Determining The Birmingham Fire and Rescue Service's Abilities To Manage An Incident Involving Nerve Or Mustard Agents

EXECUTIVE DEVELOPMENT

BY: Robert C. Sorrell
Battalion Chief
Birmingham Fire and Rescue Service
Birmingham, Alabama

An applied research project submitted to the National Fire Academy
as part of the Executive Fire Officer Program

September 1998

Abstract

The problem identified for this applied research project was that the Birmingham Fire and Rescue Service had never been evaluated as to its abilities to handle an incident involving chemical warfare agents (CWAs). It was the author's purpose in preparing this study to determine whether or not the department could handle an incident involving these agents and if not, what could be done to prepare the department for this type of incident. The historical research method was used in collecting data for this study .

The procedures used to collect data relative to this study included a literature review and a 20 question survey. References were obtained from several sources including the National Fire Academy's Learning Resource Center (LRC), the internet, commercially available reference materials and from materials gathered from seminars, meetings and training programs.

The research questions that were identified are:

1. What is the possibility of an incident involving Chemical Warfare Agents occurring in Birmingham, Alabama?
2. How prepared is the Birmingham Fire and Rescue Service to manage an incident of this type?

3. Do the members of the Birmingham Fire and Rescue Service feel that they are trained and equipped to respond to an incident of this type?
4. Are outside resources available for supporting the department in case of an incident of this type?

A survey was conducted of 100 members of the Birmingham Fire and Rescue Service. The survey included questions on training, equipment , experience and whether members felt that an incident of this type was a possibility. The results were analyzed as to what patterns and relationships existed (if any).

Additional information was gathered by inventorying the department's present assets such as the Hazardous Material Unit, Decontamination Unit and Rescue Units as to training, experience, protocols and available equipment. Other departments were also assessed as to the availability of additional equipment or resources.

The results of this study indicated that the department was marginally prepared for an incident of this type. While some equipment was available and while some training was applicable, overall the department is not prepared for an incident of this type.

The recommendations made for improving the department's response to an incident involving Chemical Warfare Agents included formulating SOPs for responding to such incidents, procuring detection and decontamination equipment , developing a training program for dealing with CWAs and having drills on responding to these types of incidents, upgrading EMS awareness and response to CWA incidents and improving response times of outside agencies in the event of a CWA incident.

Table Of Contents

PAGE

Abstract…….2

Table of Contents……5

Introduction……...6

Background and Significance……8

Literature Review……10

Procedures……19

Results……25

Discussion……36

Recommendations……..39

References……43

APPENDICES

Appendix A - Survey and Results……47

Appendix B - Acronyms……59

Introduction

The scope of research contained within this paper is limited to the question of whether or not the Birmingham Fire and Rescue Service is prepared to face an accidental release of a nerve (organophosphate poison) or a mustard gas. The accidental release aspect was chosen because a threat analysis indicated that an accidental release was more of a probability than a terrorist attack involving these chemicals. These substances (nerve or mustard gas) were chosen because more of these materials are in the area than any of the other Chemical Warfare Agents (CWAs)and to have brought any of the other CWAs into the study would have made the subject too broad and unmanageable for a paper of this length.

Problem

The problem was that the Birmingham Fire and Rescue Service had never been evaluated as to its ability to handle an incident involving nerve or mustard gas.

Purpose

The purpose of this research paper is to determine the Birmingham Fire and Rescue Service's ability to respond to and successfully mitigate an incident involving nerve or mustard gas and to identify the methods that could be used to improve the department's capabilities to respond to an incident involving these materials.

Research Method

The historical research method was used to gather information for this project. The research consisted of a literature review and a survey that was answered by members of the department.

Articles and materials were obtained from the National Fire Academy's Learning Resource Center (LRC), commercially available reference materials, the internet and from reference materials gathered at seminars, meetings and training programs.

Research Questions

1. What is the possibility of an incident involving Chemical Warfare Agents occurring in Birmingham, Alabama
2. How prepared is the Birmingham Fire and Rescue Service to manage an incident of this type?
3. Do members of the Birmingham Fire and Rescue Service feel that they are trained and equipped to respond to an incident of this type?
4. Are outside resources available for supporting the department in case of an incident of this type?

Background and Significance

The City of Birmingham is the largest city in the state of Alabama. It had a population of 265,000 in 1997 and an area of approximately 163 square miles. It is served by three interstate highway systems and four railroad lines. The largest employer in the city is the University of Alabama at Birmingham.

The Birmingham Fire and Rescue Service

The Birmingham Fire and Rescue Service is a career department providing fire, EMS and specialty services. Birmingham had 684 personnel operating from 30 fire stations and the department responded to approximately 46,500 incidents during 1997.The department operated 29 engine companies, 3 truck companies, 2 quint companies, 10 ALS transport units, an airport station , a hazardous materials unit and a decontamination unit. Four battalion chiefs were on duty daily and the average daily manning is 153 personnel.

Sites of a Potential Nerve or Mustard Gas Release Within the Birmingham Metropolitan Area

Within the Birmingham metropolitan area, there are several sites where an incident involving nerve or mustard gases could occur. A transportation accident could occur on one of the interstate highways or on one of the railroads. While shipments of these materials (nerve and mustard gas) are uncommon, shipments of organophosphate poisons are not. There are two large wholesale or distribution points for organophosphate poisons within the city and as it will be shown, numerous potential sites for these poisons exist.

There are two large research facilities located within the city and a least one of them has been confirmed to have a supply of nerve and mustard gas. While not located within the city, the Anniston Army Depot lies approximately 50 miles east of the city and according to its website (http:///www.cbdcom.apgea.army.mil.),

located on the depot is 7.4% or 2,254 tons of the nation's stockpile of chemical weapons consisting primarily of nerve and mustard gas.

Executive Development Course

The Executive Development course portion of the National Fire Academy's Executive Fire Officer Program provided guidance on the development of this project. Unit 3 on Research and Unit 4 about Problem Solving provided guidance in the development of this project. The section on research guided the author on the search for relevant information and the section on problem solving directed the author on how to determine whether or not the department was prepared to face an incident involving nerve or mustard gas.

Literature Review

The majority of the literature review involved materials obtained from the internet. While some materials were obtained from the Learning Resource Center (LRC) at the National Fire Academy, useable information was limited because most of the information pertained to terrorist releases of nerve and mustard gas and not accidental releases. Other information was gathered from commercially available reference materials, military sources and materials from classes, meetings and interviews (both telephone and personal).

Historical Background

Eifried (1997) stated that in 1993, Under Secretary of State Bartholomew, while testifying before the Armed Services Committee, stated that "We are especially concerned about the spread of biological and toxic weapons falling into the hands of terrorists…To date (1993) , we have had no evidence that any known terrorist organizations have the capability to employ such weapons…However, we cannot dismiss the possibilities… It may only be a matter of time before terrorists acquire and use these weapons."

On March 20,1995 at approximately 8 A.M. several members of the Aum Shinrikyo or Supreme Truth cult released an impure variety of sarin gas into the subway system in Tokyo. This attack killed 12 and sent over 5,000 to hospitals.

William C. Mann (1995) reported that in 1995, Senator Richard Lugar stated that " Americans have every reason to expect a nuclear , biological or chemical attack before the decade is over" (p. A6).

Douglas and Livingston (1982) wrote that a group of chemical/biological warfare experts stated in 1969 that " A large scale casualty- causing operation against a civilian population might cost $2,000 per square kilometer with conventional weapons and only $600 with nerve agents. "

Hurwitz (1982) wrote that both the USA and Britain have declassified and even published the formula for making nerve agents. Since the techniques for manufacturing nerve gas are similar to those for making insecticides and in some

cases may simply involve taking as intermediate products insecticides or other products that can be purchased commercially and putting them through one additional chemical reaction. Mullins in 1992 stated that one author wrote that "ball point pen ink is only one chemical step removed from Sarin (GB)" (p.108-109).

Livingston in 1987 stated that according to one source, "the US government has acknowledged that a small amount of the agent VX is presently unaccounted for".

Sidell in 1995 wrote that many years ago, chemical agents were stored or tested on military installations that have since been relinquished by the government. Periodically, some of these agents are unearthed or discovered during new construction on the sites. An example of this was the recovery of World War I munitions in the American University area of Washington, D.C.. These "non-stockpile" chemicals must be dealt with during restoration or development of this land. More and more of these abandoned sites are being converted to other uses and responders must be prepared.

Local Influences

The Anniston, Alabama Army Depot's (1998) web site indicates that 2,254 tons (4,508,000 pounds) or 7.4% of the United State's stockpile of chemical weapons is stored at Anniston and these contain the agents GB (Sarin), VX and mustard gas.

In an article that appeared in the Birmingham News on July 30,1998, James Long stated that the Army has seriously underestimated the danger from nerve agents stored at its depots. The latest study has shown that Sarin gas (GB) is probably twice as dangerous when inhaled as the Army previously thought. (p. 16).

Bilski and Kakuchis (1995) stated that Sarin is fatal at about .01 milligrams per kilogram of human weight (1 to 1 million parts by weight) and that if a fatal dose is absorbed, death will occur within 15 minutes (p.29). Sidell (1995) wrote that the lethal dose for VX is 10 milligrams , a droplet that will cover just two columns of the Lincoln Memorial on the back of a penny (p. 74).

Dr. Sidell also states that nerve agents are extremely potent organophosphorus compounds and that the more widely known such as Tabun (GA) , Sarin (GB) , Soman (GD) , GF and VX are similar in structure and biological activities to some commonly used insecticides such as Malathion 7 and are similar in biological activity to carbamates used as insecticides such as Sevin 7 and used in medicines such as Mestinon 7, Neostigmine 7 and Antilirium 7 (p.18-19).

Birmingham's (Alabama) Southern Research Institute's web site (http://www.sri.org.) states that the Institute's current inventory includes the agents GA (Tabun), GB(Sarin), GD(Soman), TGD(GD + a thickener), VX, HD(distilled mustard), HT(mustard + a thickener), T and L (Lewisite).

While the threat of a terrorist attack on Birmingham using these agents exists, telephone interviews with Alan Kneiffer of the Birmingham-Jefferson EMA on August 3,1998, Captain Cruchfield of the Birmingham Police Department's Tactical Unit on August 7,1998 and an FBI agent ,who wishes to remain anonymous, on August 17,1998 , the threat of an attack on Birmingham using nerve or mustard agents is rather small. However, according to Kneiffer, the possibility of an accidental incident involving these agent is a possibility.

Preparedness Issues

On September 23,1996, Public Law 104-201, The Defense Against Weapons of Mass Destruction Act was passed and in section 21it states that: State and local emergency response personnel are not adequately prepared or trained for incidents involving nuclear, radiological, biological and chemical weapons.

In March 1996, Chief Lamont Ewell, the then president of the International Association of Fire Chiefs told the United States Senate's Permanent Subcommittee on Investigations that " It would be the responsibility of local firefighting, police and emergency medical units to cope with a terrorist attack that used nuclear, biological or chemical weapons". He also stated that Fire/Police/EMS services were not prepared for the challenge.

According to Macko (1996), multi jurisdictional agencies performed poorly in exercises that concentrated on chemical or biological incidents in New Orleans in 1994 and in New York and Los Angles in 1995 .

Zeigler in 1996 wrote that " Emergency response teams are struggling to prepare for the casualties and exposure that they might face because of terrorism or an accidental release" (p. 182).

Medici and Patrick in 1995 wrote that "Chemical agents are no longer the exclusive property of military forces and a threat to be anticipated only on the battlefield" (p.5). They also felt that "It is essential to expand the scope of

knowledge of all emergency responders concerning chemical and biological agents in order to be prepared to operate safely and effectively should the need arise. This awareness is essential for self protection as well as providing the capability to render aid and assistance to those affected" (p.6). They also wrote that managing an incident involving chemical agents can be conducted similarly to managing a conventional hazardous materials incident. But; they (Medici and Patrick) in 1995 also wrote that " Unique challenges may present themselves in many forms including: lack of specific information, mass casualties, multiple fatalities, a large scale crime scene, direct attack on public safety facilities or personnel" (p.26).

Federal Government Involvement

Public Law 104-201, the Defense Against Weapons of Mass Destruction Act of 1996 or the Nunn-Lugar-Domenici legislation resulted in the Domestic Preparedness Program (DPP) being instituted. This legislation was designed to enhance the capabilities of federal, state and local emergency response agencies to respond to incidents involving Weapons of Mass Destruction (WMD) including nerve and mustard gases.

In a news briefing from the Office of the Assistant Secretary of Defense on April 16, 1997, a Captain Doubleday stated: "One DoD role in the interagency (DPP) program is to develop a training program which marshals the federal expertise of a number of agencies including FEMA, DOE,HHS, EPA and Justice and to use this information to enhance local emergency responder's

capabilities". It also includes training for responders in 120 cities and a loan for 5 years of equipment and training aids to these cities; also included in the program is a Chemical/Biological Helpline (1-800-368-6498) , a Chemical/Biological Hotline (1-800-424-8802) and a domestic preparedness website (http://www.nbc-prepare.org).

Literature Review Summary and Current Resources

The literature review indicated that a threat from nerve or mustard gases did exist and that incidents had occurred, continue to occur and the probabilities exist for these incidents to continue to occur for the foreseeable future. The potential for an event of this type (whether accidental or intentional) in the Birmingham area exists and therefore the Birmingham Fire and Rescue Service must be prepared for them. The amount of nerve, mustard and organophosphate compounds in the Birmingham area indicates that resources, training and awareness should be focused on these materials.

The literature review also indicated that even a minute amount, which is a drop the size of a pinhead, of these substances can have a devastating effect on the citizens and public safety personnel. The amount of resources needed to handle even a small incident of these materials would tax the resources of even a large city.

Within the literature review, the author found that while a large body of material exists pertaining to nerve, mustard and organophosphate agents, much

of it does not appear to agree on how to best handle an incident involving these materials. It must therefore be up to the individuals to determine which course of action to follow.

The literature review also provided information on equipment, medical requirements , identifying the agent decontamination standards, preincident planning and training needs.

Within the past two years, the body of knowledge pertaining to chemical weapons in general and nerve, mustard and organophosphates in particular has grown significantly. With the United State's Government's increased interest in CWA's and with recent national and international events, the number of courses (ACTFAST, NFA's Emergency Response To Terrorism and the United States Army's Chemical/Biological Countermeasures Course for examples) have increased significantly. A number of reference books have also come on the market such as Sidell's Management Of Chemical Warfare Agent Casualties, Jane's Chem-Bio Handbook and Tempest Publishing's First Responder Chem-Bio Handbook . Literally dozens of CWA sites are available on the internet and offshoots of the United States Government's Domestic Preparedness Program (DPP) such as the Chemical/Biological Hotline and the Chemical/Biological Helpline have become available for public service personnel. What EMS was in the 1970's and Hazardous Materials was in the 1980's, CWA's are becoming in the 1990's.

PROCEDURES

The research procedure used in preparing this paper began with a literature review via the internet between May and July, 1998. Additional information was gathered from the Learning Resource Center (LRC) at the National Fire Academy in July, 1998. Co-workers and other individuals supplied additional reference materials along with the Birmingham Public Library and the author's own reference materials.

The literature review concentrated on two particular areas: first, was there enough reference materials available on CWA's to enable a paper to be done and second, was there enough of a potential of an incident involving these materials occurring in Birmingham, Alabama to warrant such a research paper?

The literature review provided a positive response to the first question and a number of interviews with local officials familiar with the area of CWA's and a local literature review provided a positive answer to the second question.

Information obtained from the United States Army's CBDCOM's internet site pertaining to the Anniston Army Depot's stockpile of CWA's and Southern Research's website listing the CWA's that they had on premises, convinced me these materials could prove a threat to the citizens of the City of Birmingham. This belief was reenforced with telephone interviews with Alan Kneiffer, Assistant Director of the Birmingham- Jefferson EMA on August 3, 1998; Steve Spencer, Birmingham Branch Director for ADEM on August 11,1998; Max Richard,

Chemical Safety Officer at UAB and Ralph Spafford, Director of the Toxic Agent Facility at Southern Research Institute on August 3,1998.

Personal interviews with Captain Mike Daniels, Captain of the Hazardous Materials Unit of the Birmingham Fire and Rescue Service on August 7,1998; Lieutenant Harry Williams, "C" Shift OIC of the Birmingham Fire and Rescue Service's Decontamination Unit on August 2,1998 and Captain William Gresham, Captain of the City of Hoover's Hazardous Materials Unit on August 23,1998 afforded a perspective on available fire department resources and procedures.

Telephone Interviews with a Colonel Morrow of the Alabama National Guard on August 18,1998 and a First Sergeant Harris, Duty NCOIC, 318th Chemical Company, United States Army Reserve on August 11,1998 provided information pertaining to the National Guard and Army Reserve's response capabilities to CWA's and limitations placed upon them by the Posse Comitatus Act.

Dr. John Huber who was personally interviewed on August 8, 1998 and Bruce K. Martin, Area Emergency Director - Birmingham Veteran's Administration Medical Center, who was interviewed by telephone on July 27,1998, provided insight into the medical ramifications and treatments needed for exposures to CWA's. Battalion Chief Floyd E. Wilks and Captain David E. Nathan of the Birmingham Fire and Rescue Service's EMS Division were personally interviewed on July 27,1998 to gain a perspective on the Birmingham Fire and Rescue Service's EMS's ability to respond to and treat victims exposed to CWA's.

In a personal interview on August 5,1998, Chief of Training James Laster of the Birmingham Fire and Rescue Service was questioned about the department's training and capabilities for responding to incidents involving CWA's.

A survey instrument (see Appendix A) was developed to survey members of the Birmingham Fire and Rescue Service as to the perceived ability of the Department to respond to incidents involving CWA's. Questions asked included questions pertaining to rank, experience, training, equipment and department preparedness.

The survey instrument was field tested on selected personnel, results analyzed and changes made. The survey was given to 100 members of the Birmingham Fire and Rescue Service over the two day period of August 2nd and 3rd, 1998 and all 100 surveys were returned to the author.

Data from the surveys was compiled, entered into a database , analyzed and used to answer research questions # 2 & #3. The survey also provided insight into the other research questions.

Limitations

The greatest limitation to the effectiveness of the survey was the method in which it was delivered. The author gave the survey to Department personnel over a two day period while they were attending multi-company practices. The author

distributed surveys , he explained the reason for the survey and he waited while the surveys were completed. He then took the survey up and left the area. This method of having the survey completed was probably flawed for several reasons. First ,they knew who was obtaining the information and benefits from the survey and how the person being surveyed felt about him may have influenced their responses. Second, he may have unduly placed pressure upon them by staying in the room while they were answering the questions on the survey. In hindsight, a better way to have had the survey answered was for it to be a blind survey. The person would not have known who or what the survey was for and perhaps this anonymous approach may have made for a “purer” set of answers.

Selected Terms

This list of terms may help readers to better understand uncommon terms and expressions found within the body of this applied research project

Carbamate: A synthetic organic pesticide containing carbon, hydrogen , nitrogen and sulfur.

Chemical Warfare Agents (CWA’s): A chemical substance that is intended to be used in military operations to kill or seriously those exposed directly to the chemical or to incapacitate people through its psycological effects.

Decontamination Unit: In the context of this paper, it is a fire department apparatus which carries equipment which is used to remove hazardous substances from the bodies and equipment of victims exposed to CWA's.

Hazardous Materials Unit: A fire department apparatus which carries reference materials, detection equipment, tools and protective equipment needed to mitigate an incident involving hazardous substances.

Organophosphates: The group of chemicals first developed in Germany in the 1930s as insecticides. The more potent of these are highly lethal to humans. These chemicals are also found as chemical warfare agents (CWA's). These materials are toxic to humans because they prevent proper transmission of nerve impulses.

Mustard Agents: Chemical warfare substances that cause blisters and redness to the skin. Referred to as mustard because of its characteristic odor.

Nerve Agents: Chemical Warfare Agents that are very toxic relatives to some common insecticides (organophosphates) and drugs. They cause biological effects by disrupting normal functions by which nerves communicate with muscles, glands and other nerves. Common agents of this type include GA (Tabun), GB (Sarin), GD (Soman) and VX (no common name). These materials are usually found and dispersed as a liquid even though they are known as nerve gas.

Weapons of Mass Destruction (WMD): Chemical, biological or nuclear devices which are designed to inflict large numbers of casualties on military or civilian populations.

RESULTS

1. What is the possibility of an incident of this type occuring in Birmingham?

In order to answer this question, the author found it necessary to first determine whether materials such as nerve or mustard gas were located in the city. The EMA provided information pertaining to the Anniston Army Depot's supply of CWA's and an internet search confirmed the types and amounts of materials that were located on the depot.

Interviews with safety personnel from the two largest research centers in the city which are Southern Research Institute and UAB, confirmed that they either presently had CWA's on site or that they had had them in the past. Southern Research's website confirmed this information.

Interviews with local law enforcement personnel indicated that periodically they had been called upon to provide escort services to CWA's while they were being transported through the city or to locations within the city.

Since nerve gas is an organophosphate poison, a search was made of the fire department's pre-fire plans and two storage or distribution points for organophosphates such as malathion, sevin and parathion were indicated. Additional retail sites for consumer sales of such products were also located.

After the literature review revealed that nerve gas could be manufactured in a laboratory environment, these also became possibilities for an incident.

After compiling information from these sources, the answer to Research Question #1 must be **YES**. There is a possibility for an incident involving these materials to occur in Birmingham, Alabama.

As answered in survey question #17, 81% of the surveyed felt that there was a possibility of an incident involving nerve or mustard gases occurring in Birmingham and that 79% in question # 18 felt that it would require fire department personnel to mitigate the incident. Question #16 indicated that the majority of the respondents (51%) felt that a transportation accident would be responsible for the incident. (See Appendix A for complete survey results).

2. How prepared is the Birmingham Fire and Rescue Service to manage an incident of this type?

To adequately answer this question, the author had to review the Birmingham Fire and Rescue Service's SOPs (Standard Operating Procedures); to inventory the equipment carried on the department's Hazardous Materials and Decontamination Units; to assess protective equipment issued to the department's fire and EMS personnel and to determine the level of training that department personnel had received.

SOPs:

The Birmingham Fire and Rescue Service has no SOPs pertaining to a response to incidents involving CWA's.

Hazardous Materials and Decontamination Unit Inventories:

Both the Hazardous Materials and Decontamination Units carry level A and B protective suits and 1 hour SCBAs (Self Contained Breathing Apparatus). These suits and SCBAs would provide personnel adequate body and respiratory protection against nerve and mustard gases. However; the limited number of these suits and SCBAs , which are 25 and 10 respectively is limited so that large scale or long term fire department involvment using this equipment would not be possible.

There is no detection equipment on either piece of apparatus that is capable of detecting CWAs.

Material Safety Data Sheets (MSDS) for nerve and mustard gases are now available on the Hazardous Materials Unit and these agents are also addressed in some detail in their onboard and station reference materials. The internet was used to download these MSDS from the Edgewood Research, Development and Engineering Center (ERDEC) in Edgewood, Maryland. Their website address is http://wwwcbdcom.apgea.army.mil/RDA/erdec/risk/safety/msds.

Antidotes and Medical Knowledge

While there is a paramedic assigned daily to the Hazardous Materials Unit, no antidotes to nerve gas (there are no antidotes to mustard gas) are carried onboard the Unit and only a limited supply of 2milligrams of atropine is carried on each ALS transport unit. This supply of atropine would be inadequate except for initial treatment since as Barr (1985) stated: “Organophosphate poisionings often require large amounts of atropine; 40 to 50 milligrams of atropine in a 24 hour period is not unusual” (p. 67).

Decontamination Equipment and Procedures

The Decontamination Unit is adequately equipped both with materials and solutions at either .5 or 5% of sodium hypochlorite (chlorine bleach) or calcium hypochlorite (HTH pool chlorine) to decontaminate victims and personnel exposed to nerve or mustard gases. Dry decontamination agents such as Fuller’s Earth ,cornstarch or flour are not carried.

Training for department personnel in decontaminating victims and personnel is considered adequate and materials and equipment are upgraded on a regular basis.

Protective Equipment

Department personnel; both fire and EMS, not specifically assigned to the Hazardous Materials or Decontamination Unit would respond to an incident involving nerve or mustard gases wearing the department issued protective clothing. These materials consist of PBI/Nomex protective coats and pants, leather gloves, knee height rubber boots, nomex hoods and helmets. Their respiratory protection would consist of 30 minute positive pressure SCBA. While this protective clothing conforms to all NFPA standards and it would provide adequate respiratory protection, it would provide no protection against skin exposures to nerve agents and only limited protection to a mustard agent.

Training

Limited training has been given to personnel about CWAs . Hazardous Materials personnel have received additional training; but this has been primarily in the area of organophosphate poisons.

In summary, after reviewing this information, the author has concluded that the Birmingham Fire and Rescue Service is **NOT** prepared to face an incident involving nerve or mustard gases.

When department personnel were surveyed pertaining to this question, their answers were:

In question #11only 53% felt that the department had equipment that would protect our personnel from nerve or mustard gases, 47% said no or that they did not know.

Question #12 asked if the department needed such equipment and 84% stated that it did.

Only 9% of those surveyed in question #13 felt that our Hazardous Material Unit's personnel had receive adequate training pertaining to nerve or mustard gases.

Only 11% who responded to question 14 felt that our first responders were trained to respond to incidents involving nerve or mustard gases, 61% felt that they were not and 28% did not know.

When asked in question 15 if the answer to #14 was no, 88% of those surveyed felt that training about nerve and mustard gases should be given. Only 2% said no and 10% did not know.

When asked about the department's capability to handle an incident involving nerve or mustard gases, 52% felt that the department was not prepared,40% felt that the department was marginally prepared, 7% felt that the department was prepared and only 1% felt that the department was well prepared.

The results of the survey seemed to mirror what the author determined about the department's preparedness to respond to an incident involving nerve or mustard gases, that is, that the department is not prepared to respond to an incident involving nerve or mustard gases.

3. Do members of the department feel that they are equipped or trained for this type of incident?

Data provided by the 100 respondents to the survey was used in answering this question.

Background on the respondents might be appropriate at this time. 95% were male 5% female. The ranks were represented as follows: 55% firefighters, 16% apparatus operators and 29% officers of all ranks. Time of service varied from 1 year to 35 years with the average length of service being 12 years and 1 month. All categories of apparatus and all line personnel's job classifications were represented in the survey population.

When asked if the department had a plan for handling an incident involving nerve or mustard gases, 92% either said no or that they didn't know (We do not). 47% said that we do not have the means for detecting nerve or mustard gases and 46% did not know (We do not).

When asked if the department should have training and equipment for responding to incidents involving nerve or mustard gases, 85% said that we should. 82% had received hazardous materials training and 46% had obtained the highest level of training which is technician or specialist. Of those responding, 86% had received their training from the fire department.

When asked if they had ever received any chemical weapons training, 25% stated that they had and of this 25%; 100% had received it from the military. An interesting sidebar to this finding was that this same 25% felt to the person that if an incident occured in Birmingham involving nerve or mustard gases; that the military would take the lead in mitigating the incident.

To summarize this data, the majority of the respondents felt that the department **did not** have the training, equipment and other resources necessary to respond successfully to an incident involving nerve or mustard gases. However; they did feel that this training, equipment and knowledge was needed and these points were confirmed by the research that the author did on the subject.

4. Are Outside resources available to support the department in case of an incident of this type?

Of the four research questions, this question had the least clear-cut answer.

If the Birmingham Fire and Rescue Service responded to an incident involving nerve or mustard gases, the first outside resource that would be called upon would be the Birmingham-Jefferson EMA. The EMA can provide limited resources such as additional level A suits and reference materials; but they would act as the conduit to state and Federal resources. If the incident was of such a magitude that state resources were needed that is, the National Guard, the EMA would be the agency that would request the governor to declare a state

of emergency inorder to activate the appropriate National Guard Units. While there are approximately 20 National Guard Units located within a 50 mile radius of Birmingham and while all of these units have some CWA assets (such as MOPP suits and M17 or M40 Chemical/Biological Protective Masks) it would take between 4 and 24 hours to get these assets on site (telephone interview with Colonel Morrow of the Alabama National Guard, August 18,1998).

Use of United States Reserve Units such as the Army Reserve's 318th Chemical Unit which is located in Birmingham and whose specialty is CWA decontamination; or a "FST" or Forward Surgical Team would require the Governor of Alabama to request a presidential state of emergency. Once this state of emergency was declared, active duty or activated reserve components could be deployed to the incident under the direction of FEMA. However; the timeframe for this to occur is also from 8 to 24 hours and unfortunately, any response to a CWA after this amount of time would be too late. Also Federal response of military personnel would also be limited by the Posse Comitatus Act which is the preeminent law which controls United States military personnel deployed within the United States.

The EMA could also request additional resources from other fire departments and could procure resources from outside vendors. Additional resources from other fire departments would likely be limited to additional Level A encapsulated suits and SCBAs.

The Anniston Army Depot has military CWA specialists and the full range of detection, decontamination and protective equipment; but once again, gaining permission for these personnel and assets to respond would be complicated and time consuming.

The victims of nerve or mustard gas may also experience difficulty in obtaining medical treatment. After initial decontamination by the fire department and that is if the fire department sees them, only 6 of the 17 medical centers within a 50 mile radius of Birmingham have decontamination facilities (telephone interview with Bruce K. Martin, Birmingham Veterans Medical Center on July 27,1998). Also supplies of the antidotes for nerve gas which are atropine and pralidoxime chloride (2 pam-chloride) are limited. Large supplies of atropine may be obtained from veterinarians or veterinarian medical supply houses (telephone interview with David Stark, Chemical/Biological Helpline, July 27,1998). Supplies of 2 pam-chloride would probably be available only from military supplies or from hospitals that see a number of organophosphate poisoning patients. Antidotes for mustard gas would not be a problem since the only antidote for mustard gas is rapid removal of the agent from the victim.

On Wednesday, April 23,1998, United States Attorney General Janet Reno testified before a joint hearing of the Senate Intelligence Committee and the Judiciary subcommittee on technology and terrorism that " We need to make sure that we have a significant stockpile… and I don't think that we do… of vaccines and other medications". Reno also said that the United States Government was conducting a study of purchasing large stockpiles of vaccines, antidotes and antibodies to deal with the threat to U.S. cities of chemical and biological warfare.

Reno stated " Those medications would be placed strategically placed throughout the country under a procedure that would maintain the shelf life of stockpiles and would facilitate their prompt availability in the event of a major chemical or biological incident". Anderson
(1998).

Hospitals would also likely be overwhelmed with "victims" even though Seiple in 1997 stated that 4500 of the 5000 "injured" in the Tokyo subway sarin attack were thought to be psychosomatic (p.133).

In conclusion, as stated in the initial portion of this answer, whether or not outside resources are available to support the Birmingham Fire Department in case of an incident of this type is both **Yes** and **No.** Assistance may be eventually be available; but would it arrive in time to help?

Discussion

Relationships Between the Study Results and the Findings of Others

The literature review has supported this study in a number of areas. There is a possibility of an incident involving nerve or mustard gases whether accidental or intentional happening in Birmingham, Alabama. The literature review showed that knowledgeable people, whether politicians, scientists, response specialists or military personnel all see the possibility of an incident occurring within the forseeable future. A review of the potential sites of an accidental release in Birmingham also proved a possibility of an incident.

When Chief Lamont Ewell stated in 1996 that fire and EMS were not prepared for a CWA incident involving biological or chemical weapons, he could have been talking about Birmingham, Alabama today.

The findings of Medici and Patrick in 1995 or Ziegler in 1996 about expanding the scope of knowledge of emergency responders concerning chemical or biological agents and of responders struggling to prepare for the casualties that they would face because of an accidental release both were echoed in what I learned about Birmingham's state of preparedness.

The Author's Interpretation of the Study's Results

The author's interpretation of the study's results was that as good as he may feel that the Birmingham Fire and Rescue Service is, it is still woefully prepared to face the challenges that an incident involving CWAs would present. The possibility exists for an incident to occur and while the department is not prepared for it; but neither are such areas as medical care for the victims.

While much of the equipment for detecting CWAs is expensive ($6400 for a Chemical Agent Monitor/Improved Chemical Agent Monitor- CAM/ICAM); but some such as the M256A1 Chemical Detector Kit, M8 or M9 detection paper and the M18A2 Chemical Detection Kits are reasonably priced. They range from $4.50 for the M8 paper to $248 for the M18A2 Kit and some of this equipment may be available from State Agencies for Surplus Property for even less.

EMS responders must become aware of the signs and symtoms of CWAs if they are to keep from becoming victims themselves. EMS must also prepare for the mass casualties that would probably occur from an incident involving CWAs.

The Decontamination Unit must prepare for and be able to decontaminate large numbers of victims and responders.

The results of the study appear to indicate that the Birmingham Fire and Rescue Service is not sufficiently prepared to face an incident involving CWAs. Although some training has been given and some materials acquired, the

department still has a very long way to go before it is prepared for even a small incident involving a CWA such as nerve or mustard gases.

This study has been beneficial to the author in that while he knew that these agents existed, he never knew the threat that they posed and he feels that other members of the department are as guilty of this as he was. The department is not prepared; but it must become prepared because the clock is ticking.

Recommendations

1. Formulate a SOP covering responses to CWAs incidents. This SOP should address such areas as:
   A. How Fire Communications is going to gather information from callers as to the presence of a CWA , what type of fire department response are they going to dispatch the scene and what information are they going to provide to responding companies?
   B. How are the first personnel on the scene going to determine if a CWA is involved and what steps are they going to take to prevent themselves from becoming victims?
   C. How is the Hazardous Materials Unit going to be used at the scene-rescue, mitigation, reconnaissance or what?
   D. What are going to be the Decontamination Unit's priorities and what additional resources will they need and how are they to obtain them?

E. Immediate notification of the appropriate outside agencies such as EMA, ADEM, Public Health , state and Federal agencies and any other organizations as may be needed.

F. Strict adherence to the IMS policy (get control-keep control).

G. Early appointment of a PIO and Liaison Officer (keep the public informed and interact smoothly with other agencies).

H. Rapid appraisal of the EMS situation ,how many fatalities or victims and what is the worse case scenario? Does a mass casualty incident need to be declared and who is equipped to care for the victims?

I. Inclusion into the policy of any other pertinent information as seen necessary.

Once the SOP is established, it must be exercised to get the bugs out and once it is in place, it should be practiced periodically.

2. Equipment should be procured to detect CWAs. Research should be done to establish what equipment is right for this city and once this is established, resources should be allotted to obtain them. Some detection equipment may be available through the EMA or the State Agency for Surplus Property. Even though Birmingham may be in line to obtain some detection equipment from the Domestic Preparedness Initiative, efforts should be made to acquire this detection equipment as soon as possible.

Decontamination enclosures should also be acquired since one of the best ways to limit cross contamination is to have the victims remove

their clothes, shower and put on clean garments. However; many people will not want to take off their clothes and shower in front of a crowd.

3. A training program dealing exclusively with CWAs should be established be required training for all ranks from first responder to chief officers. This training should not only contain classroom work; but field work as well.

4. Small and large scale drills centering on CWAs should be developed and practiced at least biannually . These drills should not only involve the fire and EMS sections; but other agencies as well.

5. The EMS division should develop their own plans for CWA incidents that would work in conjunction with the fire division. Along these same lines, a training program should be developed for instructing EMS personnel to recognize and properly treat victims of CWAs. Hospitals and other medical providers should be included in this planning and training. Hospitals should also address how they are going to decontaminate victims and where they are going to obtain the antidotes.

6. Attempts should be made to improve the response times of outside agencies such as the Anniston Army Depot's Response Team. Efforts should be made determine how to cut through the red tape so that these assets could be deployed quickly.

References

Anderson, Paul. (1998, April 23). Federal officials say U.S. cities and towns still vulnerable to terrorist chem/bio attack. ERRI Daily Intelligence Report.

Anniston Chemical Activity. (1998) . Safely managing chemical weapons-fact sheets. (Obtained from the internet @ http://www.cbdcom.apgea.army.mil.).

Barr, Stephen J. (1985, April), Chemical Warfare Agents. Topics in Emergency Medicine. pp. 62-70.

Bilski, Andrew & Kakuchi, Sudvendrini. (1995, April 3). Tokyo terror. Maclean's. p.29.

Copenhaver, Emily D; Sample, Eileen; and Watson, Annetta P. (1997, June). ACTFAST course. Birmingham, Alabama. (Student manual used in a 1 day course held June,1997).

Crocker, Lawrence P. LTC. (1990). Army Officer's Guide (45th ed.). Harrisburg, PA: Stackpole Books.

Dashiell, Thomas R.; Patrick, William C. III; & Sidell, Frederick R. Dr. (1998). Jane's chem-bio handbook. Alexandria, VA: Jane's Information Group.

Doubleday, Captain (No first name or initials given). (1997, April 16). Background Briefing: subject: Domestic Preparedness. DefenseLINK *News.* pp. 1-16.

Douglass, Joseph D.,Jr. & Livingstone, Neil C. (1987). America the vulnerable: the threat of chemical and biological warfare. Lexington, MA: Lexington Books.

Edwards, Todd. (1998, Summer). Natural disaster/terrorist attacks: USAR units train civilians for Emergency response. The Wildcat (A publication of the U.S. Army's 81st Regional Support Command). p.8.

Eifried, Gary. (1997, April). Vulnerability of the united states to chemical and biological (cb) terrorism. Abington, MD. EAI Corporation.

Gifis, Stephen H. (1996) . Barron's Law Dictionary (4th ed.). Hauppauge, NY: Barron's Educational Series Inc.

Holmes, H. Allen. (1998, March 26) Domestic preparedness: U.S. responses need tuning. Defense Issues. Volume 13 Number 33.

Hurwitz, Elliot .(1982 May-June). Terrorists and chemical/biological weapons. Naval War College Review. Pp.36-40.

Klinghoffer, Max, M.D. (1995, Fall). Organophosphorus poisoning (nerve gas). Journal of Civil Defense. pp. 18-20.

Livingstone, Neil C. (1982). The war against terrorism. Lexington, MA: Lexington Books.

Long, James. (1998, July 30). Nerve gas deadlier than army thought it was, study shows. The Birmingham News.

Lujan, Thomas R. (1997, Autumn). Legal aspects of domestic employment of the army. Parameters . U.S. Army War College Quarterly. pp.82-97.

Macko, Steve. (1996, March 30). Senate hearings say local fire and emergency services not prepared… Emergency Net News Service Vol. 2-090.

Mann, William C. (1995, November 1). Terrorists with doomsday weapons a growing threat, experts warn. The Atlanta Constitution. p.A6.

Medici, John and Patrick, Steve. (1996, August). Emergency response to incidents involving chemical and biological warfare agents. Richmond, VA.: Virginia Department of Emergency Service, Technological Hazards Division, pp. 1-40.

Meidl, James H. (1970) Explosive and toxic hazardous materials. Beverly Hills, CA: Glencoe Press pp. 210-224.

Mercier, Charles L. Jr. (1997, Autumn). Terrorists, wmd, and the U.S. army reserve. Parameters. U.S. Army War College Quarterly. pp. 98-118.

Mullins, Wayman C. (1992) An overview and analysis of nuclear, biological and chemical terrorism: the weapons, strategies and solutions to a growing problem. American Journal of Criminal Justice. 16:2. pp. 95-119.

National Fire Academy, (1988). Hazardous materials: the pesticide challenge .(1988-521-612/00243). Washington, D.C: Government Printing Office. (Student manual used in 2-day course held September 9th & 10th, 1989).

Office of the Surgeon General and U.S. Army Program Manager for Chemical Demilitarization. (1997, October). Alabama hospital provider train-the-trainer course, toxic chemical training for medical support personnel. Birmingham, Alabama. (Student manual used in a 1-day course held October22, 1997).

Polk, R.L. & Company. (1997) . Birmingham, Alabama City Directory. Detroit MI: Author

Seiple, Chris. (1997, Autumn). Consequence management: domestic response to weapons of mass destruction. Parameters. U.S. Army War College Quarterly . pp119-134

Sibley, C. Bruce. (1996, Spring). Nerve gas- terrorism's new weapon. Journal of Civil Defense. pp. 12-14.

Sidell, Frederick R. Dr. (1995). Management of chemical warfare agent casualties. Bel Air, MD: HB Publishing.

Sidell, Frederick R. M.D. (1990, November 15). What to do in case of an unthinkable chemical warfare attack or accident. Postgraduate Medicine. Pp. 70-76, 81-84.

Tempest Publishing. (1998). First responder chem-bio handbook. Alexandria, VA: Tempest Publishing.

United States Chemical School (1998, April). Chemical/biological countermeasures course. Fort McClellan, Alabama.(Student handbook used in course).

Waltman, Greg. (1998, Summer). “FAST” Teams deploy quickly, “save lives in mock exercise”. The Wildcat (A publication of the U.S. Army’s 81st Regional Support Command. p. 8

Zeigler, James P. (1996, October). The dangers of chemical weapons. Occupational Health & Safety. pp. 182-184 and 186.

Appendix A
SURVEY

Please provide responses to all of the items.

1. How many years have you been on the department? _____

2. What is your present rank? **FF**_____ **A/O** _____ **Officer** _____

3. Does our department have a plan for handling an incident involving nerve or mustard gas? **YES**_____ **NO**_____ **DON'T KNOW**_____

4. Does our department have the means for detecting these agents? **YES**_____ **NO**_____ **DON'T KNOW**_____

5. Do you feel that the department should have training and equipment for detecting and handling these types of events? **YES**_____ **NO**_____ **DON'T KNOW**_____

6. Have you ever received any hazardous materials training? **YES**_____ **NO**_____

7. If the answer to #6 was **YES**, where did you receive this training? **FD**_____ **Industry**_____ **Military**_____ **Other**_____

8. To what level were you trained ? **A&O**_____ **Technician**_____ **Specialist**_____ **Other**_____

9. Have you ever received any chemical weapons training? **YES**_____ **NO**_____ **DON'T KNOW**_____

10. Where did you receive this training? **FD**_____ **Military**_____ **Other**_____

11. Does our department have any equipment (SCBA, Protective Suits etc.) that would protect our personnel from chemical such as nerve gas or mustard gas? **YES**_____ **NO**_____ **DON'T KNOW**_____

12. Do you think that our department needs equipment of this type?
    YES_____ **NO**_____ **DON'T KNOW**_____
13. Has our department's hazardous materials team received training in ways to detect ,protect and decontaminate against nerve or mustard gases? **YES**_____ **NO**_____ **DON'T KNOW**_____

14. Are our first responders trained to respond to incidents involving nerve or mustard gases? **YES**_____ **NO**_____ **DON'T KNOW**_____

15. If the answer to #14 was **NO**, do you think that this training should be given? **YES**_____ **NO**_____ **DON'T KNOW**_____

16. If our city was to experience an incident involving nerve or mustard gases, where would an incident of this type most likely occur?
    S**hopping area**_____ **Storage facility**_____
    R**esearch facility**_____ **Transportation incident**_____

17. Do you think that an incident involving nerve or mustard gases could occur in our city? **YES**_____ **NO**_____ **DON'T KNOW**_____

18. What agency do you believe will have the most impact on minimizing the loss of life from an incident involving nerve or mustard gas? (check all that apply) **First responders (fire/rescue/ems)**_____
    Military chemical specialists_____
    Fire department haz mat teams_____ **Other**_____

19. How would you rate our departments capability to handle an incident involving nerve or mustard gases?
    Not prepared_____ **Marginally prepared**_____
    Prepared_____ **Well prepared**_____

20. Does our city have access to large amounts of the antidotes that would be required to handle a major incident involving nerve or mustard gases?
    YES_____ **NO**_____ **DON'T KNOW**_____

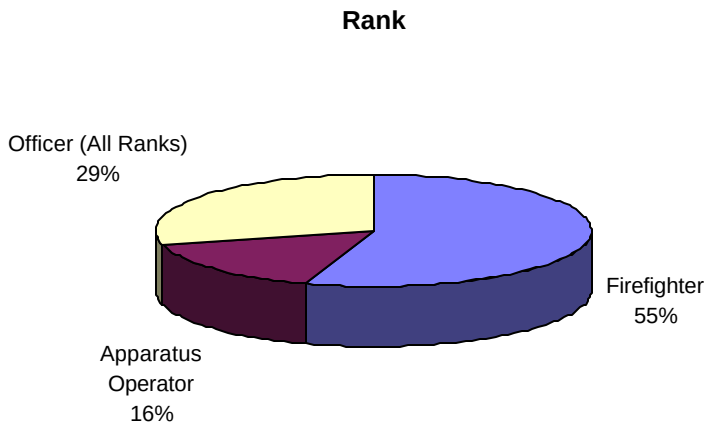
THANK YOU FOR TAKING THE TIME TO COMPLETE THIS

QUESTIONAIRE

Appendix A
Survey Results

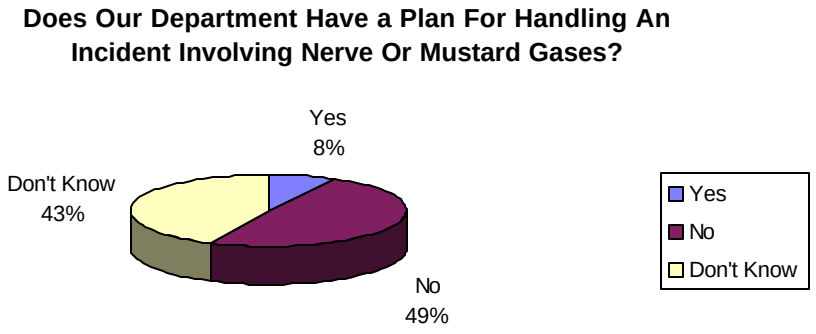
Question #1: Average length of service 12 years and 1 month.

Question #2:



Firefighter	55
Apparatus Operator	16
Officer (All Ranks)	29

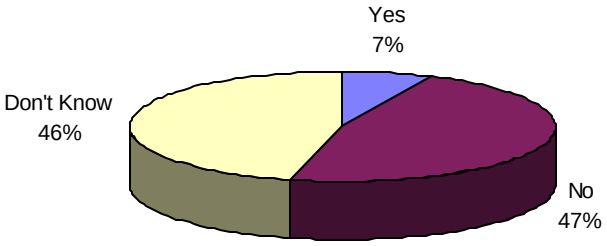
Question #3:



Yes	8
No	49
Don't Know	43

Question 4:

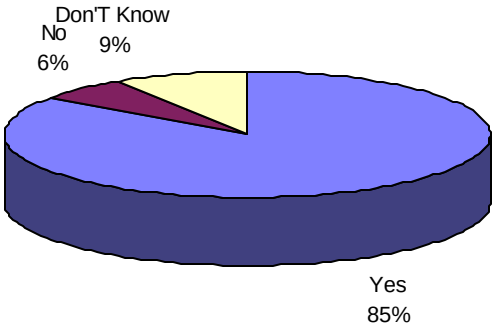
Does Our Department Have the Means For Detecting These Agents?



Yes	7
No	47
Don't Know	46

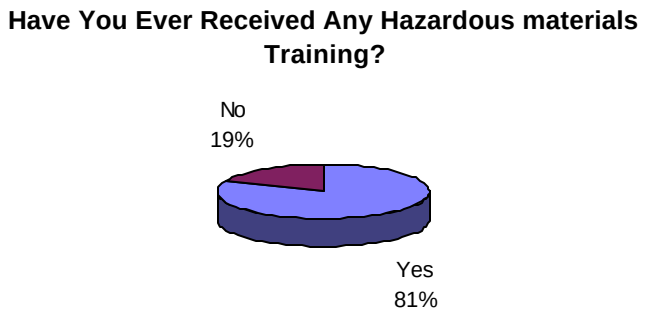
Question #5:

Do You Feel That The Department Should Have Training and Equipment For Detecting and Handling These Types of Events?



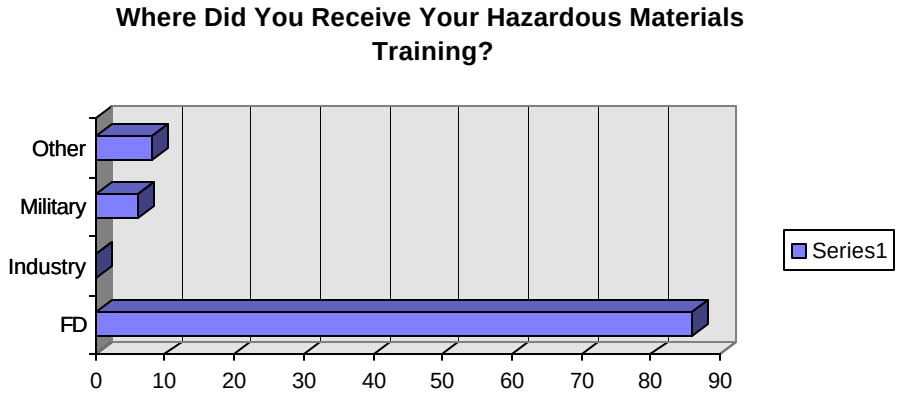
Yes	85
No	6
Don't Know	9

Question #6:



Yes	81
No	19

Question #7:

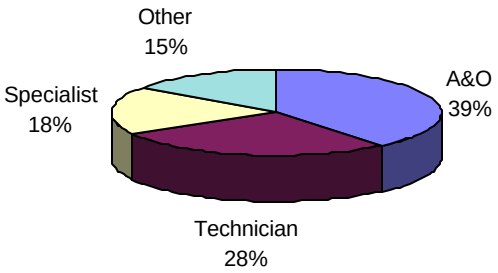


FD	86
Industry	0
Military	6

Other	8

Question #8:

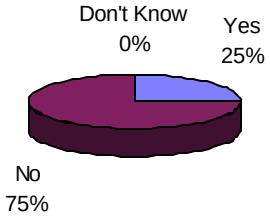
To What Level Were You Trained?



A&O	39
Technician	28
Specialist	18
Other	15

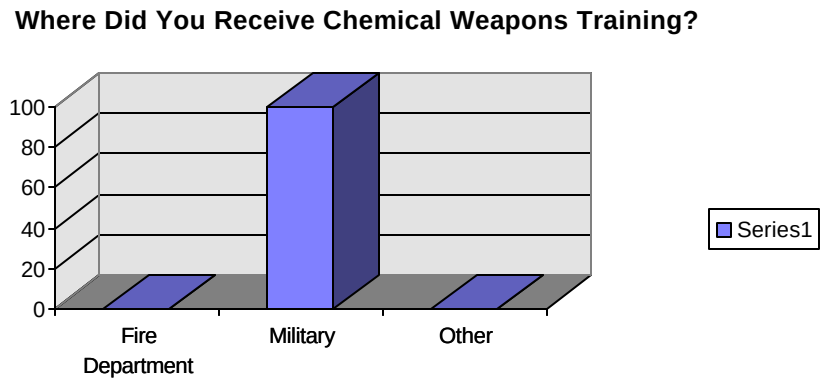
Question #9:

Have You Ever Received Any Chemical Weapons Training?



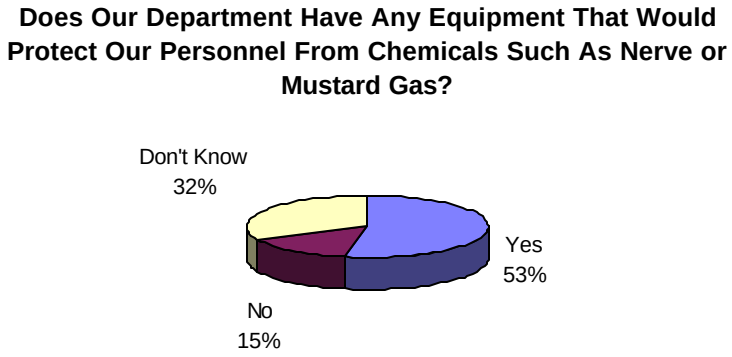
Yes	25
No	75
Don’t Know	0

Question #10:



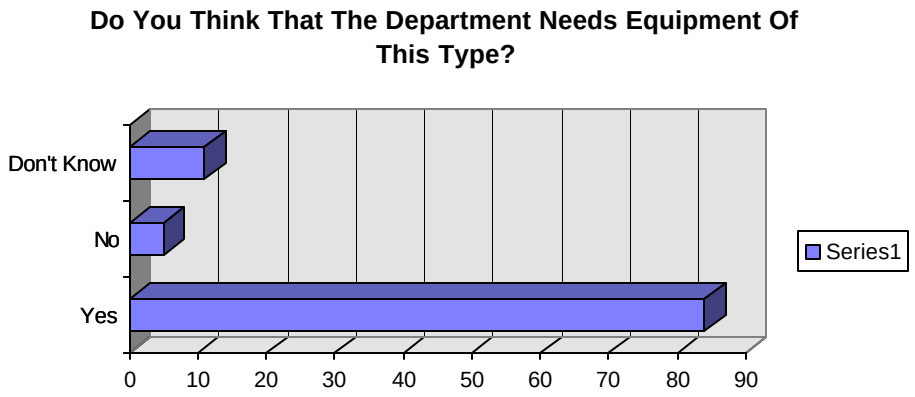
Fire Department	0
Military	100
Other	0

Question #11:



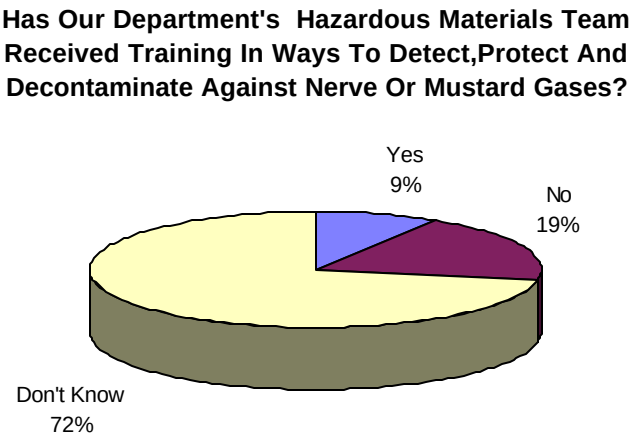
Yes	53
No	15
Don't Know	32

Question #12:



Yes	84
No	5
Don't Know	11

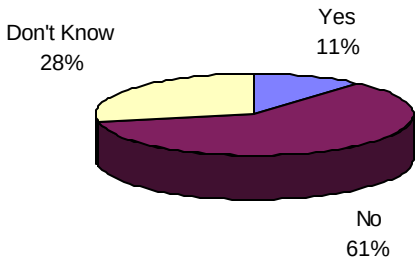
Question #13:



Yes	9
No	19
Don't Know	72

Question #14:

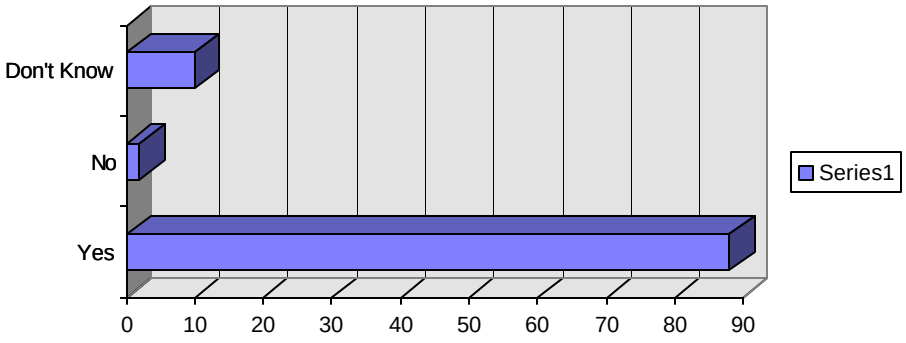
Are Our First Responders Trained To Respond To Incidents Involving Nerve Or Mustard Gases?



Yes	11
No	61
Don't Know	28

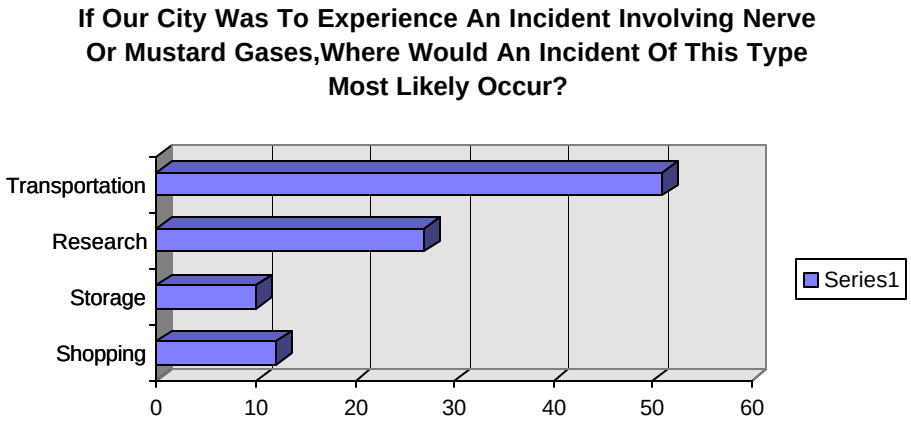
Question #15:

If The Answer To The Previous Question Was NO, Do You Think That This Training Should Be Given?



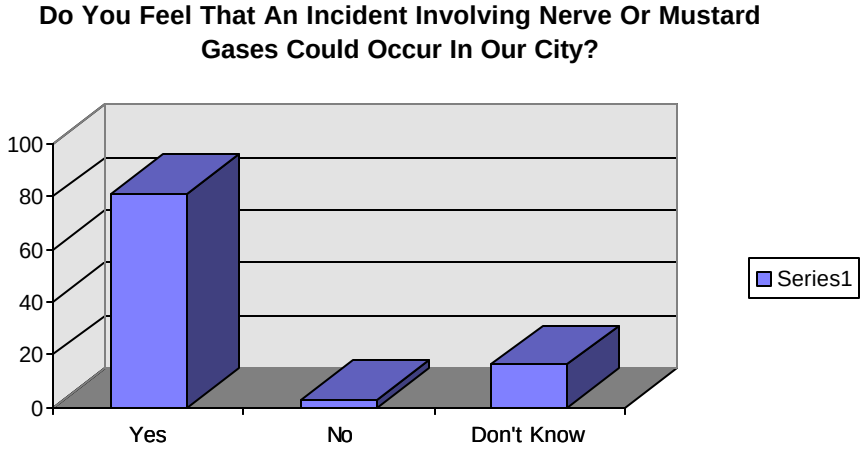
Yes	88
No	2
Don't Know	10

Question #16:



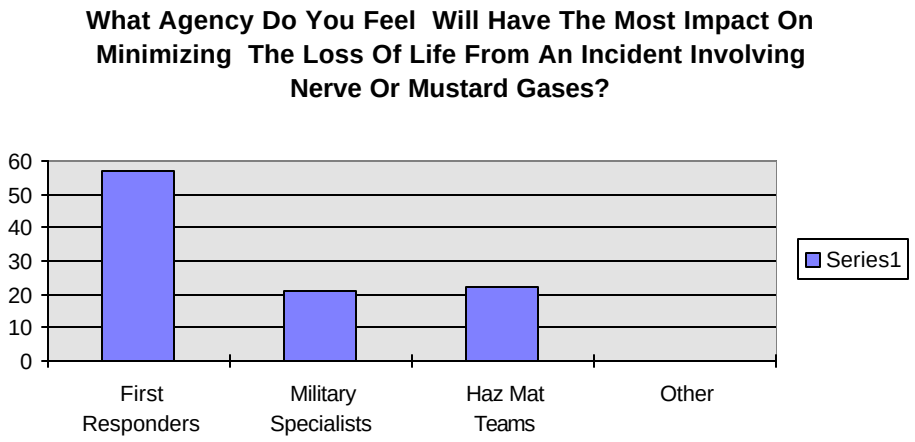
Shopping	12
Storage	10
Research	27
Transportation	51

Question #17:



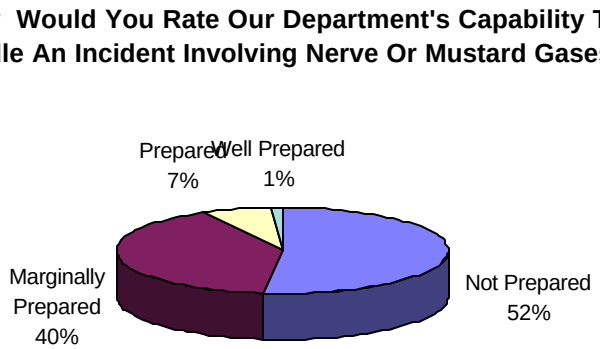
Yes	81
No	3
Don't Know	16

Question #18:



First Responders	57
Military Specialists	21
Haz Mar Teams	22
Other	0

Question #19:

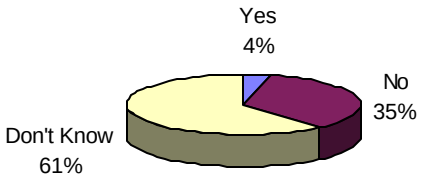


Not Prepared	52
Marginally Prepared	40

Prepared	7
Well Prepared	1

Question #20:

Does Our City Have Access To Large Amounts Of The Antidotes That Would Be Required To Handle A Major Incident Involving Nerve Or Mustard Gases?



Yes	4
No	35
Don’t Know	61

Appendix B

Acronyms

ACTFAST Agent characteristics & toxicity first aid & special treatment (training program).

ADEM Alabama Department of Environmental Management

ALS Advanced Life Support

BFRS Birmingham Fire and Rescue Service

CAM/CAM Chemical Agent Monitor/Improved Chemical Agent Monitor

CBDCOM Chemical Biological Defense Command (U.S. Army)

Chem/Bio Chemical/Biological

CWAs Chemical Warfare Agent(s)

Decon Decontamination

DOE Department of Energy

DPP Domestic Preparedness Program

EMA Emergency Management Agency

EMS Emergency Medical System

EPA Environmental Protection Agency

ERDEC Edgewood Research Development and Engineering Center

FBI	**Federal Bureau of Investigation**
FEMA	**Federal Emergency Management Agency**
FST	**Forward Surgical Team**
GA	**Tabun (Nerve Agent)**
GB	**Soman (Nerve Agent)**
GF	**Unnamed Chemical Nerve Agent**
HD	**Distilled Mustard (Blister Agent)**
HHS	**Department of Health and Human Services**
HT	**Mustard Agent mixed with a thickener (Blister Agent)**
IMS	**Incident Management System**
L	**Lewisite (Blister Agent)**
LRC	**Learning Resource Center**
MOPP	**Mission Oriented Protective Posture (Type of Military Protective Clothing, i.e.; Saratoga Chemical Protective Overgarment).**
MSDS	**Material Data Safety Sheet**
NCOIC	**Non Commissioned Officer in Charge (U.S. Army)**
NFA	**National Fire Academy**
PIO	**Public Information Officer**
SCBA	**Self Contained Breathing Apparatus**
SOP	**Standard Operating Procedure**
T	**Thickener Mixed with some Nerve Agents**

TGD	**Soman (a Nerve Agent) mixed with a thickener**
UAB	**University of Alabama at Birmingham**
VX	**Persistent Nerve Agent**
WMD	**Weapons of Mass Destruction**