EVERY day we come in contact with hundreds of substances, natural or synthetic. We rarely realize that many of these substances are toxic. During the last few decades the number of chemical substances in use has increased drastically. Experts point out that even unborn babies are being exposed to more than 200 commercial chemicals, and this number could be increasing.

Lead is one such element that contaminates the environment and also enters the human body. Even though “unleaded petrol” is in vogue these days, it is reported that lead is still used as an additive in certain types of fuels. One example is the aviation fuel, especially the one used in smaller, piston-engine planes. The fuel is nicknamed “avgas”.

Lead does not get destroyed even at high temperatures in the combustion chambers of automobile engines. It comes out as fine particles with the exhaust gases. The larger particles settle down soon but the finer ones remain suspended in air for different durations depending upon the particle size and atmospheric conditions. Finally the particles may settle down on various surfaces including soil, vegetation, buildings or on water bodies.

People living in urban areas are much more at risk from lead in dust and also through food grown locally as the chances of lead contamination are more there. Experts are of the view that an area that is more polluted in general is more likely to be contaminated with lead as well.

An important source of lead in the environment is the lead-acid battery recycling facilities. Old batteries are dismantled and lead is taken out and heated to cast the metal for fresh use. In the process some lead escapes as solid, liquid and also vapour. Also, industries producing lead wire or pipes, foundries and recycling facilities can add lead to the environment. Children living in the vicinities of facilities like lead smelters etc. have been recorded to carry high levels of lead in their blood.

Lead contamination of soil may also happen due to broken-down lead paint, discarded engine oil, pesticides used in agriculture, paint materials used in households and industries. Ageing lead paints can add high levels of lead to dust and soil.

Pica (eating non-food materials) is common in children. Chipped paint containing lead is extremely dangerous for such children. It is common to remove old paints using sandpaper which produces dust. The dust is
dumped irresponsibly. No protective measures are adopted by workers. There have been cases of painters suffering from lead poisoning.

Brightly coloured toys also carry high concentrations of lead. Lead containing paints are commonly utilized to cut the cost. Children, especially the young ones have a tendency to put the toys into their mouth allowing lead to enter directly.

PVC pipes are in common use for different purposes. According to a report very high percentage of PVC pipes in India were found to contain lead. Source of lead in the pipes could be tin which is used as stabilizer in PVC pipes.

Another source of lead in the food is the solders used for cans made of aluminium or steel. Lead from the solders can leak out and mix with the canned food items. Cheap jewellery is also a risk as these are commonly made using lead. The jewellery comes in direct contact with skin.

Cooking utensils made of metals, especially copper, brass, etc. have high probability of being contaminated with lead as very high-quality materials are not always used by the manufacturers. Lead is added to food items inadvertently when colours are used to make the food items attractive. Cheap colours in markets are generally metal based and there is high probability that lead could be present there in different proportions.

Glazing of porcelain items is common. Earlier it was done using lead salts and the practice although generally abandoned now may continue in case of cheap products. Lead from the pots can always pass into the food, especially if the food is of acidic nature. Pickles, chutneys, vinegar, etc. are often stored in such containers.

Another unsuspected source of lead is imitation leather made from polyurethane. With rise in cost of leather items imitation leather is becoming popular. Brightly coloured imitation leather items such as ladies’ purses, bags, wallets, furniture, etc. may contain lead.

Lead bullets used for hunting or lead fishing lures used for fishing can contaminate the flesh of animals, birds or fishes. Consumption of such products has potential to cause lead toxicity in consumers. Azarcon (lead tetroxide) is used in folk medicine. Lead can also be present in cosmetics.

Accumulation of Lead in Human System

Lead can enter our body through the mouth, nose, and eyes via the mucous membranes and also through the skin, especially if the skin is ruptured. Tetraethyl lead can easily enter through the skin while inorganic lead (present in paint, food, and consumer items) is not easily absorbed through the skin. Main routes are through ingestion and inhalation. In adults, about 35 to 40% of inhaled lead dust gets deposited in the lungs. About 95% of that enters the bloodstream. In case of ingested inorganic lead, about 15% is absorbed. But in case of children the absorption is more efficient. Same is true for pregnant women, and people with deficiencies of calcium, zinc, or iron.
Lead has no role to play in our body. In fact our body tends to eliminate lead but the process is very slow. The main route is through urine; smaller quantities are discharged with faeces, sweat, hairs, nails, etc.

**Impacts of Lead on Human Body**

An important reason for lead toxicity is because it interferes with many enzymes. It gets bound to sulphydryl groups found in the enzymes in lieu of other metals like Ca, Fe and Zn that act as cofactors in the enzymatic reactions. One such enzyme is responsible for synthesis of heme. That is why lead’s interference also results in anemia.

Neurons are also affected adversely. Lead exposure damages cells responsible for memory. Lead can pass the blood brain barrier as a substitute for calcium ions and interfere with the development of the brain and nervous system. Lead poisoning can also lead to loss of myelin sheaths in the neurons, reducing growth of neurons, and numbers of neurons, affecting neurotransmission.

Damage to the nervous system, especially in case of children who are much more vulnerable, is also common. The WHO (World Health Organization) has accepted a new illness: lead-caused mental retardation. In case of acute poisoning abdominal pain, collapse, metallic taste, and paralysis may occur. Also, gastrointestinal disturbances, undefined headache, peripheral neuropathy like foot and wrist drop take place. The person may suffer from inflammation of the mouth and lips (called stomatitis), excretion of coproporphyrin (called Coproporphyrinuria), etc.

Symptoms due to lead poisoning can be easily missed. The diagnosis may veer towards appendicitis, encephalitis, renal colic, etc. in adults. In children the symptoms may indicate viral gastroenteritis, constipation, abdominal colic, iron deficiency, subdural hematoma i.e. collection of blood below the inner layer of the dura (thick outermost membrane that surrounds the brain and spinal cord), neoplasms (new and abnormal growth of tissue) of the central nervous system, emotional and behavior disorders, and intellectual disability.

Acute Lead Poisoning is a rare condition that can be caused in two ways: lead may accumulate in the bones, liver, kidneys, brain, and muscles and then be released suddenly to produce an acute condition; or large amounts of lead may be inhaled or ingested at one time. Symptoms are a metallic taste in the mouth, vomiting, bloody or black diarrhea, and muscle cramps. Diagnosis is made by examination of the blood and urine which indicate rise in lead content.

**Precautions**

The WHO standard for lead in drinking water is 0.01mg/l. Indian standard is 0.1mg/l. However, how far the standards are being implemented and monitored is an issue of concern. This needs to be addressed by creating advanced facilities for proper monitoring.

Monitoring of the environment for possible contamination is ideal, especially in areas where there are obvious reasons for lead contamination. Also, random testing of food materials should be undertaken regularly. Parallel to these screening of vulnerable populations must be carried out.

Lead poisoning can be best tackled by identifying the sources of lead in the environment and devise ways to remove them. Another important step can be to stop manufacture and sale of lead containing paints, pipes and soldered items containing lead, food colours with lead salts and use of ingredients like spices with high lead.

Awareness among health officials about lead poisoning also needs to be promoted. Health officials must also be aware of the treatment processes. Some lead may be present in the intestine unabsorbed in affected patients. Administration of saline cathartics and enema may help in removing such lead.

There is strong need to raise awareness levels of the common masses as well in this regard. People should be aware of the common modes through which lead disperses into the environment and also finds its way into the human body. Lead is a highly toxic metal and a strong poison. Long-term build-up of lead in the body could even be fatal.

Dr. M.A. Haque has been Adviser with the Ministry of Environment & Forests. Address: Flat No. 2204, Tower-D, Ireo Grand Arch, Sector-58, Golf Course Extension Road, Gurgaon-122101; Email: asrarulhaque@hotmail.com