

SUMMARY: HEALTH IMPACT OF THE NAPP TECHNOLOGIES FIRE
Division of Environmental and Occupational Health Services
New Jersey Department of Health and Senior Services
April 1997

BACKGROUND

On the morning of April 21, 1995, an explosion and fire occurred at the Napp Technologies, Inc. facility in Lodi, New Jersey, killing five employees. The explosion occurred in a chemical mixing tank containing aluminum powder, sodium hydrosulfite, potassium carbonate and benzaldehyde. The consequent fire burned for several hours, requiring the coordinated emergency response of numerous local, state and federal agencies to control and extinguish the flames. Smoke from the fire drifted over residential and commercial areas for several miles to the north and west, prompting the evacuation of hundreds of persons. Runoff from the scene caused a fish kill in the adjacent Saddle River. The specific sequence of events leading up to the explosion and fire is under investigation by the U.S. Occupational Safety and Health Administration (OSHA) and the U.S. Environmental Protection Agency (EPA).

Over 900 emergency personnel from at least 30 municipalities responded to the event at Napp Technologies, including firefighters, police and sheriff staff, emergency medical technicians (EMTs), public works staff, local health officials, state and federal agencies, and volunteer aid organizations. The health risk to emergency responders and nearby populations who may be exposed to hazardous materials during a fire is often difficult to assess. In events involving combustion of chemical mixtures and building materials, the specific by-products of combustion are not usually known at the time of the event or after. Accurately measuring exposure is a difficult task due to the dynamic conditions of an emergency event. Emergency responders must control the fire to protect the public from exposure to the resulting smoke regardless of its specific chemical nature.

Shortly after the Napp explosion and fire, a team of epidemiologists, industrial hygienists, and public health nurses from the New Jersey Department of Health and Senior Services (NJDHSS) and the Bergen County Department of Health Services (BCDHS) undertook a series of public health investigations and other activities to address public health concerns. First, in cooperation with physicians of the Hackensack Medical Center (HMC), BCDHS staff conducted a medical records survey to determine the number of persons who sought medical attention for problems experienced during or in the weeks following the fire, and to assess the nature of their health complaints. Second, the NJDHSS conducted a survey of all identified emergency responders to assess the frequency of symptoms experienced and the kinds of personal protective equipment employed. Third, the NJDHSS is cooperating with the University of Medicine and Dentistry of New Jersey (UMDNJ) in a study of the long term respiratory health effects among those

who experienced acute respiratory effects during the fire. Finally, NJDHSS inspected the emergency operations of several municipalities and is assisting them in the continued preparedness and safety of emergency response units.

FINDINGS

Medical Records Survey

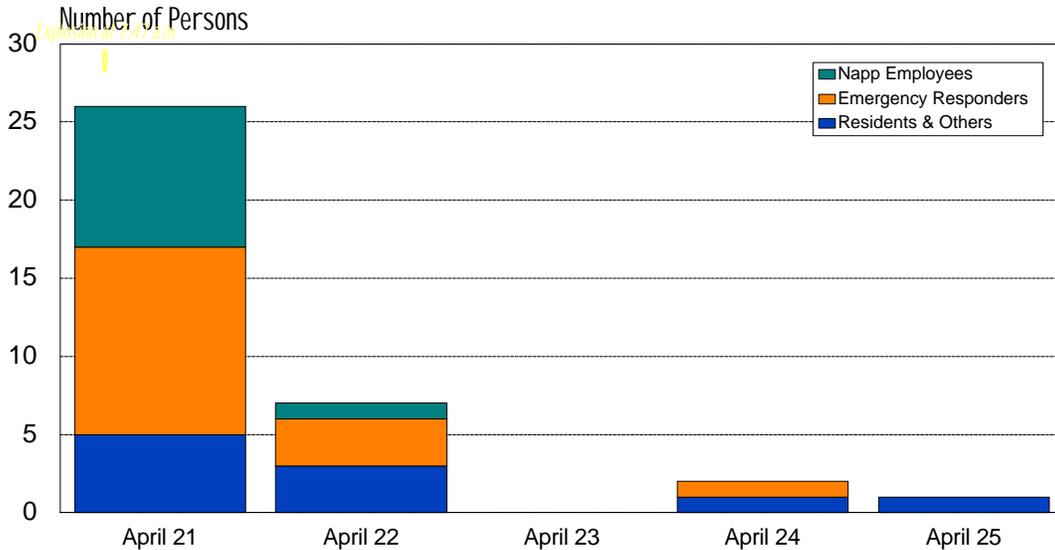
The purpose of this survey was to assess the number of individuals presenting for emergency medical care at the HMC emergency department with complaints attributed to the Napp Technologies explosion and fire, and to describe these individuals, their reported symptoms, examination findings, medical tests, treatments received, and diagnoses. During the response to the event, the HMC emergency center acted as the principal medical center for the treatment of affected individuals. The HMC also established a referral network of specialist physicians to examine persons concerned about possible effects from exposure. Other area hospitals and physicians may have seen patients with complaints related to the fire, so that the statistics below may underestimate the total numbers of affected persons.

Public health nurses from the BCDHS conducted the survey by reviewing and gathering detailed data from medical records of individuals presenting at the HMC emergency room from the time of the explosion at Napp Technologies through May 9, 1995. This period of time was chosen to capture all patients who may have experienced an immediate or delayed acute effect from exposure to the event. In addition, patient records from the period May 10 through June 21, 1995 were reviewed from the physicians comprising the HMC referral network. The data were compiled on medical abstracting forms developed by NJDHSS specifically for this survey. BCDHS sent completed forms to NJDHSS for computer entry and analysis.

Several categories of patients were revealed by the medical records survey: employees of Napp Technologies, emergency responders (firefighters, emergency medical technicians, police), employees of nearby businesses, and residents of neighboring communities. Each category was considered in the analysis because of the differences in the nature and magnitude of potential exposures.

Four Napp Technologies employees were killed at the scene by the blast and fire, and ten others were taken to the HMC emergency center for treatment, one of whom died later of injuries. Sixteen emergency responders and nine others were also taken to the HMC emergency center for medical attention during the first five days following the explosion and fire (April 21 to 25) (Figure 1). Additional emergency responders and nearby residents sought medical attention at the HMC emergency center during the next two weeks.

Figure 1. Emergency Room Visits Related to the Napp Technologies Fire
 at the Hackensack Medical Center, April 21-25, 1995
 Health Impact of the Napp Technologies Fire



The symptoms experienced by treated individuals included respiratory effects such as cough, chest tightness, sore throat, wheezing, and shortness of breath. Other symptoms commonly experienced by treated individuals included headache, nausea, vomiting and dizziness. Similar symptom frequencies were seen in the different patient categories. Physical examinations showed high pulse and respiration rates, upper respiratory tract irritation, and lung wheeze in many of the patients. Several Napp employees showed signs of emotional distress from the traumatic event.

A large proportion of emergency responders seen at the HMC emergency center were diagnosed with smoke inhalation, and nearly a third were considered to have suffered an episode of asthma or reactive airways dysfunction syndrome (RADS). A similar large proportion of residents were diagnosed with respiratory effects from inhalation of smoke or toxic vapors. Diagnoses differed for Napp employees, with burns and abrasions or contusions being most commonly recorded.

Emergency Responder Survey

The NJDHSS conducted a survey of individuals who responded to the Napp Technologies explosion and fire regarding health symptoms experienced during the fire, duties performed, and personal protection equipment worn. The purpose of this survey was to assess the frequency and types of symptoms experienced by all emergency

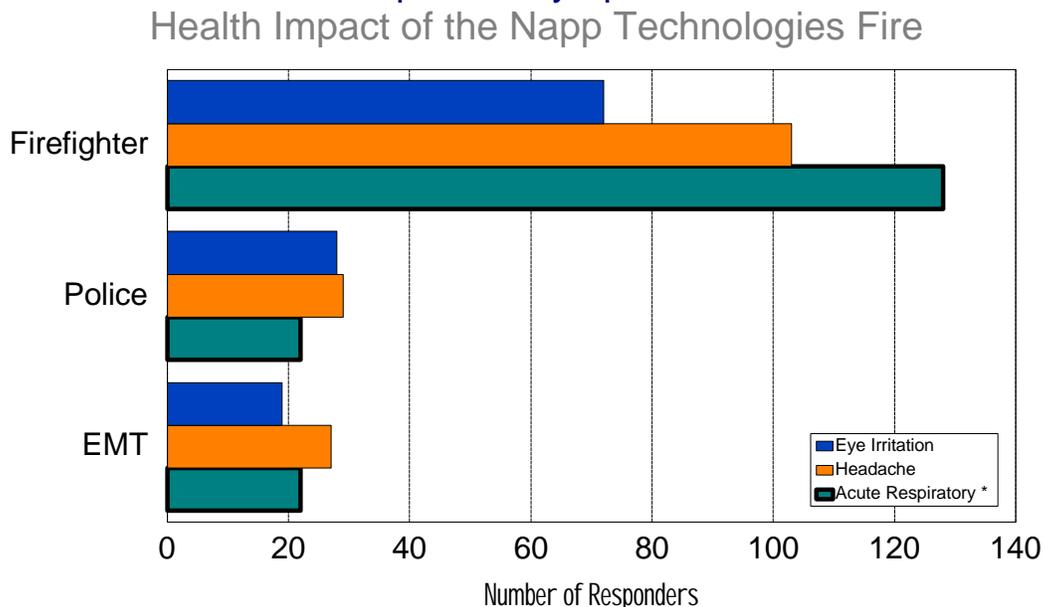
responders, to see if certain job categories or duties were associated with greater risk of symptoms, and to examine the use of personal protective equipment in the response.

NJDHSS staff sent survey questionnaires to over 900 individuals from 113 agencies and organizations involved in the emergency response at the Napp Technologies event, including firefighters, police officers, emergency medical technicians (EMTs), and persons involved in management and support services. NJDHSS received a total of 505 completed questionnaires.

Twenty-two emergency responders reported having sought medical attention at a hospital emergency room. Most were firefighters (14), while five EMTs and 3 police personnel also reported emergency care. Most of the emergency responders (81%) reported seeking no medical care as a result of the Napp Technologies fire.

The most commonly reported effects experienced within 48 hours of being on-scene at Napp Technologies were headache, eye irritation, and acute respiratory symptoms (Figure 2). About 60% reported experiencing at least one symptom. Approximately 20% of firefighters, police and EMTs reported one or more symptoms consistent with a strict case definition of an acute respiratory health effect (wheezing, shortness of breath, or chest tightness), while 46% of firefighters and over 30% of police and EMTs experienced symptoms consistent with a broader case definition including nasal congestion and cough.

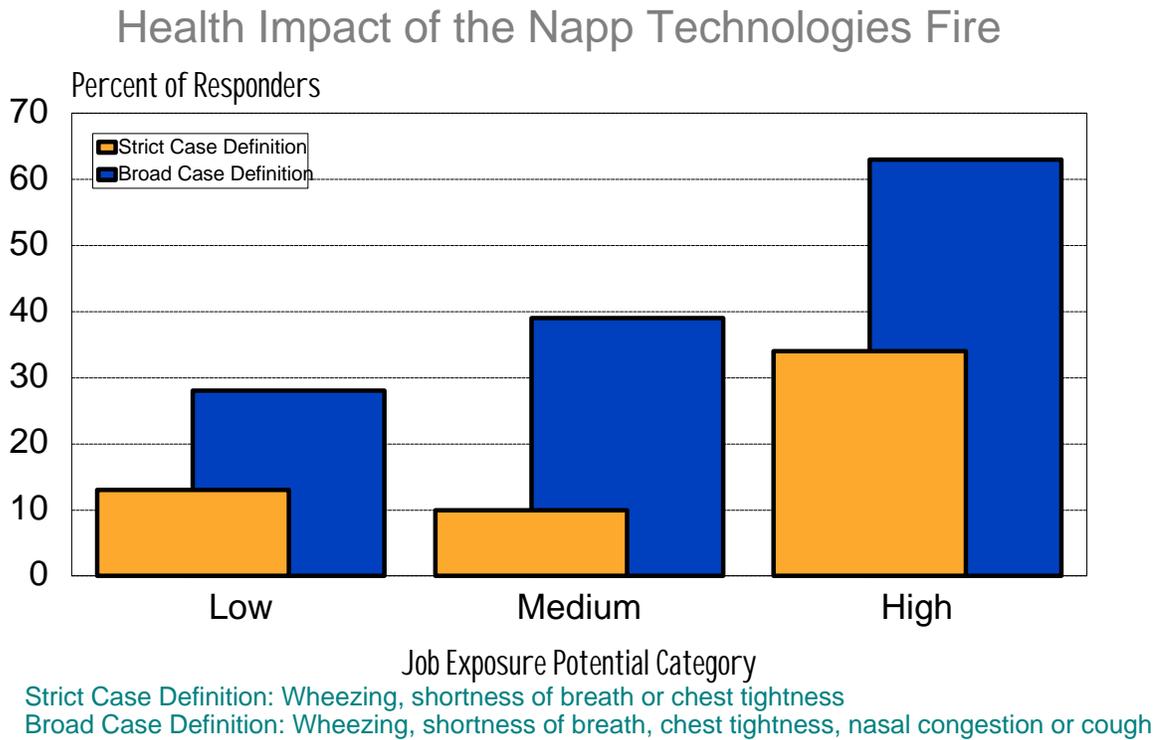
Figure 2. Number of Emergency Responders Experiencing Exposure Symptoms



* Wheezing, shortness of breath, chest tightness, nasal congestion or cough
EMT: Emergency medical technician

Acute respiratory health effect symptoms (strict case definition) were about three times as common among responders doing jobs with high potential exposure (34%) than in those with medium or low exposure potential (Figure 3), a finding that underscores the critical importance of continued training and the proper use of personal protective equipment under the difficult conditions of firefighting. Eye and throat irritation and skin rashes were also notably increased in the responders doing job duties with high exposure potential.

Figure 3. Percent of Emergency Responders Meeting Case Definitions by Exposure Category



In their survey response, several emergency responders performing support services (such as heavy equipment operators) expressed a desire for more safety training and protective equipment to be better prepared for emergency operations. In addition, anecdotal reports indicated that responders initially on the scene were not specifically aware of the nature of the hazardous materials in the burning facility.

Clinical Follow-up Study of Respiratory Health Effects

In 1994, the Occupational Health Division of the Department of Environmental and Community Medicine at the University of Medicine and Dentistry/Robert Wood Johnson Medical School (RWJMS) and NJDHSS began a joint study entitled "Bronchial Hyperreactivity Following Acute Inhalation Injury." The NJDHSS and RWJMS agreed to include in this study individuals who experienced respiratory symptoms associated with exposure from the Napp Technologies fire.

The purpose of this study is to measure the severity and persistence of respiratory problems and to assess risk factors and treatments that affect these measures. Eligible individuals who agree to participate in the study will receive a free medical evaluation of their respiratory system.

The RWJMS will summarize the results of this ongoing study upon its completion.

Municipal Emergency Preparedness Inspections

To affirm the importance of emergency preparedness and the protection of workers called upon to respond to dangerous emergency events, the NJDHSS Public Employees Occupational Safety and Health Program (PEOSH) mailed a set of materials to officials in each municipality having employees on scene at the Napp Technologies fire. These materials included relevant state and federal worker protection standards and model programs for local implementation.

The NJDHSS then conducted a series of targeted inspections to examine compliance with these standards in seven of the municipalities, with an emphasis on the local emergency response worker protection plan, responder training, provisions for medical surveillance and consultation, and availability of adequate personal protective gear. Seven municipalities were inspected: Lodi, Secaucus, South Hackensack, East Rutherford, Emerson, River Edge, and Wayne.

The inspections revealed certain inadequacies in some municipalities, particularly in the maintenance of emergency response worker protection plans and a written respiratory protection program. Each municipality was notified in writing of potential violations, if any, uncovered by the inspections and specific recommendations for compliance. The NJDHSS also notified the New Jersey Department of Labor which is responsible for the possible issuance of citations for these violations.

CONCLUSIONS AND RECOMMENDATIONS

- 1) The Napp Technologies explosion and fire on April 21, 1995, in Lodi, N.J., was a major emergency event which resulted in the deaths of five Napp

Technologies workers. Nine other Napp Technologies workers received emergency medical treatment at the Hackensack Medical Center (HMC). Hundreds of firefighters, police officers, emergency medical service technicians, and support service providers from local, state and federal agencies were needed to bring the fire under control. Sixteen emergency responders were treated at the HMC during the five day period following the explosion (April 21 to 25), and seven more sought emergency care in the next two weeks. Nine nearby residents, workers at nearby businesses, or others also sought emergency medical attention in the first five days, and ten more sought emergency care in the following two weeks.

The full public health impact of the event is not measured by these statistics alone. The NJDHSS medical records survey was restricted to conditions requiring acute medical care. A much larger, unmeasured number of community residents may have suffered symptoms related to low level exposure to smoke from the fire not requiring emergency care.

During a major event such as the Napp Technologies fire and explosion, and the subsequent response by emergency management agencies, the public's health -- including that of site workers, emergency responders, and community members -- is placed at risk. It is imperative to maintain strong prevention efforts, assure emergency response preparedness, and develop capacities for assessment of public health impact in the wake of events like this.

- 2) Over 500 hundred emergency responders participated in an NJDHSS survey. The results of the survey show that over 300, or approximately 60% of participating emergency responders, experienced one or more symptom. The most common symptoms were headache, sore throat, eye irritation, cough, and nasal congestion. Twenty percent of emergency responders reported one or more symptoms meeting a strict case definition for acute respiratory problem (wheezing, shortness of breath or chest tightness). Emergency responders whose job duties involved the greatest risk of exposure were more likely to experience symptoms meeting the strict case definition.

In view of the frequency of reported respiratory symptoms among emergency responders, the adequacy of worker training programs in hazardous materials and personal protective equipment use (particularly air purifying and supplied air respirators) should be continually examined and updated.

- 3) Inspections of some of the municipalities for compliance with relevant emergency responder worker protection standards revealed inadequacies

in the maintenance of worker protection plans. While enforcement actions may result, the NJDHSS is working to assist municipalities to meet the federal and state requirements that ensure the safety of emergency responders.

The NJDHSS should continue activities which remind all municipalities involved in the response to the Napp Technologies fire, and elsewhere, of the applicable safety standards, regulations and the availability of model plans pertaining to emergency responder protection. All agencies responsible for emergency response should continue vigilance regarding the adequate training of responders in hazardous materials and the use of personal protective equipment.

- 4) The response to the emergency event involved supportive efforts by workers not usually considered "emergency responders" such as public sector heavy equipment operators expected to respond to uncontrolled releases of hazardous substances. Current training in hazardous materials management and personal protective equipment may be inadequate for these workers.

The NJDHSS recommends periodic review of roles and training needs for the protection and safety of all workers involved in emergency response, as required under the Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120). Existing training courses such as those offered by the New York/New Jersey Hazardous Materials Worker Training Center should be extended to workers who provide support to emergency responders.

- 5) There is a need for effective systems for on-scene notification of hazardous materials likely to be faced by emergency responders, particularly those who are first on-scene.

Consideration should be given to broader use of a building placarding system such as the one developed by the National Fire Protection Association, so that key hazard information is conveyed to emergency responders in an appropriately timely manner.

A copy of the full technical report of this investigation is available by writing to the Office of the Assistant Commissioner, Division of Environmental and Occupational Health Services, New Jersey Department of Health and Senior Services, PO Box 360, Trenton, N.J. 08625 or by calling (609) 588-7463.