SENSOR Occupational Lung Disease Bulletin

A project of the Massachusetts Department of Public Health's Occupational Health Surveillance Program,
the Massachusetts Thoracic Society, and the Massachusetts Allergy Society

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Dear Health Care Provider,

This month's issue focuses on a form of work-related asthma known as RADS which may develop after an acute over-exposure to an irritating vapor, fume, smoke or dust. Two recently reported cases of RADS are presented followed by a description of this form of asthma. Approximately ten percent of the WRA cases interviewed by Massachusetts SENSOR are classified as RADS. While the prevention of other forms of work-related asthma focus on limiting exposure to known asthma-causing agents, RADS prevention efforts require attention to spill prevention and safe handling procedures of a broader range of chemicals.

Please continue to send us your case reports.

Sincerely,
Catharine M. Tumpowsky, M.P.H.
Work-Related Asthma Surveillance Project

Reactive Airways Dysfunction Syndrome (RADS)

Case 1

This case involves a forty-one year old plumber who had been working for six years installing HVAC equipment. He frequently worked with insulation in dusty areas. One day, he was spraying conductor coils with sodium hydroxide when the wind shifted and he inhaled a large, concentrated amount of the sodium hydroxide. Within twenty-four hours of this exposure, he experienced wheezing, coughing, chest tightness, and shortness of breath. He was initially treated in the emergency room and subsequently began taking proventil, albuterol and prednisone. The patient had no history of asthma and had quit smoking seven years before this incident. At the time of the interview, over one year after the incident, the patient's symptoms persisted and were aggravated by dust and other household chemicals. He has been unable to return to work.

Case 2

This case involves a twenty-six year old male who worked as a utility operator for a cereal manufacturer. He had been working in the processing plant for eight years doing a variety of jobs including transporting and unloading raw materials. One day, he was operating a forklift in the grain room when a storage hopper was emptied for repair. Several hundred pounds of oat flour were dumped on the floor to enable maintenance workers to replace a part. While the maintenance workers wore respirators, the patient who was not involved in the repair, did not. He experienced difficulty breathing and began coughing immediately and was treated in the emergency room. After three weeks, his symptoms became more manageable but at the time of the interview, had persisted for almost one year. The patient had no previous history of asthma.

Reactive Airways Dysfunction Syndrome (RADS) was first described in 1985 as nonimmunologic asthma occurring after a single exposure to high levels of an irritating vapor, fume or smoke. Initial symptoms develop within minutes or hours of exposure. In the majority of cases, there is a continuation of obstructive symptoms and persistent airways hyperreactivity for more than one year. Additional criteria include the documented absence of respiratory complaints preceding the exposure, no other pulmonary diseases, and a positive methacholine challenge test.

Clinical manifestations of RADS are considered similar to those of sensitizer-induced asthma, and include inflammation, airway hyperresponsiveness and reversible bronchial constriction. However, the most fundamental difference between the two types of asthma lies in the absence of asthma attacks after exposure to small amounts of the causative agent(s) a few weeks after onset. In some RADS cases, like the second case highlighted in this issue, the exposure may be an agent known to cause sensitization. However, an immune mechanism may or may not be demonstrated in a RADS case. Therefore, specific agent challenge tests for diagnosis will not be useful for RADS. The clinical criteria for confirming the diagnosis of RADS consist of a thorough medical and occupational history, abnormal pulmonary function tests, and objective evidence of non-specific bronchial hyperresponsiveness.

In contrast to other forms of occupational asthma, where the onset of the illness cannot be precisely determined, the onset of RADS usually can be specifically dated and timed. Because RADS is often the result of a dramatic event, such as an accident involving a vapor, gas or high-level of

REPORT AUGUST-OCTOBER CASES NOW

By November 30th, report all occupational lung disease cases seen for the first time between August and October 2000. If you have NOT seen any cases, it is not necessary to return the report form.

continued on other side

smoke or dust exposure, the patient will likely be able to identify the exact onset of their symptoms and the substance to which they were exposed.

Removal from work may not prevent symptoms in RADS patients as effectively as for other types of occupational asthma. Workers with RADS are less likely to improve away from work, at least for several months after the symptoms first appear. Once RADS has been diagnosed, because of the nonspecific bronchial hyperresponsiveness, the patient is subject to respond to other environmental stimuli, such as cigarette smoke, cold air, vehicle emissions, and common household chemicals (hairsprays, perfumes, cleaners, bleaches).

Table 1 lists some the substances that have been associated with RADS. These exposures may occur in the workplace, at home, or in the environment.

A dose-response has been reported between the amount of exposure and the likelihood of the persistence of hyper-reactivity. Limited biopsy reports of patients with RADS have shown epithelial damage with inflammation but with no eosinophils. Basement membrane thickening greater than that found with allergic asthma and loss of cilia has also been described. Besides the amount of exposure, other risk factors associated with RADS include previous history of asthma, cigarette smoking, and a viral syndrome or chest cold in the six weeks preceding exposure.

It has also been suggested that RADS may develop after chronic exposure to irritants without a single acute exposure episode that precipitated respiratory symptoms. The evidence to support this hypothesis is limited. Increased symptoms of wheezing and/or chest tightness have been reported in pulp mill workers who had repeated exposure to chlorine gas. Some of the symptomatic patients reported by physicians to Massachusetts SENSOR whose work-related asthma is not associated with a known occupational allergens, could possibly be attributed to this mechanism.

Table 1. Selected Exposures Causing RADS

Acetone	Fumigating fog
Acids	Hydrogen Sulfide
Ammonia	MDI (methylene bisphenyl isocyanate)
Bleaching Agents	Metal coat remover
Chlorine	Perchloroethylene
Cleaning Agents	Pesticides
Cutting Oils	Rust inhibitors
Detergents	Sodium Hydroxide
Diesel Exhaust	Sulfur Dioxide
Ethylene Oxide	TDI (toluene diisocyanate)
Fire/Smoke	Trichloroethylene
Formaldehyde	Welding Fumes

Massachusetts is one of four states that conduct surveillance of work-related asthma; the others are California, New Jersey, and Michigan. Between 1993-1995, 123 cases of RADS were identified in these four states. This accounted for approximately 11% of all work-related asthma cases (N=1101)
identified over this time period. Table 2 provides descriptive characteristics of these cases. RADS cases differed from other new-onset occupational asthma cases on several variables.
They were less likely to work in the manufacturing sector than in other industrial sectors. The RADS cases were more likely to be employed in technical, sales, and administrative occupations and less likely to be employed as operators, fabricators, or laborers. Eighty-nine percent of the RADS cases reported that they still had breathing problems at the time of the interview (at least three months after the exposure) and 79% reported that they had been treated in the emergency room for breathing problems. Forty percent of RADS cases were hospitalized for work-related breathing problems whereas 28% of cases with new-onset work-related asthma due to a known sensitzers were hospitalized.

Table 2. Descriptive Characteristics for SENSOR RADS cases, 1993-1995, N=123

Race- White	83%
Mean Age	42.2 years
Sex – female	46%
Ever smoke cigarettes	58%
Primary Industry	
Services	33%
Manufacturing	29%
Primary Occupation	
Precision production craft & repair	25%
Technical, sales, & admin support	21%
Operators, fabricators, & laborers	19%
Most Frequently Reported Agents	
Acids, Bases, Oxidizing Agents	5.6%
Misc. Chemicals and Materials	4.2%
Pyrolysis Products	3.5%
Solvents	1.8%
Petroleum Derivatives	1.8%
Cleaning Materials	1.6%

Data for this table were compiled by PK Henneberger, CDC, NIOSH, Div. of Respiratory Disease Studies, May 2000.

References for this article are available upon request. This article was adapted primarily from: Brooks, SM, Bernstein, IL. " Reactive Airways Dysfunction Syndrome or Irritant-Induced Asthma" in Asthma in the Workplace, edited by Bernstein, IL, Chan-Yeung, M, Malo, JL, Bernstein, DI. Marcel Dekker, Inc: New York, 1993.

Number of Work-Related Asthma Cases Reported to Massachusetts SENSOR, March 1992-July 2000

May 2000	June 2000	July 2000	Total to Date (3/92-7/00)
6	5	3	784