alternaria</i> , IC- with rye and wheat			
	<i>Chrysonilia sitophila</i> , common red bread mold	Tarfo, Wai et al., 1996	Case report	1	1	1/1	1/1		0/1		1/1		1/1		nd					1/1		1/1	Logging worker. SPT- with wood			
	<i>Dicystelium discoideum</i> , slime mould	Gottlieb, Garibaldi et al., 1993	Case report	1	1	1/1	1/1		nd		nd		1/1		nd					1/1		1/1	Laboratory worker			
	<i>Monascus ruber</i>	Vandenplas, Caroyer et al., 2000	Case report	1	1	1/1	1/1		0/1		1/1		nd		1/1*			1	1/1		1/1		Food manufacturer handling Chinese red rice (fermented with <i>M. ruber</i>). *SIC+ with red rice			
	<i>Neurospora sp.</i>	Côté, Chan et al., 1991	Case report	1	1	1/1	1/1		0/1		1/1		nd		1/1		1			1/1		1/1	Plywood factory worker			
	<i>Plasmopara viticola</i> , pseudo mildew of grapevine	Wenzel, Schaubschläger, Becker et al., 1994	Case report	1		1/1	1/1		0/1		1/1		nd		0/1					1/1		1/1	Greenhouse worker co-exposed and co-sensitized to <i>Alternaria</i>			
	<i>Rhizopus nigricans</i>	Gamboia, Jáuregui et al., 1996	Case report	1	1	1/1	1/1		0/1		nd		nd		1/1		1			1/1		1/1	Coal miner co-exposed but not sensitized to other moulds			
Microscopic organisms (Protoctistae)																										
	<i>Chlorella</i> (algae)	Ng, Tan et al., 1994	Case report	1	1	1/1	1/1		nd		1/1		1/1*		1/1				1	1/1		nd	Pharmacist. *Serial PEFR for 7 working days and 13 days off			
Enzymes																										

Agents [synonyms] CAS no.	Reference	Study type	Occupationally exposed subjects studied, n	Allergic asthma cases, n (prevalence, %)	EVIDENCE (pathological results)																		Remarks		
					WORK-RELATED SYMPTOMS				LFT		BHR		PFT		SIC				SPT		Spec. IgE				
					Asthma		Rhinitis		n/n	%	n/n	%	n/n	%	n/n	%	n/n	%	n/n	%	n/n	%			
					n/n	%	n/n	%																	
Alpha-amylase of <i>Aspergillus oryzae</i>	Brisman, Nieuwenhuijsen et al., 2004	Cohort study (prospective)	300		36/300	12*	86/300	28.7*	nd		nd		nd		nd		24/300	8*	nd		Bakers and millers. *3 year incidence; sign. increased PR of 3.0 for chest symptoms in the highest exposure category; 21/300 SPT with flour; sensitized asthmatics not listed				
*	Losada, Hinojosa et al., 1992	Survey	83	6	24/80	30.0	47/80	56.8	nd		nd		nd		6/14*	42.9	6		26/83	31.3	43/83	51.8	Pharmaceutical-industry workers. *SIC in SPT+ with respiratory symp. not all asthmatics underwent SIC; 1/5 oral Ch induced a 30% decrease in FEV1 (immediate)		
*	Brisman and Belin, 1991	Case reports (index cases) with survey	24	3	3/4*		4/4*		5/24		nd		nd		nd		10/24		5/24		Employees of a factory producing semimanufactured products for bakeries: 4 index cases and 20 additional workers. *Individual allergic symptoms listed for index cases only; 3/5 nasal Ch+				
*	Quirce, Fernández-Nieto et al., 2002a	Case reports	4	4	4/4		4/4		2/4		4/4		nd		3/3		2		1		4/4	4/4	3 bakers and 1 employee of an enzyme-processing plant. 2/4 SPT+ with hemicellulase; see glucoamylase		
*	Birbaum, Latil et al., 1988	Case report	1	1	1/1		-		nd		nd		nd		1/1		1				1/1*	1/1	Baker. *IC; also IC+ with flour; SIC- with flour		
Alpha-amylase inhibitors of cereal origin	López-Rico, Monero et al., 1998	Case reports	3	3	3/3		2/3		nd		nd		nd		nd						x*		3/3**	Wood factory workers. *3/3 SPT+ with cereals; **IgE with 13 alpha-amylase families	
Aspergillus enzymes	Quirce, Cuevas et al., 1992	Case series	5		5/5		5/5		0/5		5/5		nd											Bakers, 4/5 SPT+ with wheat and with rye; 5/5 IgE+ with wheat; 4/5 SIC+ with wheat (3 immediate, 1 dual)	
Alpha-amylase of <i>A. oryzae</i>					5										5/5		4		1		5/5		5/5		
Cellulase of <i>Aspergillus niger</i>					4										4/4		3		1		4/5		4/4		
<i>Aspergillus oryzae</i> enzymes	Baur, 1981	Case report	1	1	1/1		-		nd		nd		nd		1/1*		1							Pharmaceutical worker. *SIC with a mix of <i>A. oryzae</i> enzymes (protease, amylase, lipase)	
Amylase of <i>Aspergillus oryzae</i>																					1/1		1/1		
Protease of <i>Aspergillus oryzae</i>																					1/1		1/1		
Bromelain of <i>Ananas comosus</i>	Gailhofer, Teubl et al., 1987	Case reports	2	2	2/2		1/2		nd		nd		nd		nd						2/2	100	2/2	100	Laboratory workers. SPT- and IgE- with papain
*	Galleguillos and Rodríguez, 1978	Case reports	2	2	2/2		2/2		0/1		nd		nd		2/2		1		1		2/2		nd		Pharmaceutical laboratory workers. 1 subject had asthmatic symptoms also after ingestion of pineapple
Cellulase	Tarvainen, Kanerva et al., 1991	Case reports	4	2	3/4		2/4		0/4		2/3		2/4		nd						3/4	75	4/4	100	3 laboratory assistants and 1 process worker. 2 were co-exposed and co-sensitized to xylanase; see xylanase
Cellulase of <i>Trichoderma viridae</i> and <i>Fusarium moniliform</i>	Kim, Nahm et al., 1999	Case report	1	1	1/1		-		nd		1/1		nd		1/1		1				1/1		1/1		Employee of the textile industry
Cellulase of <i>Trichoderma reesei</i>	Vanhanen, Tuomi et al., 2000	Case series	11	7*	8/11		8/11		0/11		7/11		nd		8/11		7		1		10/11		8/11		Employees of an enzyme factory. *7/8 SIC+ were SPT+, co-exposure to xylanase; 5/10 IgE+ and 7/10 SPT+ with xylanase
Flaviastase of <i>Aspergillus niger</i>	Pauwels, Devos et al., 1978	Case reports	3	3	3/3		-		nd		nd		nd		nd						nd		3/3		Pharmacy workers
Glucoamylase (amyloglucosidase) of <i>Aspergillus niger</i>	Quirce, Fernández-Nieto et al., 2002a	Case reports	4	4	4/4		4/4		2/4	50	4/4	100	nd		3/3		3				4/4	100	4/4	100	3 bakers and 1 employee of an enzyme-processing plant. 2/4 SPT+ with hemicellulase
Glucose oxidase of <i>Aspergillus niger</i>	Baur, 1981	Case report	1	1	1/1		-		nd		nd		nd		nd						1/1*		1/1		Pharmaceutical worker. *IC
Lactase of <i>Aspergillus</i>	Muir, Verrall et al., 1997	Cross-sectional	207	9 (4.4)	20/207	9.7	33/207	15.9	nd		x		nd		nd						65/207	31.4	nd		Employees in a lactase-packaging plant. 9 asthmatics sensitized
Lysozyme (lysozyme chloride)	Park and Nahm, 1997	Case report	1	1	1/1		1/1		nd		1/1		nd		1/1		1				1/1		1/1		Pharmaceutical industry worker. Co-exposure and co-sensitization to peptidase; see peptidase
Pancreatin (porcine), containing trypsin, amylase, lipase	Wiessmann and Baur, 1985	Case series	14	11	14/14		-		11/14		7/7		nd		8/8	100	8				12/13	92.3	3/4	75	Employees of pharmaceutical company. 3/6 asthmatics who did not undergo SIC had BHR+
Pancreatin (porcine and bovine), containing trypsin, alpha-amylase	Baur, Wießmann et al., 1984	Case reports	4	3	4/4		-		nd		nd		nd		nd						nd		3/4		1 nurse, 3 pharmaceutical workers. Cross-reactivity between porcine and bovine pancreatin
Pancreatin (alpha-amylase of porcine pancreatin)	Aiken, Ward et al., 1997	Case report	1	1	1/1		-		0/1		1/1		nd		1/1						1		nd		Laboratory worker

Agents [synonyms] CAS no.	Reference	Study type	Occupationally exposed subjects studied, n	Allergic asthma cases, n (prevalence, %)	EVIDENCE (pathological results)																		Remarks				
					WORK-RELATED SYMPTOMS				LFT		BHR		PFT		SIC				SPT		Spec. IgE						
					Asthma		Rhinitis		n/n	%	n/n	%	n/n	%	n/n	%	n/n	%	Reaction					n/n	%	n/n	%
					n/n	%	n/n	%											i	l	d	n					
Papain of <i>Carica papaya</i>	Baur, König et al., 1982	Survey	33	12 (36.4)	15/33	45.5	15/33	45.5	nd		nd		nd		8/9		5		3	16/33	48.5	15/33	45.5	Papain workers. Sign. elevated SPT+ and IgE+ in symptomatics; 4 sensitized asthmatics did not undergo SIC			
*	Merget, Bergmann et al., 1995	Case report	1	1	1/1		1/1		1/1		nd		nd		nd					1/1		1/1		Grocer, not exposed over the last 8 years			
Pectinase of <i>Aspergillus niger</i>	Hartmann, Walter et al., 1983	Case reports	2	2	2/2		1/2		nd		nd		nd		nd					1/1*		2/2		Employees (secretary and mechanic) of pectinase production. *Scratch test			
Pectinase of <i>Aspergillus niger</i> and glucanase of <i>Trichoderma</i>	Sen, Wiley et al., 1998	Case reports	3	3	3/3		2/3		nd		nd		3/3*		nd					nd		3/3**		Employees in fruit salad processing. *Serial PEFR at work and off work for 2 weeks; **IgE with blend of pectinase and glucanase			
Pepsin	Drexler and Beyer, 1997	Case report	1		1/1		1/1		1/1		1/1		nd		0/1					1/1		1/1		Worker checking meat for trichinea. Nasal Ch+ (immediate)			
*	Cartier, Malo et al., 1984b	Case report	1	1	1/1		1/1		0/1		1/1		1/1		1/1				1	1/1		1/1		Employee of a pharmaceutical company with perennial asthma			
Peptidase of <i>Serratia ssp.</i>	Park and Nahm, 1997	Case report	1	1	1/1		1/1		nd		1/1		nd		1/1				1	1/1		1/1		Pharmaceutical worker. Co-exposure and co-sensitization to lysozyme chloride			
Phytase of <i>Aspergillus niger</i>	Doekes, Kamminga et al., 1999	Cross-sectional	11	5 (45.5)	5/11	45.5	-		nd		nd		nd		nd					nd		9/11	81.8	Workers of animal feed additives factory. Sign. elevated IgE of exposed compared to non-exposed subjects; SPT+ in 2 external and 3 internal controls			
*	Baur, Melching-Kollmuss et al., 2002	Cross-sectional	53	7 (13.2)	12/53	22.6	35/53	66	nd		nd		nd		nd					nd		15/53	28.3	Employees of an animal husbandry. High-exposed sign. more frequently IgE+; 7 asthmatics sensitized (personal communication)			
Protease, Alcalase of <i>Bacillus subtilis</i>	Juniper, How et al., 1977	Survey with follow-up	1642	34 (2.1)	34/1642*	2.1	-		7/12	58.3	nd		nd		nd					288/1642	17.5	x		Enzyme-packing worker. *Incidence: 34/53 symptomatics had new-onset respir. symp. and 19/34 had work-aggravated asthma over the 7-year period			
Protease, Esperase of <i>Bacillus subtilis</i>	Zachariae, Høegh-Thomsen et al., 1981	Survey with 10 year follow-up	667	16 [0.24]	16/667	2.4**	6/667	0.9**	nd		nd		nd		nd					nd		31/667	4.7**	Detergent enzyme production workers. Co-exposure and co-sensitization (70/667 IgE+) to Alcalase from Subtilisin-A; *WRS listed for sensitized subjects only; all symptomatics IgE+; **incidence in 10 years			
Rennet of <i>Endothica parasitica</i> , Suparen®	Niinimäki and Saari, 1978	Case report	1	1	1/1		-		nd		nd		nd		nd					1/1*		nd		Cheesemaker. *Scratch test; additional 7 cheesemakers exposed but not sensitized, 5 of them had WRS			
Subtilisin of <i>Bacillus subtilis</i>	Franz, McMurray et al., 1971	Case series	38	22	25/38	65.8	11/38	28.9	3/28	10.7	nd		nd		9/10	90	4	5	25/38*	65.8	nd			Employees of enzyme detergent producing plant; *IC; 22/25 asthmatics SPT+			
Trypsin (porcine), inactivated	Colten, Polakoff et al., 1975	Cross-sectional	14	4 (28.6)	4/14	28.6	1/14	7.1	1/4		nd		nd		3/3**	100	3		4/14*	28.6	nd			Workers of plastic manufacturing plant. *Scratch-test; **SIC in 3 asthmatics only			
Xylanase of <i>Aspergillus niger</i>	Tarvainen, Kanerva et al., 1991	Case reports	2	2	2/2		1/2		0/2		2/2		1/2		nd					2/2	100	2/2	100	Laboratory assistants. Co-exposure and co-sensitization to cellulase; see cellulase			
*	Baur, Sander et al., 1998	Case report	1	1	1/1		1/1		1/1		nd		nd		1/1					1/1		1/1		Baker. Also SPT+, IgE+ with cellulase of <i>A. niger</i> , alpha-amylase of <i>A. oryzae</i> and wheat flour			
Chemicals																											
Drugs																											
Alpha-methyl dopa	Harries, Newman Taylor et al., 1979	Case report	1		1/1		1/1		nd		0/1		nd		1/1				1	0/1		nd			Chemist of a drug factory		
Amoxicillin	Jiménez, Antón et al., 1998	Case report	1	1	1/1		1/1		0/1		1/1		nd		1/1				1	0/1		1/1			Pharmaceutic laboratory worker. Oral Ch induced a 33% decrease in FEV1 (late)		
Cephalosporin (Cefadroxil)	Sastre, Quirce et al., 1999	Case report	1		1/1		1/1		0/1		0/1		nd		1/1				1	0/1		0/1*			Pharmaceutical worker. *IgE- with β -lactam antibiotics; oral Ch with cephalixin induced a 22% decrease in FEV1 (immediate)		

Agents [synonyms] CAS no.	Reference	Study type	Occupation- ally exposed subjects studied, n	Allergic asthma cases, n (prevalence, %)	EVIDENCE (pathological results)																		Remarks				
					WORK-RELATED SYMPTOMS				LFT		BHR		PFT		SIC				SPT		Spec. IgE						
					Asthma		Rhinitis		n/n	%	n/n	%	n/n	%	n/n	%	n/n	%	i	l	d	n		n/n	%	n/n	%
					n/n	%	n/n	%											(n)	(n)	(n)	(n)					
Cephalosporin (Ceftazidime)	Stenton, Dennis et al., 1995	Case report	1	1	1/1		1/1		0/1		1/1		nd		1/1		1*	1*		nd		nd		Ceftazidime packaging worker. *SIC twice, a week apart			
Cephalosporins 7-aminocephalosporanic acid (7ACA)	Coutts, Dally et al., 1981	Case reports	2	2	2/2		1/2		nd		nd		nd		2/2		2			2/2		nd		Cephalosporin production worker and chemist			
Tosylate dihydrate derivative of 7ACA Cephalexin															1/1		1			1/1							
Ciprofloxacin Fluochinolone acid (intermediate of C.)	Broding, Chen et al., 1996	Case reports	2	1	1/1		1/1		0/1		0/1		nd		1/1		1			1/1		0/1		Workers in Ciprofloxacin production			
					1/1		1/1		0/1		1/1		nd		1/1		1			0/1		0/1					
Hydralazine	Perrin, Malo et al., 1990	Case report	1		1/1		1/1		nd		1/1		nd		1/1		1			0/1		0/1		Pharmaceutical worker with previously physician-diagnosed asthma			
Ipecacuanha (<i>Cephaelis ipecacuanha</i> and/or <i>Cephaelis acuminata</i>)	Luczynska, Marshall et al., 1984	Cross-sectional	42		nd		nd		nd		nd		nd		nd					12/39	30.8	12/32**	37.5	Workers packing Ipecacuanha tablets. *Allergic symptoms (rhinitis, conjunctivitis and chest tightness), not individually listed; **all IgE+ were symptomatic			
Mitoxantrone	Walusiak, Wittczak et al., 2002	Case report	1	1	1/1		1/1		nd		1/1		nd		1/1		1			nd		nd		Nurse			
Opiate compounds M-6-HS-HSA Dihydrocodeine Oxycodone Hydrocodone Codeine Morphine	Biagini, Bernstein et al., 1992	Cross-sectional with follow-up	39	21 (53.8)	21/39*	53.8	22/39	56.4	nd		nd		10/32**	31.3	nd					5-33/33**	15-100	x***		Ethic narcotics manufact. workers. *10/39 new-onset asthma; **serial PEFR during workweek compared to 3 days off work; 5/30 subjects had cross-shift decline in FEV1 of >10%; ***sign. lower epicutaneous threshold conc. in exposed subjects; ****no evidence of spec. IgE			
Penicillamine	Lagier, Cartier et al., 1989	Case report	1		1/1		1/1		1/1		1/1		nd		1/1		1			0/1		0/1		Pharmaceutical worker			
Penicillin derivate Ampicillin 6APA (6-amino penicillanic acid) Benzyl penicillin	Davies, Hendrick et al., 1974	Case reports	4		4/4		3/4		2/4	50	nd		nd		3/4	75	3			0/4		nd		Workers of a penicillin antibiotics-producing factory. 1/2 oral Ch with ampicillin induced a 36% decrease in FEV1 (late); 1/1 oral Ch with benzyl penicillin induced a 59% decrease in FEV1 (late)			
Piperacillin	Moscato, Galdi et al., 1995	Case report	1	1	1/1		1/1		0/1		0/1		nd		1/1		1			1/1		nd		Pharmaceutical worker			
Salbutamol base	Agius, Davison et al., 1994	Case reports	2	1	2/2		1/2		nd		nd		2/2*		1/1		1			0/1		nd		Pharmaceutical process workers. *Serial PEFR at work and off work for 3-4 weeks			
Salbutamol intermediate-glycyl compound powder: 2-(N-Benzyl-N-tert-butylamino)-4-hydroxy-3'-hydroxymethylacetophenone diacetate	Fawcett, Pepys et al., 1976	Case report	1	1	1/1		-		1/1		nd		nd		1/1		1			0/1		nd		Salbutamol production worker. Approx. 18 workers were exposed, one other had symptoms but was not tested			
Spiramycin	Malo and Cartier, 1988	Survey	51	4 (7.8)***	9/48	18.8	21/48	31.3	3/48	6.3	6/43	14.0	0/48		3/12*	25	2		1	x**		nd		All 51 employees of a pharmac. company. Symptoms and test results in the table reflect the production period during 2. and 3. assessment; *SIC in BHR+ and/or subjects with 2.5 fold BHR change and/or asthmatics; **SPT results not interpretable; ***4 OA cases include 1 previously diagnosed case			
* Spiramycin adipate (spiramycin base and adipic acid)	Davies and Pepys, 1975 Moscato, Naldi et al., 1984	Case report Case reports	1 2	1	1/1 2/2		1/1 1/2		0/1 0/2		nd nd		nd nd		1/1 2/2*		1 2		1 2	1/1 0/2**		nd		Pharmaceutical workers. *2/2 SIC+ with spiramycin adipate (dual), 1/1 SIC+ with spiramycin base (dual), 1/2 SIC+ with adipic acid (immediate); **patch test			
Tetracycline	Menon and Das, 1977	Case report	1	1	1/1		-		0/1		nd		nd		1/1*		1			1/1**		nd		Mechanic of a pharmaceutical company. *FEV1 decrease >20% after SIC, IC and oral Ch; **IC			
Tylosin tartrate	Lee, Wang et al., 1989	Case report	1	1	1/1		1/1		1/1		1/1		nd		1/1		1			nd		nd		Worker of a pharmaceutical factory			

Agents [synonyms] CAS no.	Reference	Study type	Occupationally exposed subjects studied, n	Allergic asthma cases, n (prevalence, %)	EVIDENCE (pathological results)														Remarks						
					WORK-RELATED SYMPTOMS				LFT		BHR		PFT		SIC					SPT		Spec. IgE			
					Asthma		Rhinitis		n	%	n	%	n	%	n	%	n	%		i	l	d	n	n	%
n: number of subjects; n/n: number of subjects with work-related symptoms or positive test results / all investigated subjects; LFT: lung function test showing obstructive ventilation pattern; BHR: bronchial hyperresponsiveness; BD: significant bronchodilator effect; PFT: FEV1 or PEFR showing significant change in follow-up pre-, (during) and post shift; SIC: specific inhalative challenge test; i: immediate, d: dual, l: late response type; SPT: significant positive skin prick test result; IC: significant positive intracutaneous test result; IgE: positive result of specific IgE antibody measurement; *, **, ***: for details see column "Remarks"; nd: not done; WR: work-related; WRS: work-related symptoms; OA: occupational asthma; sign.: significant; P: pathology; restr. = restrictive ventilation pattern; + : positive test result; - : negative test result; x: test done, no individual results listed; nasal Ch: nasal challenge test; conj. Ch: conjunctival challenge test; oral Ch: oral challenge test; HR: histamine release test; PK: Prausnitz-Küstner test																									