

GUIDELINES

Work-Related Asthma

RECOGNITION, DIAGNOSIS, AND REPORTING



Public Health Services Branch
Division of Epidemiology, Environmental and Occupational Health
Environmental and Occupational Health Surveillance Program



This page is intentionally left blank.

GUIDELINES
WORK-RELATED ASTHMA
RECOGNITION, DIAGNOSIS, AND REPORTING

March 2006

New Jersey Department of Health & Senior Services
Environmental and Occupational Health Surveillance Program
PO Box 369
Trenton, New Jersey 08625-0369
Phone: (609) 826-4984
E-mail: surveillance@doh.state.nj.us

This document is available on the Internet at: www.nj.gov/health/surv

This page is intentionally left blank.

PREFACE

Work-related asthma (WRA) has become the most common occupational lung disease in the United States, and is a serious public health concern in New Jersey. According to the American Thoracic Society, an estimated 15 percent of all asthma cases in the United States are work-related. Based on this national estimate, more than 67,000 New Jersey adults could have WRA. The assistance of New Jersey health care providers is vital to help reduce the incidence of this debilitating, sometimes fatal, occupational disease.

The New Jersey Department of Health and Senior Services (NJDHSS), Environmental and Occupational Health Surveillance (EOHS) Program, conducts surveillance and intervention activities for WRA under a Centers for Disease Control and Prevention grant. Reporting of WRA by health care professionals is an important method for identifying this disease in the NJDHSS occupational health surveillance system. In 2003, the EOHS Program, in partnership with the University of Medicine and Dentistry of New Jersey, Environmental and Occupational Health Sciences Institute, convened a Physician and Nurse Outreach Advisory Board (PNOAB). The PNOAB's mission is to promote outreach and education aimed at increasing the recognition, case reporting, and medical surveillance of WRA and other occupational diseases by health care providers in New Jersey.

The EOHS Program, in collaboration with PNOAB members, developed the enclosed document, *Guidelines -- Work-Related Asthma Recognition, Diagnosis, and Reporting*, and other educational materials for you and your patients. The *Guidelines* provide information on the differential diagnosis of WRA and will assist you in recognizing, managing, and reporting WRA cases to NJDHSS. The *Guidelines* and other materials are available from the EOHS Program, and are posted on the NJDHSS Web site at www.nj.gov/health/sury. EOHS Program staff can assist you with WRA case classification, and provide telephone consultations regarding exposures and conditions at your patient's workplace. If you have clinical questions, the EOHS Program can provide you with a list of specialists who can assist you with the diagnosis and management of WRA.

State regulation, N.J.A.C. 8:58-1.5, requires physicians, advanced practice nurses, and physician assistants to report cases of WRA, as well as other occupational diseases, to the NJDHSS. Possible, probable, and/or confirmed cases of WRA should be reported to the EOHS Program.

If you have any questions or comments regarding the *Guidelines*, or other surveillance activities associated with WRA, please contact the EOHS Program at (609) 826-4984, or via e-mail at surveillance@doh.state.nj.us. We look forward to working with you on this important public health issue, and trust that you share in our goal to reduce the incidence of WRA in our State.

This page is intentionally left blank.

This page is intentionally left blank.

ACKNOWLEDGMENTS

We are grateful to the members of the NJDHSS Physician and Nurse Outreach Advisory Board for their technical assistance and support in the development of the Guidelines and other educational materials.

Environmental & Occupational Health Associates

Elissa Ann Favata, MD, Executive Medical Director

H. Peter Blumenthal, MD, PA

Peter Blumenthal, MD, MPH, Consultant, Occupational Medicine

New Jersey Allergy, Asthma & Immunology Society

- ♦ Alan J. Goodman, MD, Allergy, Asthma & Immunology, PA
- ♦ John Oppenheimer, MD, Director of Clinical Research, Pulmonary & Allergy Associates
- ♦ Nicholas A. Romanoff, MD, Professional Allergy Associates

New Jersey Chapter of the American College of Emergency Physicians

Jennifer A. Waxler, DO, FACOEP, FACEP, Director, Emergency Medicine Department

New Jersey Health Officers Association

John Surmay, President

New Jersey Hospital Association

Cathy Cardea, RN, MSN, Vice President, Professional Practice

New Jersey Manufacturers Insurance Group

Maurice E. Goldman, MD, Medical Director

New Jersey State Association of Occupational Health Nurses

Noreen Rodriguez, RN, NP, C COHN-S

New Jersey State Nurses Association

Sharon R. Rainer, RN, MSN, APN,C, Associate Director

New Jersey Thoracic Society

Joel L. Deitz, MD, Secretary and Council Representative

Occupational and Environmental Medicine Association of New Jersey

Glenn J. Greene, PhD, MD, MPH, Assistant Professor, UMDNJ - Robert Wood Johnson Medical School

Pediatric/Adult Asthma Coalition of New Jersey

Arnold Finkel, MD, Medical Director, Horizon NJ Health

St. Peter's University Hospital

Anthony Scardella, MD, Department of Pulmonology

- ♦ Leonard Bielory, M.D., Director, Asthma & Allergy Research Center
- ♦ Lawrence Budnick, MD, Associate Professor; Director, Occupational Medicine Service
- ♦ William Halperin, MD, MPH, DrPH, Chair of Preventive Medicine; Associate Dean, School of Public Health

University of Medicine and Dentistry of New Jersey (UMDNJ) - New Jersey Medical School

Catherine Monteleone, MD, Associate Professor of Medicine, Department of Medicine; Director, Allergy & Immunology Program

UMDNJ-Robert Wood Johnson Medical School

- ♦ Howard M. Kipen, MD, MPH, Professor, Director of Occupational Health
- ♦ Iris Udasin, MD, Associate Professor, Director of Employee Health

UMDNJ - Robert Wood Johnson Medical School, Environmental and Occupational Health Sciences Institute (EOHSI)

This page is intentionally left blank.

GUIDELINES

WORK-RELATED ASTHMA RECOGNITION, DIAGNOSIS, AND REPORTING

New Jersey Department of Health and Senior Services (NJDHSS)

These Guidelines are designed to assist clinicians in the management of cases of work-related asthma (WRA). It aims to increase their knowledge of the differential diagnosis of WRA, and assist in the recognition and reporting of WRA cases to the NJDHSS.

- ♦ WRA accounts for an estimated 15% of all adult asthma.
- ♦ WRA is preventable. Prevention and cure depend upon early diagnosis and effective control of exposure to respiratory sensitizers and irritants in the workplace.
- ♦ The development of WRA has long-term adverse health and economic consequences.

What is Asthma?

Asthma is characterized as an acute or chronic inflammatory disorder of the airways, often reversible, with recurrent episodes of wheezing, shortness of breath, chest tightness, and/or cough due to airways obstruction. Other associated conditions are rhinitis and/or conjunctivitis.

Many different substances, including sensitizers and irritants, may trigger the clinical syndrome. Once sensitized, exposure to very small concentrations of the substance may cause a reaction.

What is Work-Related Asthma (WRA)?

WRA refers to asthma that can be attributed to or made worse by exposures in the workplace. WRA is characterized by:

- Episodic symptoms of airflow obstruction, which is at least partially reversible.
- Temporal pattern of symptoms associated with exposure at a workplace.

Other than the workplace association, the clinical presentation of WRA is largely indistinguishable from asthma unrelated to work.

WRA Includes Individuals with:

- **New-onset asthma** resulting from exposure in the workplace to:
 - sensitizers, or
 - irritants.
- **Work-aggravated asthma:** with a prior history of symptomatic or treated asthma who experience an increase in symptoms and/or an increase in the use of asthma medications within two years of entering a new workplace setting, or from exposure to new chemicals or agents in an existing workplace.
- **Reactive Airways Dysfunction Syndrome (RADS):** new-onset asthma that develops within 24 hours following a single, high-level exposure to inhaled irritants where the patient continues to be symptomatic for at least three months. Common causes are smoke inhalation or a spill or accidental release of a chemical irritant.

What Causes WRA and Who is Most at Risk?

The literature lists over 350 agents, industries or processes that have been epidemiologically or clinically reported to be associated with development of WRA.

Frequently reported causes of WRA include:

- *High molecular weight sensitizers* – laboratory animals, grain mites, insects, egg protein, flour and grain dust, latex
- *Low molecular weight sensitizers* – diisocyanates, paints, foams, metals, fluxes, wood dust, pharmaceuticals, cobalt, oak, cedar
- *Irritants* – formaldehyde, ammonia, chlorine, chloramines, solvents
- *Others* – molds (*Aspergillus* sp.), fungi.

Based on population studies, workers reported to be at increased risk of developing WRA include:

• adhesive manufacturing workers	• embalmers	• painters	• textile workers
• bakers	• farm workers	• pest controllers	• waiters
• chemical workers	• food processors	• pharmaceutical	• welders
• cleaners	• forestry workers	manufacturing workers	• woodworkers
• dental health workers	• health care workers	• plastics workers	
• detergent makers	• janitors	• platinum refinery workers	
• electrical workers	• laboratory technicians	• rubber workers	
• electronic production workers	• meat packers	• storage workers	
	• metal workers		
	• office workers		

NOTE: A detailed listing of asthma-causing agents is provided in Appendix A, *Industries and Asthmagens Associated with Work-Related Asthma*.

How Do I Determine if My Patient has WRA?

Consider the possibility of WRA diagnosis in all new cases of adult asthma. Take occupational and environmental histories using the Exposure History Form found in Appendix B. Ask each adult patient presenting with asthma symptoms or rhinitis about their job. It has been shown that rhinitis occurring in patients in high-risk occupations might signal an increased risk of developing WRA within 12 months of the onset of rhinitis.

Consider the temporal pattern of symptoms. Ask the following questions:

- Did symptoms of asthma develop after you started a new job or after new materials or processes were introduced on a job? (a substantial period of time may elapse between initial exposure and development of symptoms)
- Do symptoms develop within minutes of specific activities or exposures at work?
- Do delayed symptoms occur several hours after exposures or during the evenings of workdays?
- Do symptoms occur less frequently or not at all on days away from work?
- Do symptoms occur more frequently on returning to work?
- Do you find that you need to use your asthma medication more often while at work?

Two important screening factors are: 1) temporal associations, and 2) exposure to specific agents known to cause asthma. Collateral symptoms of eye and/or nose irritation are also often key components of the presentation.

Steps and Diagnostic Tools to Diagnose Work-Related Asthma

Medical History and Medical Records Review

- Symptoms (e.g., cough, wheezing, shortness of breath, chest tightness, sputum production).
- Development of disease, severity, and treatment: age at onset, prior diagnosis, prior objective evidence of reversible airflow obstruction (e.g., cross-shift spirometry), PEF (peak expiratory flow) patterns, progress of disease, need for corticosteroids and frequency of use, other respiratory disorders (e.g., respiratory infections, bronchitis, emphysema), chest X-ray, allergy testing.
- History of allergic rhinitis, sinusitis, urticaria, eczema, food allergies.
- Family history of asthma and allergies.
- Social history (e.g., cigarette smoking, recreational drugs, hobbies).

Occupational/Environmental History

- *Employment history* – Ask about current, as well as relevant past jobs with dates, job titles, industries, and job tasks. Ask about the substances with which your patient works. A chronological employment history including all jobs held since the beginning of asthma symptoms may be helpful. Ask about all activities and exposures suspected to be related to symptoms (see Appendix B for Exposure History Form).
- *Temporal pattern of symptoms and symptom triggers at work* – Ask about specific exposures to agents or processes at work (e.g., sensitizers, irritants) and the time between exposure and onset of symptoms.
- *Symptom triggers outside work* – Ask about symptoms caused by mold, pollen, pets, food, and food preservatives.
- *Objective verification of exposures* – Ask about Material Safety Data Sheets (MSDS) and results of industrial hygiene evaluations. A NJDHSS Industrial Hygienist can help you in evaluating this information.

Physical Examination

- Wheezing during normal breathing (more reliable sign of airflow obstruction than wheezing on forced exhalation). Wheezing combined with a recent exam without wheeze is supportive of a diagnosis of asthma.
- Prolonged expiratory phase and over-inflation of the thorax.
- Upper respiratory or mucosal inflammation or allergy.
- Skin allergy.
- Potential clues to diagnostically relevant exposures (e.g., tobacco stains on skin).

Note: *Many patients with asthma may have no abnormal findings.*

Pulmonary Function Testing

- Airflow obstruction is considered reversible, and supports diagnosis of asthma, if pulmonary function testing shows an increase of $\geq 12\%$ or 200 mL in FEV1 (forced expiratory volume in 1 second) after inhaling a short-acting bronchodilator.
- Diurnal variability of PEF of $\geq 20\%$ supports diagnosis of asthma.
- If inhaled bronchodilator does not improve airflow limitation, re-evaluation after anti-inflammatory therapy should be considered.
- Non-specific bronchial responsiveness test (methacholine or histamine) should be performed if spirometry is normal or near normal.

Laboratory Studies

- Eosinophile count (eosinophilia greater than 4% or 300-400/mL supports the diagnosis of asthma, but an absence of this finding is not exclusionary)
- Total serum immunoglobulin E levels (total serum immunoglobulin E levels greater than 100 IU are frequently observed in patients experiencing allergic reactions, but this finding is not specific for asthma)

Imaging Studies

- Chest X-ray (chest radiography findings are normal or indicate hyperinflation)

Other Tests

- Allergy skin testing
- Sputum examination (eosinophile predominance)

Objective Evidence of Work-Relatedness

- Pre-Post shift spirometry
- Monday-Friday spirometry
- Serial PEF at work and away from work.

Do I have to Report WRA to the New Jersey Department of Health and Senior Services?

Yes. State regulation, N.J.A.C. 8:58-1.5, requires physicians, advanced practice nurses, and physician assistants to report cases of WRA to NJDHSS. The regulation also requires that these reports state the name of the reporting health care provider and the following information on the person with WRA: name, date of birth, sex, home address, telephone number, date of onset of WRA, and employer's name/address/telephone number. A copy of the reporting form can be found in Appendix C.

NOTE: Case definitions and case criteria for reporting WRA are provided on the following page.

What are the Case Definitions and Case Criteria for Reporting Purposes?

Case Classification	POSSIBLE Work-Related Asthma	PROBABLE Work-Related Asthma	CONFIRMED Work-Related Asthma
Case Definition	Symptoms of asthma <u>AND</u> Association between symptoms of asthma and work	Diagnosis of asthma <u>AND</u> Association between symptoms of asthma and work	Diagnosis of asthma <u>AND</u> Objective evidence of work-relatedness
Case Criteria	Symptoms of asthma: Episodic cough, wheezing, shortness of breath, chest tightness, sputum production. <u>AND</u> Patient-reported work-related temporal pattern of symptoms of asthma Patient may identify specific agents, processes or conditions at the workplace where symptoms began, worsened, or had a work-related temporal pattern.	Diagnosis of asthma: Symptoms: Episodic cough, wheezing, shortness of breath, chest tightness, sputum production. Physical examination: Wheezing during normal breathing, but many patients with asthma may have no abnormal findings. Spirometry: Increase of $\geq 12\%$ in FEV1 after bronchodilator, with at least 200 ml absolute increase. Diurnal variability of PEF of $\geq 20\%$ also supports diagnosis of WRA. If spirometry results are normal, follow with <u>non-specific bronchial responsiveness</u> testing. Abnormal methacholine testing supports diagnosis of WRA. <u>AND</u> Patient-reported work-related temporal pattern of symptoms of asthma	Diagnosis of asthma <u>AND</u> Objective evidence of work-relatedness: <ul style="list-style-type: none"> Pre-Post shift spirometric decline $>12\%$ Monday-Friday spirometric decline $>12\%$ Serial PEF at work and away from work with significant worsening/variability at work Induced sputum inflammation compared at work and away.

How the NJDHSS Can Assist Health Care Providers in Recognizing and Reporting Cases of WRA

- Our staff can assist you with WRA case classification.
- If you have clinical questions, we can provide you with a list of specialists to assist you with the diagnosis of WRA.
- Our Industrial Hygienists can provide telephone consultations regarding conditions and exposures at your patient's workplace that may be associated with WRA.
- We can provide you and your patient with educational materials to assist in the evaluation and control of WRA, including:
 - *New Jersey Law Requires Physicians, Advanced Practice Nurses (APNs), and Physician Assistants (PAs) to Report Individuals Diagnosed with Work-Related Asthma* (physicians, APNs, PAs)
 - *Guidelines – Work-Related Asthma Recognition, Diagnosis, and Reporting* (physicians, APNs, PAs)
 - *HIPAA and the Provision of Protected Health Information to the NJDHSS* (physicians, APNs, PAs)
 - *Reporting Work-Related Asthma – Important Information* (physicians, APNs, PAs)
 - *Do You Have Work-Related Asthma? [English and Spanish]* (patients)
 - *Every Breath Counts! – Important Information for Adults with Asthma* (patients)
 - *Industries and Asthmagens Associated With Work-Related Asthma* (physicians, APNs, PAs, patients)

NJDHSS also maintains a Web page with the above publications and other useful information for health care providers: www.nj.gov/health/surv.

How do Health Care Providers Submit Case Reports of WRA to the NJDHSS?

Reports of possible, probable, and/or confirmed cases of WRA must be submitted to NJDHSS using our OCC-31 reporting form which can be downloaded from the Internet in two formats:

- a) A fillable Microsoft Word document at www.nj.gov/health/forms/occ-31.dot;
- b) A PDF document www.nj.gov/health/forms/occ-31.pdf.

Completed forms may be faxed or mailed to the Environmental & Occupational Health Surveillance Program as indicated on the reporting form.

What Happens after a Case of WRA is Reported to the NJDHSS?

- We will contact your patient (unless you request us not to do so) to collect information about the conditions at work that contributed to his/her WRA. We will also take an occupational and environmental history.
- If an industrial hygiene evaluation of the workplace is deemed appropriate, a NJDHSS Industrial Hygienist will conduct a free-of-charge site visit to assist the employer in reducing or eliminating exposures to the causative agent, with the aim of preventing additional workers from developing WRA. We will also invite you to accompany us on the site visit, and will provide you with a copy of the Industrial Hygiene report of findings and recommendations. The name of your patient will not be revealed to his/her employer.
- Educational materials on WRA tailored specifically to the work processes and agents associated with the reported case will be provided to your patient and his/her employer.
- NJDHSS analyzes data from the case reports regularly to identify industries, causative agents, and occupations associated with WRA. We use this information to target intervention activities aimed at high-risk industries or particular agents known to cause WRA.

References

1. American Thoracic Society. Lung function testing: selection of reference values and interpretative strategies. *Am Rev Respir Dis.* 1991; 144.
2. American Thoracic Society. Guidelines for methacholine and exercise challenge testing – 1999. *Am Rev Respir Dis.* 2000; 161.
3. Bernstein IL, Chan-Yeung M, Malo JL, Bernstein DI ed. *Asthma in the workplace*. New York: Marcel-Dekker, Inc. 1999.
4. Brooks SM, Weiss MA, Bernstein IL. Reactive airways dysfunction syndrome (RADS); Persistent asthma syndrome after high-level irritant exposure. *Chest.* 1985; 88(3).
5. Chan-Yeung M. Assessment of asthma in the workplace. *Chest.* 1995; 108(3).
6. Centers for Disease Control and Prevention. CDC Surveillance Summaries, June 1999. *MMWR* 1999; 48 (No. SS-3).
7. Friedman-Jimenez G, Beckett WS, Szeinuk J, Petsonk EL. Clinical evaluation, management, and prevention of work-related asthma. *Am J Ind Med* 37:121-141 (2000).
8. Lombardo LJ, Balmes JR. Occupational asthma: A review. *Environmental Health Perspectives.* 2000; 108 Suppl 4.
9. National Institutes of Health. Guidelines for the diagnosis and management of asthma. National Institutes of Health, National Heart, Lung, and Blood Institute. NIH Publication No. 97-4051. July 1997. Available at <http://www.nhlbi.nih.gov/guidelines/asthma/asthgdln.htm>. Accessed September 2004.
10. Petsonk EL. Work-related asthma and implications for the general public. *Environmental Health Perspectives.* 2002; 110 Suppl 4.

Questions? Concerns? Contact us:

Work-Related Asthma Surveillance Coordinator
New Jersey Department of Health & Senior Services
Environmental and Occupational Health Surveillance Program
PO Box 369
Trenton NJ 08625-0369
Phone: (609) 826-4984
E-mail: surveillance@doh.state.nj.us
Fax: (609) 292-5677
Internet: nj.gov/health/surv

This page is intentionally left blank.

Appendices

This page is intentionally left blank.

Appendix A



Industries and Asthmagens Associated with Work-Related Asthma



Listed below are industries where work-related asthma has been identified, and the asthmagens (asthma-causing agents) associated with each. The list includes agents that are sensitizers known to cause allergic asthma, as well as irritants known to be responsible for inducing reactive airways dysfunction syndrome (RADS).

Additional information on industries and occupations, and associated asthmagens can be found through sources listed at the end of the table.

Industry	Asthmagen
Adhesives industry	acid anhydrides, aliphatic amines, polycyclic compounds, colophony, diisocyanates, methyl methacrylate, cyanoacrylates
Agriculture	insect proteins, pollens, aromatic herbs, livestock, organophosphorous insecticides, soya, chloramides, sulfones, mites
Aircraft filter manufacturing	triethylenetetramine
Aluminum cable soldering	aminoethylethanolamine
Aluminum industry	aluminium salts, fluorides
Animal handling and processing	animal urine/dander, feathers, avian proteins, penicillins, cephalosporins, cereal seeds, macrolids, oilseed
Artificial fingernail application	methyl methacrylate, cyanoacrylates
Autobody repair	diisocyanates, acrylates, styrene
Automobile painting	diisocyanates
Baking	enzymes, flour/grain dust, grain mites, insect proteins, cereal seeds, powdered chicken egg
Bath enameling	acid fumes
Boat manufacturing	styrene, diisocyanates, wood dust
Boiler/gas turbine cleaning	vanadium
Brewery	hops, chloramine-T
Button manufacturing	nacre (mother of pearl)
Candy manufacturing	vegetable gums
Carpentry	wood dust, formaldehyde, diisocyanates, epoxy resins
Cement manufacturing	potassium dichromate
Ceramic industry	chromium salts, nickel salts
Chemical industry	acid anhydrides, formaldehyde, diisocyanates, methyl methacrylate, cyanoacrylates, sulphites, persulphates, piperazine, platinum salts, quaternary ammonium compounds, coloring reagents, n-methylmorpholine, isothiazolinones

Industry	Asthmagen
Chrome plating	sodium bichromate, chromic acid, potassium chromate
Coffee processing	green coffee beans
Condom manufacturing	latex, lycopodium powder
Cooking	garlic dust, spices, aromatic herbs, papain
Cosmetics manufacturing	aliphatic amines, polycyclic compounds, cochineal dust, carmine red, enzymes, formaldehyde, vegetable gums, lycopodium powder, vanillin, quaternary ammonium compounds
Custodial services	cleaning agents, latex, mold, dust, bird/bat droppings, quaternary ammonium compounds
Dairy industry	animal urine/dander, lactoserum, casein, enzymes
Dentistry	latex, methyl methacrylate, cyanoacrylates, epoxy, diisocyanates, formaldehyde, glutaraldehyde, quaternary ammonium compounds
Detergent manufacturing	subtilsins (<i>Bacillus subtilis</i>), esperase, enzymes
Diamond industry	metal carbides, cobalt, nickel
Dye manufacturing and dyeing	levafix brilliant yellow, drimarene brilliant yellow and blue, cibachrome brilliant scarlet, aromatic amines and their derivatives, acid anhydrides, cochineal, carmine red, coloring reagents, sulphites, persulphates
Electronics	solder flux fume, colophony, aliphatic amines, polycyclic compounds, acid anhydrides, zinc chloride, ammonium chloride
Entomology	insect proteins
Enzyme manufacturing	fungal alpha-amylase, enzymes
Epoxy resin manufacturing	acid anhydrides
Explosives manufacturing	vegetable gums, tetrazene, freon, lycopodium powder
Firefighting	combustion products of plastics
Floral industry	pollens, house plants, dried flowers
Food industry	garlic dust, spices, aromatic herbs, insect proteins, arthropods, shellfish, cochineal, carmine red, enzymes, vegetable gums, oil seeds, dust mites, maiko dust, seafood, powdered chicken egg, sulphites, persulphates, soya, vanillin, tea dust, casein, flours, papain, castor beans, herbal tea, chicory, vegetable oil mist
Food packaging	combustion products of polyvinyl chloride
Forensics	ninhydrin
Foundry	formaldehyde, derivatives of furan, diisocyanates
Fur dyeing	para-phenylenediamine
Galvanizing	zinc fume
Grain handling and processing	grain dust, grain mites, molds
Gum manufacturing	vegetable gums

Industry	Asthmagen
Hairdressing	henna, sulphites, persulphates, ethanolamine, formaldehyde, sericin
Health care	glutaraldehyde, latex, formaldehyde, methyl methacrylate, cyanoacrylates, quaternary ammonium compounds, methyldopa, penicillins, psyllium, hexachlorophene, chlorhexidine
Insect breeding	insect proteins, arthropods
Jewelry polishing	cuttlefish bone dust, ivory dust
Laundry	enzymes, sulphites, persulphates
Machine shop	tungsten carbide, cobalt, nickel, oil mist, coolants, ethanolamines
Meat wrapping	polyvinyl chloride fume
Metallurgy	aliphatic amines, polycyclic compounds, metal carbides, cobalt, nickel, derivatives of furan, diisocyanates, chromium salts, nickel salts, platinum salts, palladium salts, acid fumes, aluminum salts, fluorides
Mining	bioaerosols, styrene, polyester resins
Mortuary science	formaldehyde, glutaraldehyde
Mushroom cultivation and processing	mushroom spores
Nickel plating	nickel sulphate
Office work	bioaerosols, cleaning agents
Oyster farming	hoya
Paint spraying	dimethylethanolamine, diisocyanates, zinc chromate
Paper/pulp manufacturing	wood dust, formaldehyde, sulphites, persulphates, acid fumes, quaternary ammonium compounds, proteolytic enzymes, chlorine, diazonium salts
Pea processing	mexican bean weevils
Pharmaceutical industry	aliphatic amines, polycyclic compounds, aromatic amines and derivatives, acid anhydrides, penicillins, cephalosporins, cochineal dust, carmine red, enzymes, vegetable gums, lycopodium powder, macrolids, sulphites, persulphates, volatile acid chlorides, piperazine, psyllium, chloramides, sulfones, tetracyclines, cynorohodon, hydralazine, rose hips, trypsin, bromelin, papain, pepsin, ipecacuanha dust, morphine, pancreatin, isoniazid, spiramycin, cimetidine, acetic acid, phenylglycine
Pharmacy	gentian powder, flaviastase
Phenolic resin manufacturing	formaldehyde
Photographic processing	aliphatic amines, polycyclic compounds, coloring reagents, chromium salts, glutaraldehyde
Plastics manufacturing	aliphatic amines, polycyclic compounds, acid anhydrides, diazonium salts, formaldehyde, methyl methacrylate, diisocyanates, trypsin, bromelin, polyvinyl chloride (fume & dust), azodicarbonamide, styrene, polypropylene fume, diethyl phthalate
Platinum refining	chloroplatinic acid, ammonium hexachloroplatinate, soluble platinum salts
Polyurethane foam manufacturing	toluene diisocyanate, diphenylmethane diisocyanate, 4-methylmorpholine

Industry	Asthmagen
Polyurethane foam spraying	diisocyanates
Poultry processing	chickens, amprolium hydrochloride
Prawn/crab processing	prawns, crabs
Printing/lithography	vegetable gums
Refuse collection processing	bioaerosols
Rubber industry	aliphatic amines, polycyclic compounds, aromatic amines and derivatives, diazonium salts, formaldehyde
Seafood industry	shellfish
Silkworm culturing	silkworms, sericin
Soldering	solder flux fume, colophony, polyether alcohol, polypropylene glycol
Steel industry	vanadium
Surgical glove manufacturing	latex
Tanning	aliphatic amines, polycyclic compounds, coloring reagents, enzymes, formaldehyde, chromium salts, sulphites, persulphates, casein
Tea processing	tea dust
Teaching	cleaning agents, mold, dusts
Textile industry	cochineal dust, carmine red, coloring reagents, enzymes, vegetable gums, chromium salts, sericin, natural fibers, latex
Tobacco farming and processing	tobacco leaf, tobacco dust
Tungsten carbide tool manufacturing/grinding	cobalt, nickel
Venipuncture	bis (tri-n-butyltin) oxide
Veterinary medicine	animal proteins, urine/dander, penicillins, cephalosporins, macrolids, piperazine
Water treatment industry	chloramides, sulfones, chloramine-T
Welding	chromium salts, nickel, chromium, vanadium, zinc chloride, ammonium chloride
Winery	mites, organophosphorous insecticides
Woodworking	wood dust, ramin
Wool processing	wool
X-ray processing	glutaraldehyde

SOURCES:

- Asmanet Web Site: www.remcomp.fr/asmanet/asmapro/asmawork.htm
- Association of Occupational and Environmental Clinics: www.aoec.org/aoeccode.htm
- Bernstein IL, Chan-Yeung M, Malo J-L, Bernstein DI, eds. *Asthma in the Workplace*. Marcel Dekker Inc., New York, 1999.
- Canadian Centre for Occupational Health and Safety: www.ccohs.ca/oshanswers/diseases/asthma.html
- National Institute of Health: http://hazmap.nlm.nih.gov/cgi-bin/hazmap_generic?tbl=TblDiseases&id=23

Appendix B

Exposure History Form

Part 1. Exposure Survey

Please circle the appropriate answer.

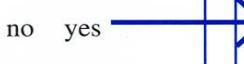
Name: _____ Date: _____

Birth date: _____ Sex (circle one): Male _____ Female _____

1. Are you currently exposed to any of the following?

metals	no	yes
dust or fibers	no	yes
chemicals	no	yes
fumes	no	yes
radiation	no	yes
biologic agents	no	yes
loud noise, vibration, extreme heat or cold	no	yes
2. Have you been exposed to any of the above in the past? no yes
3. Do any household members have contact with metals, dust, fibers, chemicals, fumes, radiation, or biologic agents? no yes

If you answered *yes* to any of the items above, describe your exposure in detail—how you were exposed, to what you were exposed. If you need more space, please use a separate sheet of paper.

4. Do you know the names of the metals, dusts, fibers, chemicals, fumes, or radiation that you are/were exposed to? no yes  If yes, list them below
5. Do you get the material on your skin or clothing? no yes
6. Are your work clothes laundered at home? no yes
7. Do you shower at work? no yes
8. Can you smell the chemical or material you are working with? no yes
9. Do you use protective equipment such as gloves, masks, respirator, or hearing protectors? no yes  If yes, list the protective equipment used
10. Have you been advised to use protective equipment? no yes
11. Have you been instructed in the use of protective equipment? no yes

Part 1. Exposure Survey (cont'd)

12. Do you wash your hands with solvents? no yes

13. Do you smoke at the workplace? no yes At home? no yes

14. Do you eat at the workplace? no yes

15. Do you know of any co-workers experiencing similar or unusual symptoms? no yes

16. Are family members experiencing similar or unusual symptoms? no yes

17. Has there been a change in the health or behavior of family pets? no yes

18. Do your symptoms seem to be aggravated by a specific activity? no yes

19. Do your symptoms get either worse or better at work?
at home? no yes
on weekends? no yes
on vacation? no yes

20. Has anything about your job changed in recent months (such as duties, procedures, overtime)? no yes

21. Do you use any traditional or alternative medicines? no yes

If you answered *yes* to any of the questions, please explain.

Part 2. Work History

A. Occupational Profile

Name: _____

Birth date: _____

Sex: Male Female

The following questions refer to your current or most recent job:

Job title: _____ Describe this job: _____

Type of industry: _____

Name of employer: _____

Date job began: _____

Are you still working in this job? yes no _____

If no, when did this job end? _____

Fill in the table below listing all jobs you have worked including short-term, seasonal, part-time employment, and military service. Begin with your most recent job. Use additional paper if necessary.

Dates of Employment	Job Title and Description of Work	Exposures*	Protective Equipment

*List the chemicals, dusts, fibers, fumes, radiation, biologic agents (i.e., molds or viruses) and physical agents (i.e., extreme heat, cold, vibration, or noise) that you were exposed to at this job.

Have you ever worked at a job or hobby in which you came in contact with any of the following by breathing, touching, or ingesting (swallowing)? If yes, please check the box beside the name.

<input type="radio"/> Acids	<input type="radio"/> Chloroprene	<input type="radio"/> Methylene chloride	<input type="radio"/> Styrene
<input type="radio"/> Alcohols (industrial)	<input type="radio"/> Chromates	<input type="radio"/> Nickel	<input type="radio"/> Talc
<input type="radio"/> Alkalies	<input type="radio"/> Coal dust	<input type="radio"/> PBBs	<input type="radio"/> Toluene
<input type="radio"/> Ammonia	<input type="radio"/> Dichlorobenzene	<input type="radio"/> PCBs	<input type="radio"/> TDI or MDI
<input type="radio"/> Arsenic	<input type="radio"/> Ethylene dibromide	<input type="radio"/> Perchloroethylene	<input type="radio"/> Trichloroethylene
<input type="radio"/> Asbestos	<input type="radio"/> Ethylene dichloride	<input type="radio"/> Pesticides	<input type="radio"/> Trinitrotoluene
<input type="radio"/> Benzene	<input type="radio"/> Fiberglass	<input type="radio"/> Phenol	<input type="radio"/> Vinyl chloride
<input type="radio"/> Beryllium	<input type="radio"/> Halothane	<input type="radio"/> Phosgene	<input type="radio"/> Welding fumes
<input type="radio"/> Cadmium	<input type="radio"/> Isocyanates	<input type="radio"/> Radiation	<input type="radio"/> X-rays
<input type="radio"/> Carbon tetrachloride	<input type="radio"/> Ketones	<input type="radio"/> Rock dust	<input type="radio"/> Other (specify)
<input type="radio"/> Chlorinated naphthalenes	<input type="radio"/> Lead	<input type="radio"/> Silica powder	
<input type="radio"/> Chloroform	<input type="radio"/> Mercury	<input type="radio"/> Solvents	

B. Occupational Exposure Inventory*Please circle the appropriate answer.*

1. Have you ever been off work for more than 1 day because of an illness related to work? no yes
2. Have you ever been advised to change jobs or work assignments because of any health problems or injuries? no yes
3. Has your work routine changed recently? no yes
4. Is there poor ventilation in your workplace? no yes

Part 3. Environmental History*Please circle the appropriate answer.*

1. Do you live next to or near an industrial plant, commercial business, dump site, or nonresidential property? no yes
2. Which of the following do you have in your home?
Please circle those that apply.

Air conditioner	Air purifier	Central heating (gas or oil?)	Gas stove	Electric stove
Fireplace	Wood stove	Humidifier		
3. Have you recently acquired new furniture or carpet, refinished furniture, or remodeled your home? no yes
4. Have you weatherized your home recently? no yes
5. Are pesticides or herbicides (bug or weed killers; flea and tick sprays, collars, powders, or shampoos) used in your home or garden, or on pets? no yes
6. Do you (or any household member) have a hobby or craft? no yes
7. Do you work on your car? no yes
8. Have you ever changed your residence because of a health problem? no yes
9. Does your drinking water come from a private well, city water supply, or grocery store?
10. Approximately what year was your home built? _____

If you answered *yes* to any of the questions, please explain.

Appendix C

New Jersey Department of Health and Senior Services
 Consumer, Environmental and Occupational Health Service
 P.O. Box 369
 Trenton, NJ 08625-0369

**OCCUPATIONAL AND ENVIRONMENTAL
 DISEASE, INJURY, OR POISONING REPORT
 BY HEALTH CARE PROVIDER**

INSTRUCTIONS: In accordance with N.J.A.C. 8:58-1.5, health care providers must report any patient who is ill or diagnosed with any disease, injury, or poisoning listed below within 30 days after the disease, injury, or poisoning has been diagnosed or treated. In addition, suspect cases or patients with other occupational diseases may be reported. All information **MUST** be completed. Mail complete report to above address or fax to (609) 292-5677. Additional information, report forms, or business reply envelopes may be obtained from the above address, or by calling (609) 826-4984. This form is also available online in Microsoft Word and in PDF format at <http://nj.gov/health/surv>.

Date _____

PATIENT INFORMATION			
Name of Patient (Print)			Date of Birth
(First)	(MI)	(Last)	
Street Address			Age (If DOB Unavailable)
City		State	Zip Code
Sex	Race	Home Telephone Number ()	
<input type="checkbox"/> Male <input type="checkbox"/> Female	<input type="checkbox"/> White <input type="checkbox"/> Am. Ind./ Alaskan Native <input type="checkbox"/> Black <input type="checkbox"/> Asian/Pacific Islander	<input type="checkbox"/> Other <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown	
DIAGNOSTIC INFORMATION			
Date of Onset of Disease, Injury, or Poisoning _____ / _____ / _____			
Diagnosis: <input type="checkbox"/> Work-Related Asthma <input type="checkbox"/> Work-Related Fatal Injury <input type="checkbox"/> Possible <input type="checkbox"/> Work-Related Injury in Children (Under Age 18) <input type="checkbox"/> Probable <input type="checkbox"/> Work-Related Carpal Tunnel Syndrome <input type="checkbox"/> Confirmed <input type="checkbox"/> Poisoning Caused by Known or Suspected Occupational Exposure <input type="checkbox"/> Extrinsic Allergic Alveolitis <input type="checkbox"/> Pesticide Toxicity <input type="checkbox"/> Silicosis <input type="checkbox"/> Asbestosis <input type="checkbox"/> Asbestosis <input type="checkbox"/> Cadmium Toxicity, Adult <input type="checkbox"/> Pneumoconiosis, Other and Unspecified <input type="checkbox"/> (Blood \geq 25 $\mu\text{g}/\text{dL}$; Urine \geq 80 $\mu\text{g}/\text{L}$) <input type="checkbox"/> Occupational Dermatitis <input type="checkbox"/> Blood = _____ $\mu\text{g}/\text{dL}$ <input type="checkbox"/> Other Occupational Disease - Specify: <input type="checkbox"/> Urine = _____ $\mu\text{g}/\text{L}$ <input type="checkbox"/> Other Occupational Disease - Specify: <input type="checkbox"/> Mercury Toxicity, Adult <input type="checkbox"/> Other Occupational Disease - Specify: <input type="checkbox"/> Blood \geq .07 $\mu\text{g}/\text{mL}$; Urine \geq 100 $\mu\text{g}/\text{L}$ <input type="checkbox"/> Other Occupational Disease - Specify: <input type="checkbox"/> Blood = _____ $\mu\text{g}/\text{mL}$ <input type="checkbox"/> Other Occupational Disease - Specify: <input type="checkbox"/> Urine = _____ $\mu\text{g}/\text{L}$ <input type="checkbox"/> Other Occupational Disease - Specify: <input type="checkbox"/> Cadmium Toxicity, Adult <input type="checkbox"/> Other Occupational Disease - Specify: <input type="checkbox"/> Blood \geq 5 $\mu\text{g}/\text{L}$ whole blood; <input type="checkbox"/> Other Occupational Disease - Specify: <input type="checkbox"/> Urine \geq 3 $\mu\text{g}/\text{gram creatinine}$ <input type="checkbox"/> Other Occupational Disease - Specify: <input type="checkbox"/> Blood = _____ $\mu\text{g}/\text{L}$ whole blood <input type="checkbox"/> Other Occupational Disease - Specify: <input type="checkbox"/> Urine = _____ $\mu\text{g}/\text{gram creatinine}$			
Name and Address of Laboratory Which Performed the Testing, If Applicable			
Laboratory Name _____ Street Address _____ City _____ State _____ Zip _____			
PLACE OF EXPOSURE / INJURY			
Company Where Exposure/Injury Occurred Name _____ Street Address _____ Phone No. _____ City _____ State _____ Zip _____			
Job Title or Type of Work Performed by Patient		Patient-Reported Cause of Symptoms	
HEALTH CARE PROVIDER INFORMATION			
Name of Health Care Provider (Print)		Telephone Number ()	
Address Facility Name _____ Street Address _____ City _____ State _____ Zip _____			
Indicate Any Reasons Why the Patient Should <u>NOT</u> be Contacted		Comments by Health Care Provider, if Any	