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Pay Attention to Books' Deadly Dust

Relationship of Lung Cancer and Heart Attack to Library Books' Dust

By

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When you open a dusty book, an air current is created which pushes up the dust accumulated on and in the books directly to your nose. There are no other normal cases that you blow dust in your nose by yourself. Since dust particles can be very harmful, in this article we study the hazards and the solutions of this problem.

There are no studies done for libraries, however, we can come to some conclusion by using the information of the pollution risk in other related environments.

This study reveals that the librarians who work with dusty books are in real health danger. The range of risks varies from lung cancer and heart attack to chronic asthma, allergy problems, depression, nervous problems, esthetic problems of skin etc. They should be considered workers at high risk and be protected by law. The existing standards are not enough to protect the librarians and new studies should be conducted to create new standards.

Here is a scientific approach for understanding and solving these problems.

The Problem

Recently, in some public libraries the author of this article observed some common abnormal health conditions among librarians such as lung cancer, heart attack, facial skin damage and respiratory allergy problems. Few of the lung cancer and heart attack cases

belonged to heavy smokers, most others were related to people that did not seem to be exposed these risks. The cases of lung cancer were especially suspicious. There are two major sources of risk for lung cancer: smoking and radon gas. Other causes for lung cancer are extremely rare.

Also, it was surprised to see damages to facial skin of many librarians. The respiratory allergy problems are also very common among them . (Whenever I enter some public libraries the symptoms of my allergy begin and my nose acts as a real sensor of allergens!!)

By chance I came across a natural phenomenon that led me to think that there is a relation between these illnesses and book's dust. This phenomenon is explained below. Especially I came to believe dust as the cause of these illnesses and problems because it seems closer people are to the sources of dust more problems they have.

Discovery

There are many discoveries in history of science which have been made by observing simple natural phenomena. I was lucky enough to come across such a natural phenomenon that led me to put together my ideas and observations. When you carefully observe such a phenomenon the Mother Nature is your guide and it's just like putting together the pieces of a puzzle.

This phenomenon is the falling down of snow particles on glass surfaces. You may have already been amazed to observe this phenomenon on the front of your car window. The snow flakes are in perfect regular crystalline forms and are always flat. If you look carefully the interesting thing is that they fall all on their face (flat side) and never on their side. You have the feeling that a magnetic force is pulling down the snow flakes toward the glass surface. Some kind of force can keep a layer of 1 inch thick on a vertical glass surface. The surface tension between molecules of the same polarity explains this phenomenon. The water and glass are made of polar molecules. As a general rule in surface chemistry, the polar molecules exercise an attraction force on each other which explains the falling of snow flakes on their flat side. The same reason explains why you can have 1 inch snow on the vertical part of your car windows.

The above phenomenon can happen in your library but certainly not with snow flakes! The dust particles, like snow particles, are polar molecules. The paper surfaces like glass surfaces are made of polar molecules. The plastic surfaces are relatively non-polar. That is why the dust particles, are deposited on the paper surfaces and practically not on the plastic surfaces. The paper surfaces act as dust magnets and hold the dust particles as long as they are not cleaned.

Once dust is deposited on the paper side of books, other phenomenon is responsible for transferring dust into our body. When you open a dusty book an air current is created

which pushes up the dust accumulated on and inside it directly to your nose. There are no other normal cases that you blow dust in your nose by yourself.

My observations of irregular health problems in cited public library that I was noting every day made me a of piece puzzle and finding a scientific explanation of mechanism of dust accumulation on books and the way it transfer to our body added other pieces . Later on we will look for some other pieces in the literature, especially to find out the health hazard of dust itself. We could make at the end our puzzle. This may be is not exactly the real fact, but we believe is the first scientific hypothesis in Books` Dust Hazard. It was always like that in the history of science progress.

Literature Review

Researchers have virtually paid no attention to the problem of dusty books. This may be because its importance to health mater is not yet recognized. There are however enough scientific documentation and discussions to reach a good understanding of this problem. Here, we present some related literature.

The source of dust

Dust consist of particulate matter (PM) of either solid or liquid (aerosol), suspended in the air. They are produced naturally, in the industrial plants, or by man made activities in the cities, country, farm etc.

The examples of natural particulates matter are desert and dry land dust, hydrocarbons released by forest and pollen of trees. Man activities are the most important source of dust released in the environment. The heavy metals like lead, mercury and chromium released by metallurgic industries are one source of problems. Combustion processes, in the motor engines or power plants produce a spectrum of toxic materials. The combustion of fossil fuels, mostly used in cars, produce quantities of vanadium, chromium, nickel, iron, copper and other highly reactive and catalytic materials.

Dust particles on their surfaces absorb or, get reacted by, many toxic gas matters which cause the transfer of these toxic materials. An example is sulfur oxide which can be dissolved by humidity in air and then get absorbed on the surfaces of dust particles. Another source of dust particles are highly toxic carbon resulting from incomplete combustion, in car engines, especially diesel engines. A large number of chemicals that are known or suspected to cause cancer are thrown every day in the air by different industrial plants like refineries, petrochemicals, plastics, etc. Some of the important pollutants in this category are arsenic, benzene, dioxin and asbestos.

Friction between the rubber of cars wheels and the surfaces of roads, and between the wheels and their brake pads produce a large quantity of dust which is blown in the air. This dust can contain rubber, metal, ceramic, carbon, kevlar, fiber glass and asbestos [1]. Pesticides and herbicides used in agriculture, or as mosquito sprays constitute another important source of dust pollutants.

Today, tobacco smoke constitutes a part of dust pollution. A 1994 report estimated that in the air of Los Angeles, in the category of fine particles, for every 100 particle of dust there is 1 part tobacco smoke particulate [1]. Radioactive materials from nuclear accidents and radon gas can be transferred by dust particles. Radon, a radioactive gas raised from ground and accumulated in the closed areas of buildings can create health problems. It is believed that radon gas is the second cause of lung cancer after tobacco smoke.

The dust particulate matter, as Holman cited in her book, is a catalog of all kind of chemicals used in our modern style of life [1].

Another source of dust is dust mites and microorganisms. Dust mites are microscopic insects, found in dusty places, and are the cause of allergy difficulties. Microorganisms are different kinds of bacteria and viruses transferred by dust particulate. Bacteria by themselves can constitute dust particles.

How Does Dust Affect the Body?

The dust particles damage the body; begins its attack in the eyes and on the skin by making irritation and allergy problems. Some chemicals can enter in the blood stream directly via exposure to the skin. It is reported that high concentration of dust specially tarry or sticky particles can create esthetic problems on the skin. [2].

A part of dust, with diameter more than 10 microns, is absorbed in the saliva and mucus in the mouth, throat and nose. This inhaleable dust can cause allergy and irritation in the nose and throat. Dust contaminated by toxins can find their way into digestive track. The toxin by this way can absorb into the blood stream.

Particles with diameter below 10 microns (PM10), called fine dust, (respirable dust) can pass body`s filters, enter deeply in the lungs and lodge in their branches. For comparison the diameter of human hairs is 100 microns. It is reported that, 90% of particulate matter with diameter less than 2.5 microns (PM2.5) which are deposited in deeper lung airways may be cleared from the body within one year in healthy non smokers [3]. In this way the toxic matters may be taking into blood stream. These fine dust particles (PM2.5), which are non visible to the eyes and some optical microscopes have greatest potential for damaging health. Dust protection masks, generally used by people, cannot remove these fine particles.

The toxins that enter in the blood stream can be distributed around body and create heart, liver, kidney, etc problems. Also, some heavy metals like mercury and lead, extremely harmful even with very low level of concentration can attack the central nervous system provoking nervous and depression problems [4].

The organic dust (dust particle contaminated with microorganism) can cause illness by three mechanisms 1- Infection 2- Intoxication, 3- Reducing immune system defense [5].

Here we compare the diameters of some dust particles [1]:

Dust 63 microns and smaller

Pollen 10-100 microns

Cement dust 3-100 microns

Fungal spores 1-5 microns

Bacteria 0.2-15 microns

Various smokes 0.01-1 microns

Tobacco smoke 0.01 -0.5 microns

Outdoor Air Pollution

The fine particles (less than 10 microns and particularly less than 5 microns) can travel in the air by wind and some natural phenomena over several hundred miles and remain in the air for several years. The rain and snow can only fall wash them from air. The large particles settle down generally after a few days.

Only in the past 10 years the researchers have begun to understand the magnitude of the health effects associated with particulate matter. A new study by New York University (NYU), School of Medicine and Brigham Young University [6, 7] provide the strongest evident that long term exposure to fine particulate matter is an important risk factor for lung cancer deaths as well as heart disease mortality.

In this study which evaluated the effect of air pollution on human health over a 16 years period and for 500,000 adult who were followed from 1982 to 1998, as a part of an ongoing cancer study, the researchers calculated that the number of deaths from lung cancer increases by eight percent for every additional 10 micrograms of fine dust particle (PM_{2.5}) found in a cubic meter of air. It has been found that large particles and gaseous pollutant were generally not associated with higher number of deaths.

Arden Pope, professor of economics at Brigham Young University, the study co-leader, said that the increased risk of lung cancer and heart disease from air pollution were

clearly far less than the risks associated with active cigarette smoking but we found that the risk of dying from lung cancer as well as heart disease in the most polluted cities was compatible with the risk associated with nonsmokers with long term exposure to second hand smoke [6]

More than 800 new scientific studies confirm relationship between particulate matter, in air with illness, hospitalization, and premature death [8]. In a study published in science news [9] it is suggested that, nearly 1200 hospitalizations for heart disease, in the Detroit Area each year may trace to fine dust particles in the air

The US Environment Protection Agency (EPA) set annual average limits for fine particulate matter (PM 2.5) in cities to 15 micrograms per cubic meter. Schwartz however reviewed data on air pollution and death from London, 1958-1972, and showed there was no threshold level below which health damage does not occur [10]. There are many research works which show that there is a quasi-linear relationship between the risk of health damage and mortality and increase of concentration of particulate matter in air [11].

Indoor Air Pollution

In a 1989 report by US Environment Protection Agency indicate that the level of indoor air pollutant may be two to five times greater than outdoor levels, and the Science Advisory Board of the EPA has put indoor air pollution on its list of top 5 environmental risks to the public [12]. If you live in a highly industrial area, the EPA has identified close to a thousand indoor pollutants, about 30 of which are carcinogens.

The most filters used in air conditioner devices are unable to trap the fine particles and use of efficient insulation without sufficient ventilation accumulates the dust particles inside the building. The turbulence caused by air conditioning can suspend more particles in the air.

In air conditioner systems not cleaned regularly the dust particles, if settled on the wet surfaces; they are very likely to support the growth of microorganisms [5]. We can respect, as a result, accumulation of microorganisms in the buildings. A report published by the American Industrial Hygiene Association (AIHA) evokes, in more than 30 studies worldwide since 1982, the presence of fungi growing on the dust deposited inside the air conditioner units [13].

The EPA suggests three ways to reduce pollutants inside buildings, remove source of pollution, ventilate the buildings thoroughly, and clean the air with an air purifying device. The US Food and Drug Administration now lists certain air purifiers as a class II medical device, which means that consumers with doctor prescribed air cleaners may be reimbursed by their insurance company.

At the recent Health Indoor Environments 2002 conference, Ashkins explaining some related illness gave some statistics that support these reasons for maintaining clean buildings [14]:

-4.8 millions children suffer from asthma, cancer is the no 1 related cause of death in children each year, 8500 children are diagnosed with cancer each year.

-There are productivity losses at work, up to 30% more error, over 7% works slow down.

World Health Organization (WHO) has estimated that about 2 800 000 people die annually from exposure to high concentration of particulate matter suspended in the indoor air environmental [15]

The case of libraries

There are no studies done for libraries, however, we can come to some conclusion by using the information of the pollution risk in each concerned environment.

We consider the most risky situation. In some public libraries there are reserve stocks in which the books and other documents are kept in open shelves and many of the books and documents are not cleaned up for decades. You can see a visible thick layer of dust, normally of dark color; sticking over three sides of books. There is some dust diffused inside the book and between the pages. As we explained earlier, paper surfaces act as magnet of dust particles. On the sides of books, there is dirt made of harmful dust particles when as they are not cleaned for many years.

Dust particles get accumulated along the sides of the books during the time that they don't get cleaned. The papers are originally treated in large sizes to make them water or moisture proof, then they are cut in book sizes. As a result where the paper is cut is free of moisture proof coating. So the sides of books are without moisture proof coating and are suitable for absorbing air humidity. The sides of books in addition to preserving dust are a good environment for growth of microorganism and micro insects i.e. mite dust and booklice. Book lice are tiny, speedy insect, often seen zipping across old papers [1]. The dust mite related to books has received enough attention in the literature. What is new in this study is considering the health hazard of dust particle itself.

When you open a book an air current is created which pushes up the dust directly to your nose that you can immediately feel the dust. This kind of dust transfer to our body is unique in the case of books. Dust can deposit on other things like wood parts, metallic object etc., but there is no other normal cases that you have to confront dust so closely and directly and there is no other normal cases that you blow dust in your nose by yourself. Traditionally and by natural habits all places and things in house or library are cleaned up except books. This is may be because the dust has been until now a matter of appearance and not a source of health danger. But when we consider the results of some researches that the dust is one of the most harmful matters that we can inhale [16]; it would be suggested that we make a real challenge in our habits.

The only case that may be comparable with the case of books is active smoking. That's other case that the person blows harmful matters by himself through respiratory organs inside body.

When you read a dusty book you are exposed to dust particles as long as you continue to read the book.

When a library staff goes to pick up a dusty book in the reserve stock, as a result of air disturbance, the small particles (<10 microns) flay away from the surfaces to which are attached. The person who carries the book can spread the dust everywhere. As a result the concentration of dust particles may be the most in public libraries.

A health effect is determined not just by the pollution level but also, and more importantly, by the time people spend breathing polluted air, exposure level and concentration of pollution. Only scientific measure can determine the exact risk level for a librarian who works in such work places.

When we consider carefully existing information in the literature related to corresponding risk area and the observation of this author in some public library, and mechanism of dust accumulation and its transfer to our body, we come to conclusion that, the librarians who work in public libraries with reserve stock are in real danger. A librarian who has to open the books several times per day, the risk seems to be at highest level and comparable with active smoking. Staffs who carry the dusty books can distribute the dust particle around him and inside the library. The risk for such staff should be less than active smoking but seems to be always more than second hand smoking.

The overall risk seems to vary from lung cancer, heart attack, asthma to ordinary allergy problem, esthetic problem of skin, depression etc. These librarians should be considering as workers at high risk and protected by law.

In the cases of lung cancer and heart attacks that I heard in some public libraries, I now believe that there is strong relationship of their illness and the books' dust.
What law says?

In Grand Bretagne, employers' legal duty arises under section 2 of the Health and Safety at work Act 1974, which requires them to do all they can to provide a safe system of work and a safe working environment. Employers may have to conduct a risk assessment under regulation 3 of the Management of Health and Safety at Work Regulations 1992, which places a duty on the employer to make a risk assessment if the hazardous substance arises from other source than manufacturing process [17].

If you are an employee, you can check with your union and local health department to find out what your rights are where you work.

What is the solution?

The best way to eliminate the risk is to eliminate the source of risk by cleaning the dusty books regularly.

The clean up can be done by vacuum cleaners. Many vacuum cleaners in market are not efficient for removing fine dust particles. Only vacuum cleaner equipped with HEPA (High Efficiency Particulate Arresting) can effectively remove fine dust. Vacuum cleaner with multi-stage filtration systems and double wall disposable inner bags are helpful. If possible, a central vacuum system should be installed, which removes collected materials but dose not require that someone to be exposed to the collected dust in vacuum bag.

Cleaning the air with an Air Purifier (Air Cleaner) device equipped with electrostatic filter is efficient for limited area of library or office of staffs.

Using Book Dust Jacket is a good way of protection of books against dust.

It is possible to cover the three sides of books with dust proof coating. If there is not such product in market, today coating technology permits to easily develop one.

Conclusion

The dust today is not a problem of appearance, but a problem of health. Dust particulates are one of the most harmful matters that you can inhale.

In the case of books there are two important points:

-The surfaces of papers act as a magnet of dust particulates. The three sides of books act as a preserve of dust particulate as long as they are not cleaned.

-When you open a dusty book, dust particulates deposited on three sides of books are removed and are pushed up with the resulting air current directly into your nose.

Consideration of these two phenomena makes the case of books important and it is what until now nobody thought about it. This kind of dust transfer to our body is only comparable with the case of active smoking in which somebody blow up harmful matters by himself through respiratory organs into body.

When we consider carefully existing information in the literature related to corresponding risk area and the observation of this author in some public library, and explanation of mechanism of dust accumulation on books and its transfer to our body, proposed in this report, we come to this hypothesis that there is link between books dust and illnesses like lung cancer, heart attack, allergy asthma, skin problems. The librarians who work with dusty books, seems to be in real health danger. The risk is ranging from lung cancer and heart attack to chronic asthma, allergy problems, depression, nervous problem, esthetic problems of skin etc. They should consider as workers at high risk and protected by law.

The existing standards are not enough to protect the librarians and new studies should be done to create new standards.

The public libraries should take responsibility to clean up dusty books before lending to their clients.

In the cases of lung cancer and heart attacks that this author observed in some public libraries, It is believed now that there is strong relationship of these cases and books` dust.

This article could be considered the first scientific hypothesis regarding books' dust hazard. This work should be further developed by immunologists and other health specialists. Meanwhile this author strongly believes that action should be taken to protect people at risks.

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