Lead Poisoning

The purpose of this article is not to suggest curtailing shooting or reloading activities in any way. Rather, it is to make shooters and instructors aware of the possibility of lead poisoning and how to protect yourself from toxic lead contamination.

A Firearms Safety Hazard

The U.S. Environmental Protection Agency (EPA) classifies lead as a heavy metal with no beneficial biological use in the body. When a person inhales or ingests lead, it is absorbed into the bloodstream. Once in the body it becomes very difficult to remove. Continual exposure results in the accumulation of lead in the body, and measurable amounts of lead indicate cumulative exposure over a lifetime.

The EPA has determined that lead poses a serious health hazard to everyone. Unfortunately, individuals working with and around firearms often overlook the harmful effects of lead. Therefore, firearms range personnel must take precautions to control all unnecessary exposure to this toxic element. For firearms range personnel, knowing the hazards of lead is a primary responsibility. Taking the necessary precautions to minimize exposure is a duty of all firearms instructors.

Effects of Lead on the Body

Approximately 6 percent of all lead ingested or inhaled is deposited in the blood or soft body tissues, such as the kidneys, brain, or other vital organs. The remaining 94 percent is deposited in the bone. Because the body mistakes lead for calcium, it presumes that, once deposited, the lead needs to be stored. However, the body does break down lead so that it can be removed. The time required for this process is measured by the term "half-life", which means the amount of time the body needs to excrete one-half of that lead. The half-life of lead is approximately 20 years. This means one-half of the lead dosage absorbed by the body through only one exposure and deposited in the bone would still be present after 20 years.

Health Concern

For decades, the presence of lead in the environment has been widespread, beginning with smelting factories and continuing with the manufacture of glazed pottery, batteries, and lead gasoline. It has only recently been acknowledged as a serious threat to public health that warrants government control.

In 1971, the EPA began enforcing the Lead Based Paint Poisoning Prevention Act, which restricts the amount of lead used in paints. Seven years later, the agency set the National Ambient Air Quality Standards, which serves as the primary mechanism to reduce lead in gasoline. However, even with these standards and controls, the residue of lead in food, water, and dirt can elevate the lead level in a person's blood.

Firearms and exposure to lead, typically the exposure to lead on the firing line occurs as soon as the shooter pulls the trigger and the hammer falls. This action causes the primer of the cartridge to explode, in the chamber, which then ignites the main powder charge. At this point, a breathable cloud of lead particles is expelled into the air, with lead dust spraying the shooter's hands.

Lead particles also shear off as the bullet travels through the barrel. When the bullet leaves the barrel, a second cloud of contaminants, in the form of the muzzle blast, blasts into the air. Then, as the bullet strikes the impact area, another contaminated cloud rises.

When shooters inhale these clouds of contaminates, lead particles go directly into their lungs and are quickly absorbed into the bloodstream. The blood then transfers the lead to soft body tissue

and bone. Heat from smoking, sweating, or physical activity accelerates this process.

Lead can also settle on the skin and hair, and in turn, can be absorbed through the pores of the skin. If lead particles reach the mouth, they can be ingested into the digestive system.

Exposure increases at clean-up time. Handling empty casings can result in lead being transferred to the skin. The weapon cleaning process also removes much of the remaining lead in the barrel and transfers it to the cleaner's hands. Oils and solvents used to clean and lubricate weapons cause the natural oils in the skin to evaporate, leaving dry skin and open pores through which the lead can pass.

Symptoms of Lead Poisoning

The numerous symptoms of lead poisoning mimic various diseases, often making diagnosis difficult. Most commonly, individuals experience abdominal pain, fatigue, nausea, subtle mood changes, headaches, constipation, irritability, and depression. Muscle pain, muscle weakness, weight loss, impotence, convulsions, anemia, and renal failure may occur with increased lead levels in the body.

Testing for Lead

Testing for lead can be performed in several ways. The blood lead level (BLL) test detects recent exposure to lead but does not provide information regarding long term or past exposure. The BLL measures the quantity of lead in micrograms per deciliter of blood, written as us/100 dl, that is micrograms of lead per 100 deciliters of blood.

The Occupational Safety and Health Administration (OSHA) Standards states that the median blood levels for adults should be about 15 ug/100 dL. For reproductive health, the blood level should stay below 30-ug/100 dL. OSHA recommends removal from the work place of any employee whose BLL measures 40 ug/100 dL or higher.

The zinc protoporphyrin (ZPP) test can be performed in conjunction with the BLL to determine longer exposure. Lead interferes with the absorption of iron into the blood, which is needed to transport oxygen, thereby allowing zinc to replace iron. The ZPP measures the amount of zinc in the blood, which remains elevated longer than the BLL. The normal range for the ZPP is 0-100 dl. An elevated ZPP indicates concentration in the bone marrow.

The only effective test used for bone lead levels is the disodium edentate (EDTA) chelating agent test. EDTA, a solution that is administered intravenously, bonds with the lead in bone, and clears it from body compartments so that it is excreted through the urine. EDTA both tests and treats an individual; however, medical personnel use it only in extreme cases of lead poisoning because of the potentially harmful side effects.

Special Risks

In males, high levels of lead can decrease the sex drive and cause sterility. Lead can also alter the structure of sperm cells, thereby potentially causing birth defects.

Pregnant women are vulnerable to rapid absorption of lead, along with calcium, from the blood into the bone. This mobilization occurs due to hormonal changes caused by pregnancy. In pregnant women, lead passes unimpeded through the placenta to the fetus, potentially causing miscarriages of the fetus and birth defects.

Children are more vulnerable to lead toxicity than adults are. Children exposed to lead may manifest into slow learning, mental drifts, slight retardation in development, hypertension, and behavioral problems. Excessive blood levels in children can seriously and irreversibly damage a child's brain and nervous system. Because the symptoms mirror those of various childhood diseases, many doctors do not test for lead.

Precautions on the Range

Precautions can be taken both on and off the range to protect shooters, instructors, and their families from lead poisoning. Administrative controls and good hygiene are two necessary tools. In addition, all shooters and instructors should practice the following dos and don'ts of range safety.

Do Not Smoke on the Range

Smoking any type of tobacco products on the range should be prohibited to prevent acceleration of inhaled lead into the blood stream and ingestion of lead transferred from hands to the cigarette, cigar, etc.

Do Not Eat on the Range

Lead dust on hands and face can be ingested through contact with food. Airborne lead expelled from the weapon can also contaminate food.

Don't Collect Fired Brass in Baseball Caps

Many shooters use their baseball caps to collect spent brass, this contaminates the cap with lead particles, When the cap is placed back on the head, the lead is deposited into the hair and absorbed into the skin. Providing boxes for the brass prevents this practice.

Do Be Aware Face, Arms, and Hands Are Covered With Lead

Shooters and instructors should wash thoroughly with cold water and plenty of soap. Cold water is preferred because warm water enhances the absorption of lead by opening the pores of the skin. If no water is available, shooters should consider carrying a box of wet hand wipes or a bottle of cool water and a washcloth for this purpose.

Do Be Aware That Hair and Clothes Are Still Contaminated

Shooters and Firearms Instructors should wear an outer garment, such as a jumpsuit or coveralls, or change clothes before going home. Contaminated clothes should not be cleaned by blowing, shaking, or other means that dispense lead into the air. To prevent cross-contamination, range clothes should be washed separately from the family's regular laundry. Families with infants should be particularly careful, since infants are most vulnerable to lead contamination. Families with infants should be particularly careful since infants are most vulnerable to lead contamination. Changing to clean clothing before leaving the range prevents recontamination of the hands and any contamination of the family vehicle.

Do Change Shoes Before Entering the Residence

Shoes can also transport lead into the home. Shoes should be left at the door to prevent tracking lead onto floors and carpets. Ordinary vacuuming does not remove lead from the home, but redistributes it by blowing it in to the air to be inhaled and/or resettled onto the carpet.

Do Avoid Physical Contact with Family Members until After Shower, Shampoo, and Change of Clothes

Lead can be transferred by casual contact. Family and friends should not be hugged or kissed until after a shower and a change of clothes. Any physical contacts should be avoided while the shooter is still in range clothing.

Indoor Ranges

Although NVGC does not have an indoor range, many of our members have access to commercial, military, and police indoor ranges. Most indoor ranges have a greater lead dust problem than outdoor ranges. However, range personnel can institute several controls to lower the amount of lead dust in these facilities.

The choice of ammunition is one such control. Nonjacketed ammunition produces the most lead dust and fumes, jacketed ammunition, the least. Shotgun shells produce more airborne lead dust than any handgun round. Currently, many ammunition manufacturers are developing lead-free ammunition.

Indoor ranges should not be carpeted, since lead dust settles and contaminates the rugs. A High Efficiency Particulate (HEPA) vacuum, which has a 3-stage particulate air filter is the best vacuum to use for lead.

Because water cannot be treated for lead contamination, personnel should use water sparingly to remove lead when cleaning ranges. If water is used for lead removal, minimizing the amount of water used will result in less pollution. Range maintenance employees should wear disposable coveralls and air purifying masks while cleaning and/or repairing indoor ranges.

What Does All This Mean To You?

During the early years of firearms training, neither eye protection nor ear protection was provided or encouraged on the range. Today, ranges now require both types of protection on the line.

Currently we have learned that another health hazard, - Lead Poisoning, threatens the physical well being of shooters and instructors in firearms ranges. However, through administrative controls and education, shooters can reduce their own exposure and exposure of their families to lead.