

Diesel Exposure in Firefighters.

Recently attention has been focused on the ill effects of diesel exposure on the human body. Diesel exposure is known to be an exacerbating factor of nasal, sinus, and throat disorders as well as a potential cause of lung and bladder cancer. Firefighters are a group of people that are at highest risk of diesel related illness because of the prolonged exposure to diesel fumes. No other profession is subjected to over 24 hours straight of diesel exposure and it is not surprising that we are seeing a large number of firefighters with problems related to this exposure. Recently one firefighter in Illinois even received compensation after a trial for his health problems related to diesel exposure.

The initial symptoms of diesel exposure are runny nose, nasal congestion, sore throat and mild shortness of breath. With time these symptoms may worsen or become permanent due to continued damage to the linings of the nose and throat. Additionally particles that are inhaled can reach the lungs and potentially lead to lung cancer years later. Fortunately not all people exposed to diesel will have problems and only few will develop cancer.

When symptoms do develop it is important to be evaluated by a doctor. The doctor's role is to first try to treat and educate the patient so that symptoms will be decreased and the patient will feel better. The second purpose is to document the degree of damage and symptoms, which may be work related. On later visits the doctor can then determine whether the problem is getting better or worse.

Frank,

Here are the notes from my talk,

Greg.

Today I will be discussing diesel-induced rhinitis in firefighters.

Diesel exhaust exposure is a well-known cause of nasal, sinus and throat disorders as well as an exacerbating factor in allergy and asthma patients. It is also thought to play a causative role in lung cancer.

Firefighters as a group are at particularly high risk for suffering the effects of diesel exhaust exposure. This is due to a combination of high diesel exhaust levels in firehouses, as well as the fact that they spend 24 hours at a time in the firehouse. Also firefighters have the potential for other hazardous exposures, which may exacerbate the problem.

Over the past 4 years we have cared for 27 firefighters who suffer from diesel induce rhinitis. The goal of this study is to describe their clinical picture and to provide treatment recommendations. We also hope to increase awareness of this occupational hazard.

This study is a retrospective chart review of 27 firefighters diagnosed with diesel-induced rhinitis since 2001. 26 of the 27 patients are men and the average age is 43. Additionally, all patients are non-smokers with no history of asthma or allergy.

The most common symptoms in our group were nasal obstruction and postnasal discharge. Fatigue was also very prevalent. Many patients also complained of cough and shortness of breath. Only 2 patients had complaints of sneezing or itchy eyes that might be expected in patients with allergic rhinitis.

While most of these symptoms are usually only an annoyance, one of our patients experienced such severe symptoms that he was rendered disabled as even brief exposure to diesel exhaust caused severe symptoms. This condition is called idiopathic environmental intolerance.

Physical examination in all patients revealed nasal mucosal edema and 74 % actually had cobble stoning of the nasal mucosa. Many patients also had visible thick postnasal discharge in the nasopharynx and oropharynx and over 50% had laryngeal edema. Four of the patients were noted to have nasal polyps, one of whom has required surgery.

In these patients we have tried several treatments. Not all patients received all of these treatments on this list, although all did receive nasal steroids and saline. This chart shows the percentage of patients that have shown improvement with each medication that they tried. The most useful treatments have been inhaled nasal steroids, which 93% of patients have found helpful and continue to use. Additionally 89 % of patients continue to do nasal saline irrigation, which is a much higher percentage of compliance than our other patients with rhinitis who do not suffer from diesel exposure. Many patients also find guaifenesin helpful in decreasing their postnasal discharge. The most effective treatment in these patients has been time off of work as all patients related improvement in their symptoms when on vacation or off of work due to injury. This is a hallmark of occupational exposure.

To provide a little perspective, it is interesting to note that rhinitis was not a problem prior to the industrial revolution. The first description of rhinitis was by doctor in England named Bostock who suffered from it in 1819. At that time the disease was so uncommon that it took him 9 years to find 28 more cases. By 1907 it was noted to be a common diagnosis in England. Now in Japan, where industrialization didn't start until the early 1900's, there was not even a word in the Japanese language to describe hay fever prior to 1950. In both England and Japan there was noted to be over a threefold increase in rhinitis in the second half of the twentieth century. Air-pollution is thought to be the likely cause of these trends.

Obviously, in 1819, diesel engine exhaust was not much of a problem. Today, however, much of the Air-pollution is due to diesel exhaust. The EPA in 1997 estimated that over 25 % of smog precursors come from diesel exhaust. Now despite diesel's polluting effects, most commercial engines are made to run on diesel fuel because of better fuel efficiency and longer engine life. The long engine life is a problem because engines stay in service for a longer time. Thus even when less polluting engines are developed it takes a long time for them to go into service because the older trucks and buses are still running well. This leads to a large amount of diesel exhaust in the environment.

The effects of diesel on the nose are well known. Increased levels of IgE, eosinophils, and cytokines are seen after diesel exposure. Additionally, nasal cytology studies in diesel-exposed dockworkers have revealed metaplasia of the nasal mucosa with an increase in leukocytes and goblet cells that indicates a chronic inflammatory state.

Other studies have shown that exposure to diesel exhaust coupled with ragweed causes a greater allergic response versus ragweed alone. Another study showed that diesel exhaust can induce allergic sensitization to an otherwise innocuous antigen. In this study a group of atopic individuals were exposed to antigen from a deep-sea underwater plant called keyhole limpet and half were also exposed to diesel exhaust at the same time. Only the patients who received diesel were noted to have allergic responses with subsequent antigen challenges to this substance. While all of these effects of diesel are serious, the most serious medical effect is that diesel exposure has been repeatedly shown to be a likely cause of lung cancer.

The worst head and neck effect of diesel exposure is the development of idiopathic environmental intolerance, also known as multiple chemical sensitivities syndrome. This is a condition where over time patients start to have severe allergy type symptoms even with minimal exposure to diesel exhaust. Fortunately the symptoms resolve once the exposure ends, but over time, other irritants, such as cigarette smoke can trigger the symptoms as well. This condition unfortunately is chronic and in one of our patients it has led to inability to continue working as firefighters.

After 9-11 we were all reminded that firefighting is a risky occupation and I'm sure that all firefighters know that they are risking their health in their occupation. I just don't think that they realize they are risking their health when sitting in their firehouse. Firefighters have very high diesel exhaust exposures because of the fact that the fire-trucks are usually run and maintained in the firehouses. Now while there are exhaust capture systems available that can lessen this exposure, they are expensive and most firehouses do not have them. Thus firefighters are exposed to high levels of diesel for 24 hours at a time. This coupled with the other toxic exposures that they may face increases their health risks.

To give a better understanding of a firefighter's exposure level we can look at this chart. As you can see, firefighters have much more diesel exposure than any other diesel-exposed occupation, and as much as 75 times more than the general population.

In conclusion, diesel exposure may cause rhinitis, which can be so severe that it can be disabling. Additionally it can worsen asthma and lead to lung cancer as well. Firefighters are at very high risk for the effects of diesel exposure and when they suffer from rhinitis it can be difficult to treat satisfactorily. Awareness of this occupational problem must be increased and preventive measures should be taken to protect the firefighters, since we count on them to protect us.