Occupational Airways

A newsletter of the Occupational Health & Special Projects Program, Division of Environmental Epidemiology and Occupational Health (EEOH), Connecticut Department of Public Health, 410 Capitol Avenue, MS# 11OSP, P.O. Box 340308, Hartford, CT 06134-0308 (860) 509-7744

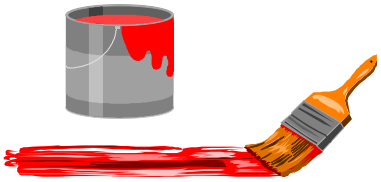
Vol. 3. No. 1 **May 1997**

This issue:

REACTIVE AIRWAYS DYSFUNCTION SYNDROME (RADS)

by Adam L. Seidner, MD - Fellow, UCONN Health Center, Division of Occupational and Environmental Medicine, Farmington, CT

Over two hundred agents have been identified as causes of work-related asthma. It is estimated that two to fifteen percent of adult asthma cases are caused by some chemical irritant or immunogen in the work environment.[1] Occupational asthma is recognized as a result of the development of an immune response to a variety of agents such as animal proteins and isocyanates. It has also been reported to develop after a single inhalation exposure to high levels of irritant gases, fumes or vapors, eliciting a nonimmunological response. This condition was coined Reactive Airways Dysfunction Syndrome (RADS) by Brooks and colleagues in 1985[2].



RADS has been seen in exposure at home and in the workplace to various chemicals such as ammonia, chlorine, toluene diisocyanate (TDI) and glacial acetic acid.[3] Table 1 lists other agents that have been known to cause RADS.

Table 1
Selected Occupational Exposures Which Cause RADS[4,5,6]

Acetone	Hydrogen Sulfide
Ammonia	MDI (methylene bisphenyl isocyanate)
Bleaching Agents	Perchloroethylene
Chlorine	Pesticides
Cleaning Agents	Rust Inhibitors
Cutting Oils	Smoke
Detergents	Sodium Hydroxide
Disinfectants	Solvents
Floor Sealants	Sulfur Dioxide
Formaldehyde (high concentration)	Sulfuric Acid
Glacial Acetic Acid	TDI (toluene diisocyanate)
Hydrochloric Acid	Trichloroethylene
	Welding fumes

Clinical manifestations of RADS are considered similar to those of immunogenic asthma, and include inflammation, airway hyperresponsiveness and reversibility of 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. Therefore, standard diagnostic immunogenic procedures for asthma caused by immunogic agents cannot be utilized for RADS. Accurate diagnosis of RADS relies on patient history and demonstration of persistent nonspecific hyperresponsiveness.[3]

Brooks and colleagues outlined a diagnostic criteria for RADS as follows: [2]

- Documented absence of previous respiratory complaints, no atopic predisposition
- Onset of symptoms after a single specific exposure incident or accident
- Exposure to a gas, smoke, fume or vapor that was present in very high concentrations and had irritant qualities

- Onset of symptoms occurring within 24 hours after the exposure and persisting for more than three months
- Immediate medical attention required
- Symptoms simulating asthma, with cough, wheezing, and dyspnea predominating
- Airflow obstruction possibly shown on pulmonary function tests
- Bronchial biopsy specimen with mucosal damage and inflammation without eosinophilia
- Positive methacholine challenge testing
- Other types of pulmonary diseases ruled out[7]

Atopy has not been found to be a risk factor for RADS. Patients with pre-existing asthma may develop symptoms after exposure to a nonspecific irritant. However, this is not considered RADS, but a temporary exacerbation of a pre-existing condition. [5,7]

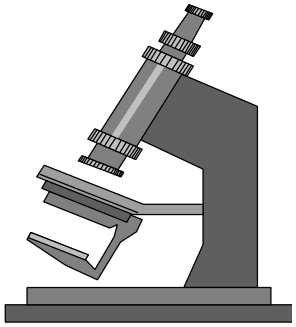
Once RADS has been diagnosed, because of the nonspecific bronchial hyperresponsiveness, the patient is subject to respond to other environmental stimuli, such as cigarette smoke, cold air, vehicle emissions, and common household chemicals (hairsprays, perfumes, cleaners, bleaches).[7]

Pathophysiology:

The basic pulmonary reactions to toxic agents may include bronchoconstriction, vasoconstriction, increased vascular permeability, and inflammation. These events are mediated or modulated by biogenic amines, peptides, enzymes and acidic lipids. The prostaglandins, prostaglandin endoperoxides, thromboxanes, bradykinin, spasmogenic lung peptide, and proteases may all play a role in the development of irritant-induced pulmonary disease.[8]

An irritant receptor has been proposed for the bronchoconstriction seen in patients with irritant asthma. Stimulation of irritant cough receptors by inhaled material and mediation by the vagus nerve is prominent among those pathogenic processes producing airways obstruction in asthmatics.[8]

In persons with immune mediated asthma, the pathomorphologic biopsies taken from bronchi usually show neutrophilic and lymphocytic infiltrations as well as frequent and severe destruction of the bronchial epithelium. The pathologic findings in patients with RADS has been conflicting. Research has indicated that patients with RADS do not have these eosinophilic infiltrations or basement membrane thickening. However, other research has demonstrated an increased number of cells with a predominance of lymphocytes, and biopsy specimens have shown increased basement membrane thickness.[3] If a common pathway exists for irritant or nonimmune asthma and asthma with an immune basis, then pathologic changes common to both would be expected.



Discussion:

Occupational asthma is not a single entity even when a single specific causal factor can be identified in the workplace. There continues to be controversy as to whether RADS is a “real clinical entity” and whether it is a form of occupational asthma, although the majority of data show that it is a distinct clinical entity. Therefore, the physician must be aware of the patient's entire medical history, the precise occupational exposures, and be able to demonstrate a cause-and-effect relationship before making a definitive diagnosis of work-related asthma.[7]

When a causal relationship between the occupational agent and asthma has been established, the most important part of the treatment is protection from the exposure. This can be accomplished through substitution of materials, ventilation, personal protective

equipment, or change in job. These industrial exposures can cause permanent impairment.

Individuals with RADS are treated in the same manner as other asthmatics. The use of beta 2-adrenergic drugs, steroids, inhaled cromolyn and ipratropium can be helpful. Prevention of RADS requires plans for reducing or eliminating accidents and spills, plans for engineering controls and proper and effective local exhaust ventilation, and plans for emergency response if spills or releases occur. There is still much research needed to understand RADS, its pathogenesis and appropriate forms of treatment.

For more information, contact Dr. Adam Seidner at University of Connecticut Health Center at 860/679-2893.

REFERENCES

1. Bardana EJ; "Occupational asthma and related respiratory disorders", Disease-A-Month 1995 Mar;41(3):143-99.

2. Brooks SM; Weiss MA; Bernstein IL; "Reactive airways dysfunction syndrome (RADS).Persistent airways hyperreactivity after high level irritant exposure", Chest, 1985 88:376-384.

3. Gautrin D; et al; "Is reactive airways dysfunction syndrome a variant of occupational asthma?", Journal of Allergy & Clinical Immunology 1994 Jan;93(1 Pt 1):12-22.

4. Bardana E, Montanaro A, O'Hollaren MT, "Occupational asthma", Philadelphia: Hanley & Belfus, Inc. 1992.

5. Chan-Yeung M; Malo JL; "Aetiological agents in occupational asthma", European Respiratory Journal 1994 Feb;7(2):346-71.

6. MA Department of Public Health, Occupational Health Surveillance Program and the MA Thoracic Society, "Reactive Airways Dysfunction Syndrome (RADS)", SENSOR Occupational Lung Disease Bulletin 1995 Jan.

7. Alberts, WM; "Reactive airways dysfunction syndrome", Chest, 1996 Jun; 109 (6): 1618-26.

8. Meggs WJ; "RADS and RUDS: the toxic induction of asthma and rhinitis", Journal of Toxicology-Clinical Toxicology 1994;32(5):487-501.

REPORT Cases Of Occupational Disease For 1997 NOW!

For more information, call (860) 509-7744

Summary of Number of Reported Cases of Selected Respiratory Diseases

CT DPH Occupational Disease Surveillance Data

	1994	1995	1996*	1997	ODSS Total**
Asthma	13	34	35	3	125
RADS* **	1	1	5	2	15
Silicosis	4	1	0	0	7
Asbestosis	3	5	10	0	45
Asbestos-related pleural diseases	17	8	7	1	123
Total	38	49	56	6	315

* As of April 30, 1997. Data subject to change.
** Occupational Disease Surveillance System (ODSS) total since 11/91
*** Reactive Airways Dysfunction Syndrome

Newsletter Evaluation Review

Thank you to all those who responded to the newsletter evaluation in the December 1996 issue of *Occupational Airways*. The majority of responses indicated its usefulness to the readers. The newsletter was rated an average of 8 for quality, on a scale of 1-10, with 10 being the highest. Some suggestions for future topics include silicosis, hypersensitivity pneumonitis, indoor air quality, radon, mesothelioma and latex allergies. Although the June 1996 issue of *Occupational Airways* focused on one issue around latex (latex hypersensitivity in health care workers), more attention may be warranted.

If you have not submitted an evaluation and would like to do so, please feel free to fax or mail it according to the instructions on the form. If you need a copy of the evaluation form, please call 860/509-7744.

Environmental and Occupational Reference Guide

This guide lists environmental and occupational health-related federal, state and private agencies and organizations with their phone numbers. A list of web sites is also included.

For a copy of this guide, please call 860/509-7742.

Connecticut Department of Public Health
Division of Environmental Epidemiology & Occupational Health
410 Capitol Avenue, MS# 11OSP
P.O. Box 340308
Hartford, CT 06134-0308

TO:

DPH NOTES:

1997 Reportable Diseases and Reportable Laboratory Findings

Three respirable agents have been added to the Department of Public Health's Reportable Disease list this year. Clinicians and laboratories are now required to report [all] cases of **carbon monoxide poisoning** and **mercury poisoning** to DPH. In addition, **Legionnaire's disease** is now reportable.

The objectives for surveillance of these conditions are: (1) to describe the magnitude and epidemiological features of these problems; and (2) to determine risk factors for occurrence in order to design and implement intervention and prevention programs. To meet these objectives,

- Clinicians should report any suspect case of carbon monoxide (CO) poisoning, including use of hyperbaric chambers to treat suspect cases, and any suspect case of mercury (Hg) poisoning.
- Laboratories should report carboxyhemoglobin levels > 12%.
- Laboratories should report urine Hg ≥ 35 μg/g creatinine and blood Hg ≥ 1.5 μg/dL.

For more information, a complete list of reportable diseases for 1997 or for *Reportable Disease Confidential Case Report* forms, please call the Infectious Disease Epidemiology program at 860/509-7994. For copies of the *Physician's Report of Occupational Disease* forms, please call the Occupational Health program at 860/509-7744.

Occupational Airways is produced by the Occupational Health & Special Projects Program, Division of Environmental Epidemiology & Occupational Health, Connecticut Department of Public Health.

Editor:
Juanita Estrada, Epidemiologist

Staff:
Carolyn Jean Dupuy, Director
Betty Jung, Epidemiologist
Marian Heyman, Epidemiologist/Industrial Hygienist

Contributor to this edition:
Adam Seidner, MD