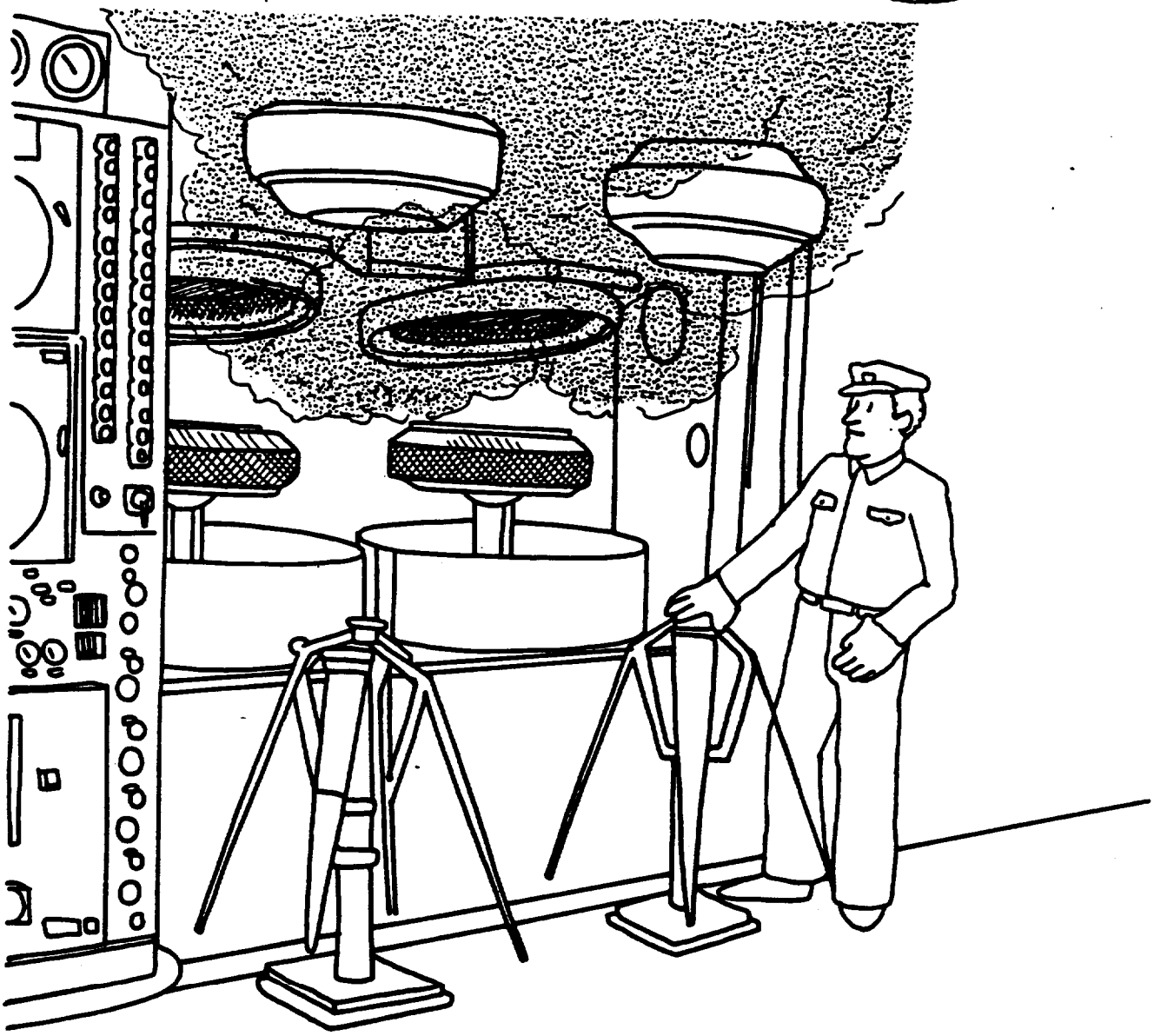
Cancer in the Rubber Industry: The Risks and What You Can Do About Them

PLAINTIFF'S EXHIBIT
1110

U.S. Department of Labor
Occupational Safety and Health Administration

May 1980
OSHA 3068

NOV 1984
RECEIVED
Bureau of Occupational Health
SW Region



Contents of this publication are in the public domain and may be reproduced, fully or partially, without permission of the Federal Government. Source credit is requested but not required.

cancer in the Rubber Industry: The Risks and What You Can Do About Them

U.S. Department of Labor
Ray Marshall, Secretary

Occupational Safety and Health Administration
Eula Bingham, Assistant Secretary

TABLE OF CONTENTS

INTRODUCTION

Rubber workers are exposed to numerous chemicals and products of chemical reactions. Research on the deaths of rubber workers indicates that there have been cancer-causing agents (carcinogens) in the rubber working environment in the past. Although the chemicals used and plant conditions in many instances may have changed, there is no reason to believe that this situation is completely corrected. What do you know about the substances with which you work? Not too long ago, for example, benzene, 2-aminonaphthalene (beta naphthylamine). and acrylonitrile were used without any suspicion of danger. Now they have been identified as carcinogens: There is an excess' of cancer deaths among workers who used-these substances. This booklet will help you locate some of these hazardous substances in the areas, departments, or operations which have been identified as high-risk work stations. Exposures to toxic substances must be controlled.

You have an obligation to yourself and your family to protect yourself from exposure to carcinogens. Your employer also has a legal obligation to provide you with a healthy work environment. Until all the carcinogens are pinpointed and exposure to them reduced by ventilation and other engineering controls, it is risky for you not to take action. Don't allow yourself to become an addition to the statistics that prove the link between rubber workers and cancer. Please read this booklet carefully and follow those measures which apply to you. You and your coworkers should have a better opportunity to live a long and healthy life.

How to Use This Booklet

While most of the detailed examples in this booklet refer to tire production, the information is general and applies to all rubber workers. Whether you make tires, hose, conveyor belts, or rubber bands, many of the problems you will encounter are the same. Information in this booklet is also useful (though to a lesser degree) to workers involved in the production of synthetic rubber. Many workers may switch jobs within a company and face different working conditions, including exposure to the chemicals used to produce synthetic rubber and the substances used in the production of finished rubber goods. Whatever your job may be, you will find precautions in this booklet that will help you protect your health. After you have read the booklet, discuss it with your coworkers and then work together with members of your safety committee and management to bring about the necessary changes with engineering controls and improved work practices. You have a personal obligation to become actively involved with your coworkers and management in areas where your health is at risk. You have the greatest opportunity to bring about changes and improvement at your workplace through your personal interest and motivation. Your efforts to acquire information about workplace hazards, and to bring these issues to the attention of your coworkers, union, and management, should help to improve attitudes toward health and lead to correction of conditions at your worksite.

Where necessary, chemical names from references cited in this publication have been changed to agree with modem internationally accepted terminology, according to the following reference: ***Nomenclature*** of ***Organic Compounds,*** fletcher, Dermer & Fox, ACS Series 126, 1974.

This publication was produced in OSHA's Office of Training and Education by Arthur Gass and John Steelnack, who served as project officers.

* In this context. "excess" can be defined as "above average." Thus. an "excess of cancer deaths" mans cancer deaths above the normal rate.

THE PROBLEM

What Is Cancer?

Cancer is the second leading cause of death in the U.S. There are many different types of cancer but they are all characterized by the uncontrolled growth of body tissues. Cancer cells divide, grow rapidly, and usually take the form of a tumor (swelling). The tumor will eventually crowd and damage the surrounding healthy organs or tissues. In addition, the cancer may spread to other organs or other parts of the body. If untreated, or if treatment does not work, the cancer eventually can cause death. Therefore it is important to detect cancer at an early stage in its growth when it can be treated effectively. But, since cancer is both difficult to treat and often fatal, it is more important to prevent it, by limiting exposure to toxic hazards.

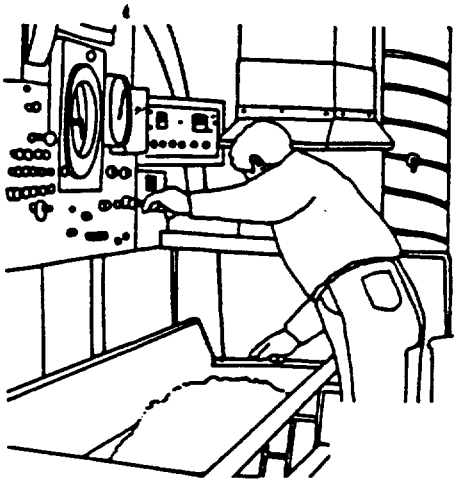
What Causes Cancer in Rubber Workers?

The exact causes of most types of cancer are not well understood. It is believed, however, that at least 20% of all cancer is caused by exposure to substances and physical hazards found in the workplace; chemicals, dusts, fumes, radiation, cigarette smoke, and some food additives account for another 40% to 70%, and approximately 10% is thought to be hereditary. Known cancer-causing substances (carcinogens) that rubber workers have encountered in the past are benzene, 2-aminonaphthalene, aromatic amines, and acrylonitrile. There are suspicions about many more, such as N-phenyl-2-aminonaphthalene (phenyl beta naphthylamine) and chloroprene.

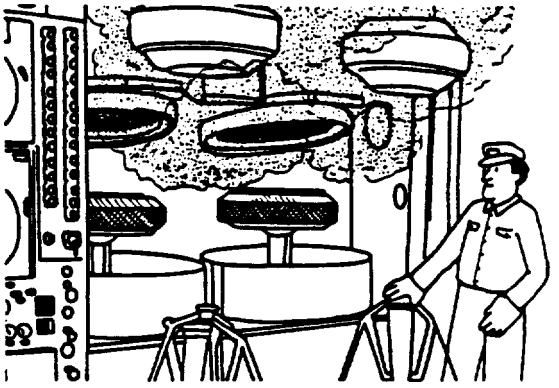
There is the possibility that some antioxidants, accelerators, or other additives, and contaminants attached to carbon black may be carcinogenic. A great deal of research is being performed to determine which substances are responsible for the excess cancer in rubber workers. Until we know more answers, it is necessary for both you and your employer to take certain precautions to reduce your exposure to potential carcinogens. These measures will be discussed in a later section, but first it is important for you to understand a few more facts about cancer.

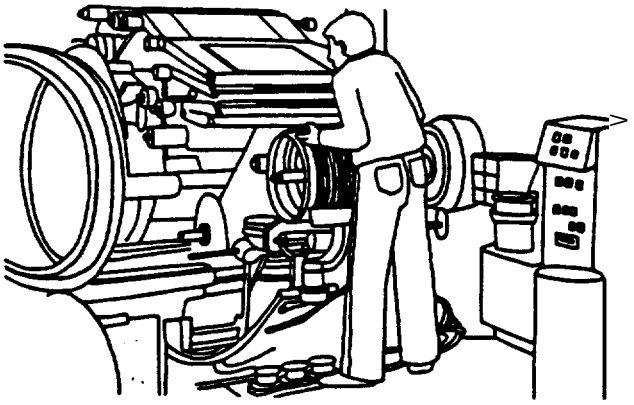
SOME SPECIFIC STUDIES SHOW THAT, COMPARED TO THE GENERAL POPULATION:

Rubber workers in processing operations for mixing, milling, and compounding show increases in the number of stomach cancers and in leukemia cases.



Curing workers have an increase in the number of lung cancer cases.

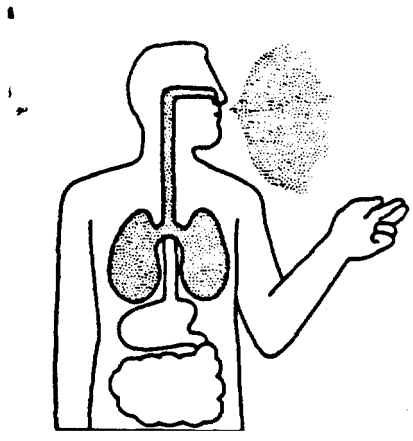




Workers in tire building using solvents and cements experience increases in bladder cancer occurrence and an increase in brain cancer cases.

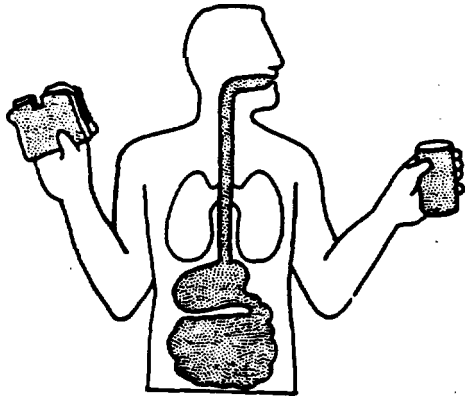
There are three ways that carcinogens can enter the body to cause cancer:

1. By Being Inhaled



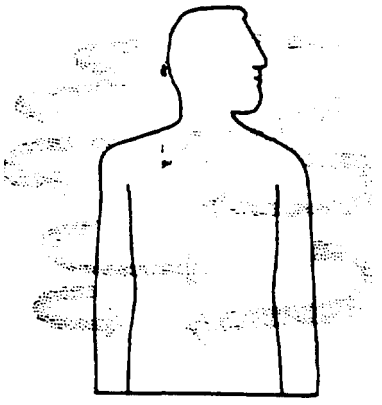
Your lungs are exposed to whatever is in the air that you inhale. Smoke, dust, mist, solvents, silica, asbestos fibers, and fumes, all have a chance to react with your lungs. Some can cause lung cancer. Some chemicals, such as solvents, cross from the lungs into the blood stream to react with other organs of the body. Small dust particles of 5 microns or less (one micron equals 1/25,400th of an inch) in size can become lodged deep in the lung. Larger particles are trapped higher up in the mucous lining of the air passages that lead to the lung. These particles are carried out of the lung and are swallowed or blown out of the nose. Other particles can be ingested and carried away by the white blood cells of the lung tissues into the blood stream. It has been suggested that some chemicals can be adsorbed on the surface of dust particles such as carbon black, become trapped in the lung, and react with the lung tissues.

2. By Being Swallowed



The swallowing of a carcinogen can result in cancer of the intestinal tract and other organs. Stomach and intestinal cancer rates are elevated in rubber workers. One of the ways that carcinogens can be swallowed is by eating or drinking in the work area. Any food or drink stored in the work area can become contaminated with dusts or chemicals used in that area. This is why the storage or consumption of food or drink in work areas where carcinogens are present is prohibited in the Occupational Safety and Health Administration (OSHA) standards. You should wash your hands prior to eating, drinking, going to lunch, or going home. If there is no washroom convenient to your lunchroom or break area, request that your employer install one. A second way that carcinogens can be swallowed is through inhaling dust in the air. Your lungs trap much of this dust on their mucous lining, which is then swallowed as a result of normal lung elimination. This cleansing action has been suggested as a cause of the excess stomach cancers seen in rubber workers.

3. *By Skin Absorption*



The third way that carcinogens can enter the body is by absorption through the skin. The skin is normally an effective barrier to many substances found in nature. The skin contains a layer of lipid or fat which acts to exclude most water-soluble chemicals. The wide use of organic solvents in the rubber industry can have a serious effect on the protective capacity of the skin. Many organic solvents can penetrate this fat or lipid layer and enter the underlying cell layers and the blood stream. These solvents can then be transmitted by the blood to other areas of the body. These solvents also act to dry the skin oils that protect skin from cracking and infection. The presence of coal tar compounds and petroleum products in some solvents and plasticizers used in the rubber industry may be a cause for the excess numbers of skin cancers seen.

Some scientists believe that good nutrition and good health habits may support and raise body defenses to the early growth and spread of cancer cells. Generally, there is a relatively long period between the first exposure to a carcinogen and the eventual development of cancer. This "latent period" varies from person to person and from one carcinogen to another, but is generally anywhere from 15 to 40 years. This means that the effects of the exposure you are receiving now may not appear for many years. You might feel fine even though you may be in the early stages of developing cancer.

Once a cluster of cancer cells starts to grow, the process almost never stops by itself and may not stop even when exposure to the carcinogen is ended. This means that it is not sufficient to merely end exposure to carcinogens to prevent cancer; it is also important to continue medical examinatcn of people who were exposed at some time in the past since they are still living with the risk of developing cancer.

Finally, there is no known safe level of exposure to any carcinogen. Any exposure to a carcinogen increases your risk of developing cancer. Higher doses of carcinogens mean that, for any given group of workers, more of them will develop cancer. Reducing the exposure lowers the risk of cancer but does not eliminate it. The best approach to preventing cancer from occurring on the job is to eliminate exposure to carcinogens in the workplace. This is difficult, especially since the carcinogenic potential of many rubber chemicals is unknown.

The ideal course *of action* is *to* reduce exposure to all chemical substances *to the* lowest *possible level* in the workplace unless they have been proved to be harmless. This should not only result in a reduction in cancer, but also should reduce other work-related ailments such as chronic breathing problems, nervous system disorders, and skin irritation.

Can Cancer Be Cured?

Currently about 20% of all recorded deaths in the United States are due to cancer. Many people think that once they have cancer they are likely to die of this disease. This is not always the case. For example, nearly everyone who gets skin cancer can be successfully treated. But for the types of cancer that occur frequently among rubber workers, the outlook is not as good. The following table shows what percentage of cancer patients with the type of cancer shown are alive five years after the ailment was first diagnosed:

Type of Tumor	Percent of Patients Alive After Five Years
Stomach	12%
Bladder	55%
Lymphatic or Leukemia	26%
Lung	8.5%

One key factor in whether or not most forms of cancer can be cured is early detection and treatment. If the cancer goes unnoticed and untreated for a long time, then the patient's chances for survival are severely reduced. Treatment often involves surgery to remove the diseased organ or tissue.

THE BEST WAY TO AVOID CANCER IS BY PREVENTION. Most work-related cancer can be prevented through proper engineering controls and good work practices. Thus the focus of this booklet is cancer prevention.

Cancer in the Rubber industry

Cancer in the rubber industry is not a new problem. The British first noticed an unusually high or excessive number of cancer deaths among rubber workers in 1920. A great many studies have been performed since that time to determine the types of cancer and their causes. Much of the latest information on cancer in the rubber industry has been developed by Harvard University and the University of North Carolina. (Reference 22) This research has been funded by a joint occupational health program supported by the rubber companies and the United Rubber Workers Union. Studies are continuing to determine the problem areas in rubber plants and to identify sources of disease. The types of cancer and their incidence vary widely from one job to another and from one plant to another. This situation occurs because of the variety of chemicais used and the variation in exposure levels. The following chart summarizes what has been found so far:

Type of Cancer	Risk Ratio'	Work Areas of Highest Risk	References (See page 40)
Stomach Cancer	2 to 2.3	• Synthetic Plant • Compounding • Mixing • Mill-Mixing • Milling • Testing Laboratories • Tread Extrusion and Cementing • Receiving/Shipping • Calendering • Tube and Flap Building • "Green" Tire Preparation	1, 4, 9, 10, 11, 12
Intestinal Cancer	2 to 2.3	• Milling • Rubber Making • Solid Tires/Tracks • Tread Extrusion and Cementing • Maintenance/General Service • Special Products	1, 4, 9, 12
Pancreatic Cancer	2.5 to **3**	• Tire Curing • Elevators	1
Lung Cancer	1.4 to **2.3**	• Synthetic Latex • Receiving/Shipping • Cement Mixing • Compounding • Mill-Mixing • Tread Extrusion and Cementing • Tire Curing • Fuel Cells/Deicing • Tire Molds • Reclaim	1, 4, 10, 11, 12, 13, 14
Prostate Cancer	1.6 to **3.5**	• Calendering • Compounding • Mixing • Janitoring and Trucking • Cement Mixing • Maintenance/General Service • Final Finish • Material Conservation	1, 4, 9, 10, 11, 12

Type of Cancer	Risk Ratio*	Work Areas of Highest Risk	References
Bladder Cancer	1.5 to 2.5	• Compounding • Chemical Plant • Mixing • Tire Building • Warehouse/Shipping and Receiving • Milling • Reclaim • Cement Mixing • Plastics • Calendering	1, 3, 4. 10. 11
Skin Cancer	6.5	• Tire Assembly	1
Brain Cancer	4.1	• Tire Assembly	1
Lymphatic Cancer and Leukemia	2.5 to 5	• Tire Building • Calendering • Tire Curing • Elevators • Tubes • Rubber Fabrics • General Service • Compounding • Mixing • Finishing, Repair, and Inspection • Cement Mixing • Tire Painting • Plystock Handling • Synthetic Plant • Tread Extrusion and Cementing • Janitoring and Trucking	1, 4. 5, 9, 11.12

* In this small population of workers, normal risk is 1.0 and increased risk *is* greater than 1.0