For decades now, work-related cancer has been known and documented in several countries of the world. As an occupational hazard, cancer has been recognised worldwide with provisions for prevention and compensation.

However, only recently, through an amendment in the Factories Act 1948 Schedule III, occupational cancer has been included in the list of notifiable diseases in India. This implies that in factories covered under the above Act, cancer will also be considered as an occupational disease likely to affect workers.

This is a welcome step forward in the ongoing struggle of workers and their organisations to protect their health at workplaces. This will also make it possible for workers and their organisations to invoke the provisions of the Factories Act for investigation, modification and improvement of workplaces. To that extent, this may provide another vehicle by which occupational health hazard-related struggles of the workers can be further intensified.

However, mere inclusion of occupational cancer as a notifiable disease in the Factories Act does not imply substantial changes in the identification, treatment, prevention and compensation related to such diseases. This is because, as an occupational disease, cancer takes several years, some time decades, to appear in visible and identifiable form on the human body at work places. Thus it is very hard to create mechanisms for early diagnosis and prevention. Secondly, for numerous chemicals being used and produced in the industry and elsewhere, it is very difficult to establish cancer-causing (carcinogenic) properties of these materials. It is only through years of study, both epidemiologically and in the laboratories, that such carcinogenic properties could be identified.

Besides, there is a lack of data about cancer-causing materials being used and produced in factories and elsewhere in the country. There is also very little information available about the exposure level and limits of materials that are known to be carcinogenic. Collection, analysis and dissemination of such information is woefully absent in this field in this country. To that extent, the struggle of the workers and their organisations and supporters to make work places safer and healthier get undermined.

It is hoped that several more legal steps and enactments would be made in future to strengthen such possibilities and to create conditions for prevention of occupational cancer. Workers and organisations must continue to press their demands for their 'Right to Know' in this regard.
Occupational cancer is the outcome of sustained exposure to chemical and physical cancer-causing agents at the workplace. The manifestation can take years after exposure to these agents. Because of this, it is difficult to establish the link between certain occupations and the particular cancer risks which the workers in these occupations face.

The earliest link was established in 1775, when a study showed that scrotal cancer was common among the chimney sweeps, due to the sustained exposure to soot which their work entailed. Other reports of that period recorded the incidence of skin cancer among paraffin workers and shale oil workers. These reports proved that such cancers occurred as a result of long exposure to these agents. After this, many more studies were conducted which established more strongly the cancer-causing properties of chemicals and processes at work. Some of the early examples were liver cancer due to polyvinyl chloride, and lung cancer among asbestos workers and among workers of the industrial processes handling bis-chloromethyl methyl ether and mustard gas.

Scientifically, therefore, occupational cancer began to hold a central position in the history of cancer research, as it provided the first examples of cancers for which direct causes could be identified, first in terms of occupational exposure, and subsequently, in terms of specific causative agents. Research was then focused on isolating the chemicals and elements which were cancer-causing or carcinogenic.

**Definition of Carcinogens**

"Carcinogens may be defined as chemical, physical or parasitical agents of natural and synthetic origin capable, under conditions of exposure, of producing cancer in living beings. In several organs and tissues, regardless of the route of exposure and the dose and physical state of the agents used. Any substance which is causally associated with an increased occurrence of a cancer is regarded as a carcinogen.

Carcinogenic agents can be classified as:

- Natural carcinogens
- Synthetic carcinogens

Natural carcinogens include all those constituents that interact with people in their daily life. For example, ultraviolet rays of the sun, visible light, radio-waves, gamma rays etc., are well known causes of skin cancer. There are also other types of inorganic compounds such as charcoal, soot, and coke which are cancer-causing agents. Other important natural carcinogens are the extractives of tobacco, and other plant and animal metabolic products.

Synthetic carcinogens are chemicals which are produced synthetically. Some of the important ones are B-Naphthylamine, food and cosmetic dyes, iron dextron, and vinyl chloride, which causes a rare cancer of blood vessels in the liver. Other chemicals such as hydrocarbons like DDT, Dieldrin, Aldrin etc., which are used in the form of pesticides are also a cause of cancer, as also carbon and silicon plastics used as adhesives, lubricants, synthetic rubber and prostheses.

**Epidemiology**

The concept of a carcinogen in the epidemiological context is essentially any exposure which can be identified clearly, and which is associated with an increased occurrence of cancer.

Recent research in occupational cancer has shown that certain types of cancer are specifically associated with particular occupations. These are:

Respiratory tract cancer usually occurs in asbestos workers and uranium ore miners. Skin cancer is also common in these industries. Exposure to vapour or clumps of oils, tar and pitch, volatile alkylating agents such as bis (chloromethyl) ether, or working with certain metal derivatives such as chromium are also associated with this cancer. Nickel derivatives in the form of dust generated at the earliest stages of refining have led to bronchial and lung cancer. Lung cancer has also been reported among hemate workers.

Nasal cavity cancer is common in nickel refining and chromate preparation. Workers in the leather industry use excessive chrome. Similarly, workers concerned with production of isopropyl oil are also prone to this cancer. It is also reported in the wooden furniture industry and possibly among flour mills workers, mainly because these occupations entail exposure to high levels of dust.
Liver cancer is most commonly found in industries where vinyl chloride is used in the production process. In an experiment done with rats, the presence of 50 ppm of vinyl chloride was found to be enough to induce liver tumors. Even one to two ppm level in the environment has been reported to be hazardous.

Other types of occupational cancer can be from exposure to chemicals like benzene, where the incidence of leukemia is very high. Paints of aluminum materials which contain natural radio active mesothorium have been proved to cause bone cancer.

While it is simple to list the substances recognised as carcinogenic in the working environment, a similar classification by occupation presents several problems and is also limited by inadequate information about industrial processes.

Attempts have been made to list out the occupations which have a high risk of cancer. A list has been prepared by the International Labour Organisation in which high cancer risk occupations have been identified and then ascribed likely causative agents. The International Agency for Research on Cancer has a list of chemicals associated with (or strongly suspected to be associated with) the initiation of cancers in humans.

Epidemiological studies have also provided evidence to verify that atmospheric pollutants contain carcinogenic agents which can cause lung cancer. For example, smoke emanating from chimneys of factories, exhaust from automobiles using both gasoline and diesel, the brown cloud expelled from hot engines, the asphalt covering the roads, the coal tar and pitch used for roofing, etc.

It should also be emphasized that the carcinogenic risk in several other industrial processes has not yet been investigated. Because the existing epidemiological studies are not sufficient on their own to provide diagnostic cues, it is necessary to investigate the occurrence of the disease in detail at the time of diagnosis.

Diagnosis

At the diagnostic level, it is imperative to collect a detailed occupational history of the patient - when and where the patient has been employed in the past, etc., in order to ascertain whether the job entailed one in which exposure to a carcinogen could occur. This information can be collected while interrogating the patient. However, one has to be careful since the workers themselves are not aware of the chemical compounds present in their occupational setting, primarily because they are not given any information regarding this. Another source of information can be the factory records in which detailed information is usually available from health insurance records, particularly in the large industries and factories.

Collecting the occupational history of the patient can provide convincing evidence for compensation purposes.

Prevention

As a preventive measure, efforts should be made to prohibit the presence of carcinogenic substances in industrial processes. Only a few countries like Canada, Sweden, Australia, USA and UK have legal restrictions on the production and use of carcinogenic substances. But there are often discrepancies from one country to another. In developed countries some carcinogens which have been identified through experiments on animals, other organisms and epidemiological surveys have been banned from production and use. The awareness in our country has still to reach to that level despite concrete proof of cancer-causing effects of substances like B-naphthylamine, benzidine and asbestos, these are still being produced and used; coal tar is being regularly used by road labourers; x-rays, minerals and dyes are also indiscriminately used and produced.

The major option is to eliminate contacts between workers and carcinogenic substances present in the workplace. This can be done in the following ways:

a. Production and transportation of carcinogens in closed areas.
b. Control of the working environment by monitoring levels of exposure.
c. Personal Protective Equipment as a last resort for those workers who are at a higher risk of being exposed to carcinogenic substances.

There is also a need for national and international regulations on the production, use and distribution of carcinogenic substances, including waste disposal procedures, in order to avoid contamination of the general environment and workplace.

Legislation

Regarding legislation concerning carcinogens, most of the industrialised countries have general laws dealing with toxic substances, but only a few countries include special provisions for carcinogens. The first country to adopt regulations prohibiting the manufacture of certain chemicals specifically because of their carcinogenicity was the United
Occupational cancer does not differ clinically and histopathologically from other cancers. In diagnosis, detailed occupational history is the main diagnostic assessment. As a useful tool the following table (which is not exhaustive) is given.

<table>
<thead>
<tr>
<th>Industrial occurrence</th>
<th>Reported or suspected agent</th>
<th>Site of the cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>In industries associated with</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asbestos production</td>
<td>asbestos</td>
<td>lung, pleura</td>
</tr>
<tr>
<td>Boot, shoe manufacture and repairs</td>
<td>leather dust, benzene</td>
<td>nose, bone marrow</td>
</tr>
<tr>
<td>Chemicals production</td>
<td></td>
<td></td>
</tr>
<tr>
<td>vinyl chloride</td>
<td>vinyl chloride monomer</td>
<td>liver</td>
</tr>
<tr>
<td>isopropyl alcohol</td>
<td>not identified</td>
<td>paranasal sinuses</td>
</tr>
<tr>
<td>dyes (also users)</td>
<td>benzidine, 2-naphthylamine, 4-aminodiphenyl</td>
<td>bladder</td>
</tr>
<tr>
<td>BCME, CMME</td>
<td>BCME, CMME</td>
<td>lung</td>
</tr>
<tr>
<td>auramine</td>
<td>auramine and other aromatic amines</td>
<td>bladder</td>
</tr>
<tr>
<td>Chromate production, plating, pigment</td>
<td>chromium</td>
<td>lung</td>
</tr>
<tr>
<td>Copper smelting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>insulation, pipe covering</td>
<td>asbestos</td>
<td>lung</td>
</tr>
<tr>
<td>Furniture</td>
<td>wood dust</td>
<td></td>
</tr>
<tr>
<td>Gas production</td>
<td></td>
<td></td>
</tr>
<tr>
<td>coke plants</td>
<td>benzo(a) pyrene</td>
<td>lung</td>
</tr>
<tr>
<td>gas works</td>
<td>coal carbonisation products, alpha and beta naphthylamine</td>
<td>lung, bladder, scrotum</td>
</tr>
<tr>
<td>Mining</td>
<td></td>
<td></td>
</tr>
<tr>
<td>arsenic</td>
<td>arsenic</td>
<td>lung, skin</td>
</tr>
<tr>
<td>asbestos</td>
<td>asbestos</td>
<td>lung</td>
</tr>
<tr>
<td>iron</td>
<td>not identified</td>
<td>lung</td>
</tr>
<tr>
<td>uranium</td>
<td>radon</td>
<td></td>
</tr>
<tr>
<td>Nickel refining</td>
<td>nickel</td>
<td>nasal sinuses, lung</td>
</tr>
<tr>
<td>Petroleum</td>
<td>polycyclic hydrocarbons</td>
<td></td>
</tr>
<tr>
<td>Roofing, asphalt work</td>
<td>benzo(a) pyrene</td>
<td>lung</td>
</tr>
<tr>
<td>Rubber, tyres</td>
<td>benzene</td>
<td>lymphatic and haematopoietic system</td>
</tr>
<tr>
<td>Ship building, motor vehicles, transport</td>
<td></td>
<td>leukaemia, bladder</td>
</tr>
<tr>
<td>Steel production</td>
<td>benzo(a) pyrene</td>
<td>lung</td>
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Kingdom with regard to aromatic amines. During 1930's, attempts were made to include it in the Workmen's Compensation Act, but only in 1962 bladder cancer due to exposure to aromatic amines was included in the Prescribed Industrial Diseases Regulation. Finally, in 1967, specific legislation prohibiting the manufacture of 2-naphthylamine and benzidine, and 4-amino-phenyl were passed. But all the existing laws regulating exposure to carcinogens were formulated in 1965 and till date no new laws have been adopted thereafter.

Thus only a few countries have legislations with specificity to chemical carcinogenic substances, and attempts to provide guidance for the implementation of the principles set forth by the ILO.

In India, even though occupational skin cancer has been included in the Notifiable Diseases Schedule from the beginning of the enactment of the Factories Act in 1948, practically no initiative has been taken to diagnose and prevent skin cancer. More inclusion of occupational cancer in the list, therefore, will not automatically implicate prevention and early diagnosis and treatment of occupational cancer. Perhaps it is necessary to establish an universal standard for the detection of carcinogenic risks of products used and produced at the workplace. The occurrence of cancer due to exposure to carcinogens at the workplace should not be denied by attributing it to workers smoking and alcohol consumption habits. It has been seen that the potential carcinogenic effects of different substances at the workplace are not recognised, and statistical significance of smoking and drinking is given priority. There is a need to examine the carcinogenic effect at the workplace primarily from the point of view of safety practices, focusing on the workers at the centre.
Between 400,000 to two million pesticide poisonings occur worldwide each year, of which 10,000 to 90,000 are fatal. The extent of the harmful effects of these compounds are yet to be ascertained. As a matter of fact, the toxic effect of only 10 per cent of these chemicals are known. A report of the World Wide Institute says "babies in rural Punjab daily ingest certain pesticides in amounts 21 times more than 'acceptable levels'"

Recognising the grave consequences of pesticides poisoning, the Department of Science and Technology (DST), Government of India, has brought out a status report on pesticide residues under the scheme of "Consumer Protection Thru Science and Technology (PS & TY). This is a planned programme under the Seventh five-year Plan. The report suggests an integrated pest management (IPM) involving a combination of biological, physical and chemical controls, and development of pest resistant crop varieties. The report has 37 recommendations on how to ensure safety from pesticides vis-a-vis IPM, legislation and consumer education.

Doctors have issued warnings about the widespread aluminium phosphate poisoning in North India. This is a common fumigant that protects stored grain from being eaten up by pests. Doctors of the All India Institute of Medical Sciences (AIIMS), New Delhi, have established that several hundred people have died in recent months after accidental ingestion of the chemical, which is as dangerous as cyanide if swallowed. The AIIMS report is based on its own data and on medical reports from other hospitals in neighbouring states. The guideline for pesticide use rules that aluminium phosphate can only be used by government organisations, and pest control operators with technically qualified personnel. Despite these restrictions this chemical is openly used by agricultural workers. Scientists at the Indian Agriculture Research Institute (IARI) say that aluminium phosphate is in great demand amongst the farmers who find it to be a convenient and inexpensive fumigant.

In an architectural engineering firm in San Francisco, a worker on the Video Display Terminals (VDTs) complained of acute pain in the eyes, after working for about three months on the VDTs. She filed a Workers' Compensation claim for eye injury which the company's insurance carrier contested. After a long-drawn legal battle, she was eventually granted temporary disability payment and workers' compensation settlement - one of the first VDT-related settlements in the United States. This settlement has important implication for VDT operators worldwide.

A three day workshop on Labour Legislation and Occupational Health and Safety was organised jointly by PRIA and Volunteers for Social Justice at Phillur, Punjab, from September 9 to 11, 1988. The local agriculture and forest workers and their union representatives attended the workshop. Legislations regarding minimum wages, contract labour, compensation and other welfare benefits were discussed. The participants planned to organize meetings at their own work areas to highlight the problems, including health and safety issues. Taking stock of the situation, a long term strategy will be chalked out by worker activists and the Volunteers for Social Justice.

A two day workshop on Occupational Health and Safety was jointly organised by PRIA and a Hyderabad-based environmental group, Centre for Environmental Concerns, on July 29 & 30, 1988 at Hyderabad. The participants at the workshop developed a common understanding on the issues of Occupational Health and Safety. These participants were from Hyderabad-based Trade Unions, NGOs, factory management, industrial hygienists, and other worker activists. A few other experts and resource persons from other parts of the country were also present to share their concern on the issue. The group members present in the workshop agreed to develop a common forum to document the hazards and work together to educate workers and communities on the issues. The Centre of Environment Concerns is planning to invite workers, students, and community members to document the industrial hazards in and around Hyderabad.

The 12th Asian Conference on Occupational Health will be held in Bombay from November 18-22, 1988. The Conference is being organised by the Indian Association of Occupational Health, and the theme is "Health and Safety at the Workplace". Issues such as health hazards of chemicals, petrochemicals and related industries, health problems of rural agricultural workers, environmental pollution problems of working women, role of trade unions etc., will be taken up at the Conference.
Three workers died in the underground pipeline of the Hindustan Aeronautics Limited plant in Surkhetda on July 14, 1988. These workers were inside a 30 feet deep pipeline, clearing the line. When they did not come out till late in the evening, the HAL authorities opened the pipeline and removed the bodies. Workers launched an agitation over the management's callousness in the handling of the situation.

Due to poisonous gas leak from tube-wells in Karnal and Panipat districts of Haryana on July 12, 1988, twenty eight people died.

The city of Brisbane, in Australia, was placed under a state of emergency on July 12, 1988 after a massive leak at a fuel depot 10 kilometres from the city centre. Thousands of people were evacuated and roads were blocked as fuel gushed from the ruptured 6 million litre tank, creating a cloud of inflammable vapour. Just one spark would have caused the vapour to ignite.

On July 11, 1988, six people were affected following a leakage in the ammonia gas pipeline of the Sindri fertilizer plant at Dhanbad. The employees were removed to the hospital.

An explosion on July 6, 1988, in an oil rig off the Scottish coast, claimed over 160 lives. Experts from the Occidental Petroleum Company, who are the owners of the rig Alpha, said that the explosion was caused by gas leaking into the compressed air chambers. This is the worst British oil disaster in the last 20 years.

Sulphur Dioxide leakage from a chemical factory, Lubri Chem, caused hundreds of residents from Rai and some nearby villages in Bhayander town of Thane district, Maharashtra, to suffer from burning sensations in their eyes, bouts of dizziness, chest pains, vomiting, etc. The leakage occurred when the Ferro oil from a tank was being transferred to another tank through a pipe.

In Bhatinda district of Punjab, two labourers of the State Water Supply and Sewerage Board died due to poisonous gas leak from the sewerage manhole.

Four workers were killed and 30 others injured when a blast in a steel plant in western Japan caused huge quantities of Carbon Monoxide gas to escape from the mill. The blast occurred at Nisshin Steel Company in Kure when the air-heating furnace was filled with the mixture of fuel gas and air. Thirty persons were injured while trying to stop the leak.
The sewerage system of the Bombay Municipal Corporation consists of an underground network of about 1,000 km of pipelines, comprising the larger interceptor sewers (main sewers) and the smaller pipelines (pipe sewers). The sewerage department of the Bombay Municipal Corporation has four divisions and each has roughly about 120 workers, including a diver, inspection, and repair of the subterranean channels, in order to ensure free flow of sewage. These are the major work of the sewermen. Cleaning the sewer is a highly hazardous job.

**Cleaning the Sewers**

Desilting and maintenance of a sewerage system in Bombay is mostly done manually. A small percent of the work is semi-mechanized. The manual desilting operations basically consist of removal of silt from the manholes and the cleaning of silt from the pipelines.

Manual desilting is usually done with the use of a "deal" (bucket) which is filled up with sewage and pulled up. A "scabber" is also used, which pushes the sludge forward inside the sewer. This scabber is connected to a chain wound around a drum, which is pulled up manually. The scabbers can become quite heavy and pulling them up entails strenuous work. If the sewer gets choked and the water level rises, the workers dive in, submerging themselves completely inside the sewage to clear the choke. These workers are not provided with any protective equipment.

Routine maintenance work is undertaken for eight months in a year, from October to May. During this time the workers have to work on a continuous night shift due to heavy vehicular traffic during the day time.

**Work Hazards**

Due to the working conditions, several workers in the main sewer are suffering from T.B., asthma, and skin diseases. They also complain of insomnia and anemia (lack of appetite). This creates many problems in their private and social life.

There have been a number of accidents over the past few years in the sewers. In 1986, two workers became unconscious and died in the sludge as they could not be pulled out from the sewer in time. In 1975, two of the workers were washed away in the heavy flow in one of the sewers.

The pre-entry checks carried out to detect the presence of toxic gases and/or the absence of oxygen are primitive, inadequate and inaccurate. These checks are done through outdated methods. Since these methods are not fool-proof, the workers have devised their own mechanisms to save themselves from the imminent danger. When a worker goes down he keeps calling. This is a signal that there is no danger in the sewer. The minute he stops talking, he is pulled up immediately.

The sewerage workers also face other serious accident risks, such as:

1. **Gasping:** Many deaths have occurred from poisoning by carbon monoxide, bencene, hydrogen sulphide, carbon dioxide and methane concentration, as well as lack of oxygen.

2. **Immersion:** Death by drowning is not common although sewermen have been washed away in the sewer due to fast rate of flow of the sewage water.

3. **Injuries:** Accidents at road level are very common; head injuries are caused by objects falling down the manhole; toes are often crushed by heavy manhole covers; sometimes minor scratches become septic and lead to other infections.

The other health risk that the sewerage workers face is that they catch infectious diseases like leprositis, also called "sewerman’s disease." The worker is infected by this disease while working in areas where the sewage flow is minimal, as a result of which there are many rats and other subterranean animals. The sewerage workers also suffer from cardiovascular degeneration, which is induced by high blood pressure, breathlessness, giddiness and a raised level of cholesterol. This is generally severe among sewermen who have been on the job for ten years or more. The workers also complain of arthritis diseases which incapacitate them at an early age.

Sewerage workers also suffer from skin diseases (dermatitis). Cases of conjunctivitis due to exposure to fumes are common. Fifty three percent of the workers regularly complain of burning eyes and photophobia (aversion to light). The fumes from ammonia, chlorine, hydrogen sulphide or tar are usually the cause. The sewerage workers also suffer from headaches, nausea, dizziness, diarrhoea and other infections of the digestive tract. Many others suffer from physical tiredness. This is due to the physical conditions due to continuous night work. A sewer-worker's job entails several occupational hazards which poses dangers to the health, social life and well-being of the worker.

The Occupational Health Centre, Bombay is demanding for an investigation of the working environment inside the sewer, including analysis of sewer gas and fumes, and review of the control of waste disposal systems. In addition to the monitoring of the work environment, there is also need of regular medical check-up of the sewage workers.

(Study conducted by the Occupational Health and Safety Centre for the Municipal Mazdoor Union)
HEALTH AND SAFETY ISSUES COMMONLY FACED BY FARM WORKERS

This book is a guide to recognise, understand and diagnose hazards which agricultural workers face in the course of their work. It also answers questions about protection against hazards and how organised action can be taken by unions to monitor, prevent, and demand for compensation.

Available from: Labour Occupational Health Program, Institute of Industrial Relations, University of California, Berkeley California 94720, USA.

POCKET GUIDE TO CHEMICAL HAZARDS

This presents information from the NIOSH/OSHA. The information contained in this guide include chemical names and synonyms, permissible exposure limits, chemicals and physical properties, signs and symptoms of over exposure, environmental and medical monitoring procedures, respiratory and personal protective equipment, use recommendations and procedures for emergency treatment. This book is useful for persons working on occupational health and safety in the industry, as it provides data on the chemicals used and includes all known effects resulting from exposure to the chemicals.

Available from: Department of Health and Human Services, Public Health Services, Centre for Diseases Control, N.I.O.S.H, Robert A Taft Laboratories, 4676 Colombia Parkway, Cincinnati, Ohio 45226, USA.

HEALTH AND SAFETY HANDBOOK FOR LOCAL UNIONS

The book is in response to questions union workers most often ask during health and safety training sessions. It is intended to help in solving workplace health and safety problems for local unions and health and safety representatives, shop stewards and members. It also includes information on the structure and functioning of various types of health and safety committees.

Available from: Labour Occupational Health Program. (Address as above).

NOTIFIABLE DISEASES

This booklet deals with all the twenty nine notifiable diseases mentioned in the Schedule III of the Factories Act 1948 (Amended). It mentions the industrial occurrence, signs, symptoms and nature of diagnosis of these diseases. It will help clinicians and workers to diagnose the diseases at the initial stages. This has been prepared in support of PRIA’s involvement in the issue of occupational health and safety.

Available from PRIA.

Simple account of the common occupational injuries and diseases. It describes how to inspect the workplace and how to run and equip a clinic which provides medical examinations, treatment and first aid training.