

Controlling Blood-Lead Levels for Cowboy Action Shooters™

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Lefty very well may have died from lead poisoning, but in his case it was the damage caused by the projectile and not the introduction of lead dust into his blood!

Lead was discovered around 7000 BC and has seen a wide array of early uses including coins, vases, food utensils, and sculpture. Because it is so easily formed and extremely durable, lead was the popular material for making pipes and fittings in water systems (until its dangers were discovered). In fact, the chemical symbol for lead – Pb – was derived from “plumbum” the Latin word for waterworks.

As cowboy shooters, we’re well aware of the gross residual effects of lead; we’re often showered with ricochet fragments, and there are obvious lead pieces of all shapes and kinds at our feet and at the base of our targets. And, often we go back to our trailers parked hundreds of feet from the range, only to find pieces of lead falling upon us as we roll up our awnings. The presence of lead pieces at a range is daunting. The unseen residual of lead is much less obvious, but the effects of aspiration, ingestion, and absorption of lead particulate into our body is a very serious matter.

Lead is the ideal material for bullets because it casts well and can be easily deformed (a major consideration when bullets are pressed into cases). It can be driven down a tightly fitted barrel at high rates of speed while at the same time being forced into the barrel’s rifling. And, when it arrives at the point of impact, lead deforms and disintegrates easily where it can cause – as it did with Lefty – fatal results.

When a gun is fired, the primer causes the powder to explode creating enormous pressure between the case and the bullet. Following the path of least resistance, the bullet is forced to separate from the case, and travel down the barrel (the case is held in place by the gun’s breech). As the bullet leaves the case, three things happen to the lead bullet: 1) the crimped end of the case strips away small particles of lead; 2) the friction between the bullet and the barrel causes minute particles of lead to be stripped from the bullet and cling to the walls of the barrel; and 3) the bullet comes in contact with the rifling where – because of the laws of physics – inertia prevents the bullet from spinning immediately into the rifling’s “twist.” For a very short distance the bullet travels down the barrel without twisting at the rate demanded by the rifling, and as it moves forward and begins to spin, some of the lead from the bullet is stripped away by the rifling.

Although the pressure – referred to as copper units of pressure or CUP – created by the powder’s explosion is omni-directional, the steel barrel contains the pressure and the force becomes bi-directional; the case is being forced back against the breech, and the bullet is being forced out of the barrel. Even though we clearly recognize that the resultant force and lead exits the front of the barrel, only some portion of the lead particulate follows with it. During the explosion,



Fig. 1. A lead-test kit was used to determine if the darkened area of the brim of my hat contained any lead residue. When the test kit’s swab turned red, it proved positive for the presence of lead particulate.

the lead particulate that is stripped away when the bullet is pulled from the case’s crimp, and the lead particulate that is stripped away as the bullet enters the chamber and rifling is driven backward toward the case, and typically past the case, in the direction of the shooter. On revolvers, much of the particulate exits laterally through the cylinder

gap (the space between the cylinder and the barrel) and presents itself in a large envelope of air surrounding the revolver.

Evidence of the residue is obvious. I'm sure some of you have wiped your face after a match and wondered why your cheeks and forehead are so sooty. The photo of one of my hats (Fig. 1) shows a darkened area at the front end of the brim where the hat was just 8" from the breech of my Lightning rifle and 12" from the breech of my s/s shotgun.

This residual lead particulate is not just dirty, it can be damaging to our nervous system, and potentially lethal!

Lead is toxic and can be poisonous if there is enough build up over time. Lead can cause serious permanent neurological and physiological damage that is bad for adults but even worse for children. It can enter the blood stream either through aspiration (breathing lead particulate), ingestion (particulate entering our mouth), or absorption. While absorption through the skin is possible, it appears that the absorption of heavy metals through the skin on the face or hands – referred to as “glabrous skin” – poses a very small risk for shooters. Dr. Francis Testoni suggests that “while absorption of lead through the skin can occur, the amount of absorption through the skin of the fingers is far less potent than the introduction of lead through the nose and mouth, or through other skin on the body.”

Introduction of lead through the nose

Envisioning the transfer of lead to our system through aspiration is simple. When a gun is fired, a cloud of lead particulate is immediately present in the air around us, and some of it is driven back towards our face. The same debris you saw on the



Fig. 2. There was a high risk of transferring lead particulate from the fingers to the crackers this shooter was eating at a match. (This photo was not staged.)

hat in Fig. 1 easily found its way to the nose and lungs. As long as we are breathing in that space, we are taking in lead particulate. Our nose has a pretty good means of filtering foreign particles and germs, but in overwhelming situations – like breathing in a cloud of lead particulate – some of the lead finds its way to our lungs, and some to our stomach via the nasal passage to our throat. The Center for Disease Control (CDC), suggests that “larger particles that are too large to get into your lungs can be coughed up and swallowed.”

According to the CDC, “many factors will determine whether you will be harmed, including the dose (how much), the duration (how long), and how you come in contact with lead. You must also consider any other chemicals you are exposed to and your age, sex, diet, family traits, lifestyle, and state of health.”

Introduction of lead to the mouth

Ingestion of lead particulate through the mouth when shooting can be equally potent to breathing lead particulate. In the case of ingestion, lead on our hands and fingers gets transferred to our mouth where it finds its way to our stomach. Once the lead particulate is on the hands, transfer to the mouth can happen in several ways if the hands are not carefully washed first:

At the Range

- Opening a bottle of water
- Eating food
- Blowing the nose
- Wiping the mouth
- Pulling gum, candy, protein bar, etc., from a wrapper and eating it
- Removing a cigarette from a pack and putting it in the mouth

At home

- When cleaning guns (especially when brushing a chamber or barrel)
- When reloading (especially on non-coated bullets)
- Handling empty cases, readying them for cleaning
- Breathing dust when opening a case tumbler too soon after it stops running (there is additional risk from breathing the cleaning media particulate - such as walnut shell - because the walnut shell particulate cannot be absorbed in the lungs)
- Eating while cleaning or reloading (the same set of criteria as previously mentioned when at the range)

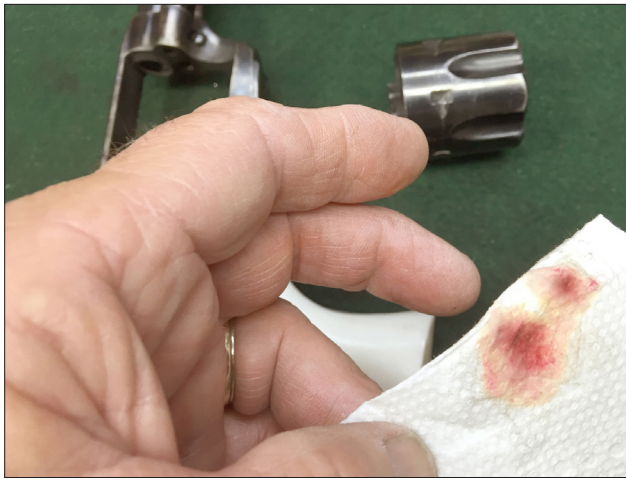


Fig. 3. Testing the residue on my fingers, the lead-test solution on this paper towel turned red after merely holding (not shooting) this pistol five days after it was shot (hands were clean before picking up the pistol).

Fig. 3 shows a lead test taken from my washed left hand from simply holding an SAA after only 20 .45LC rounds were fired. Using the test kit's solution, the red stain on the cloth indicates the presence of lead on my fingers. Of great importance is that my hands were carefully washed before this test was done. The transfer of lead to my clean hands came only from holding and touching the gun near the cylinder and barrel five days after it was fired. Obviously, the presence of lead on my hands would have been greater if the test had been done immediately after the gun was fired. Unfortunately, the test kits do not show the quantitative level of the lead, just that it is present.

Introduction of lead through the fingers.

From discussions with several dermatologists, I've learned more about the potential danger of lead on our fingers. There is no question that clean hands leads to good health, but dermatologists are suggesting that we should not fear the potential absorption of lead particulate through the fingers. Our body boasts several types of skin; the skin on the face of our hands (and the bottom of our feet) is what is referred to as "glabrous" skin. Glabrous skin is void of hair and pubescence, and is basically a closed-cell surface. In this regard, transmission and absorption of chemicals, solvents, and particulate through the glabrous skin is virtually non-existent. If, for instance, you were to place a transderm scopolimine (a patch that is worn behind the ear to prevent or diminish motion sickness) on the palm of your hand or on one of your fingers, and it were left there for several hours or even days, the body would most likely recognize little or no apparent benefit or effect from the scopolimine as it cannot be transferred through and absorbed by the glabrous skin

of our hands. By comparison, after placing the patch behind the ear where the skin is porous, the effect of the scopolimine would be recognized by most participants in 10 to 15 minutes.

This then begs the question of why so much talk about having lead residue on the fingers. The issue is not the absorption of the lead through the fingers, but instead the transfer of lead particulate to the non-glabrous skin, and more particularly to the mouth and nose.

This speaks to the reason that instructions for so many topical ointments, liquids, and chemicals urge the thorough washing of hands after use; it has little to do with the danger of absorption through the skin of the hands, but instead with the accidental indirect or direct transfer of the residue from the hands to the eyes, mouth, or other parts of the body. Direct transfer occurs when the fingers are placed in the mouth, or to the nose. Indirect transfer occurs when touching food that then goes into the mouth, or touching a bottle cap or the edge of a cup that is then transferred to the mouth.

I'm not suggesting that we should no longer wash our hands when handling lead and bullets, but instead that we focus on what our lead-laden fingers are touching next. Periodically washing hands with soap, or more specifically with D-Lead when re-loading and handling lead and bullets is a good way to ensure that lead particulate is removed from the hands and fingers on a regular basis.

Testing for blood-lead levels

In the same way doctors say that a large percentage of men die with some level of prostate problems, it would seem that an equally large percentage of cowboy shooters have elevated levels of lead in their blood. The concern is that most shooters don't know that their blood lead levels (BLL) are elevated, and many don't know that a test for "blood lead level" even exists.

Your doctor can order a "Pb" blood test for you. It will reveal how many parts-per-volume of lead is in your blood. In many states, the lab is required to notify the Department of Public Health when elevated blood lead levels are detected. Since my blood lead level exceeded the norm, I received a notice from the California Department of Public Health within two weeks of my first blood-lead test. So, don't be alarmed if big brother is watching – they just want to know where and how you were exposed to lead, and they typically advise what you can do about it. (Each time I have had a

Pb test, I received a notice from the Department of Public Health.)

My first BLL test (12/2/2015) indicated that my levels were 12.1 mcg/dl, and I have spoken to other cowboy shooters who report that their BLL has been as high as 25 mcg/dl, with a few shooters commenting that theirs were “way more than that!”

Lead in blood is measured in micrograms of lead per deciliter of blood (mcg/dl). (1mcg/dl equals 0.01 ppm which equates to 100th of a part per million). In children, a BLL higher than 5 micrograms per deciliter (5 mcg/dl) is considered dangerous. For adults, the U.S. Department of Health and Human Services considers anything above 10 mcg/dl to be dangerous. The Health and Human Services Agency of the State of California states that “an adult in the United States who does not work with lead typically has a blood lead level of less than 2 mcg/dl.” By contrast the Occupational Safety and Health Administration (OSHA) allows workers who have been removed from lead exposure to return to work when their BLL falls below 40 mcg/dl. Lead levels can also be tested in urine with acceptable levels being less than 0.08 mcg/dl.



Fig 4. Lead test kits are available at your local hardware store for about \$12.00. Depending on the kit, the swabs will allow about four to six tests.

Indications of lead exposure

Initially, chronic exposure to lead may show no immediate signs or disorders, but lead exposure is cumulative, and a raised BLL decreases blood supply to the central nervous system by damaging small blood vessels. Clinical signs of acute toxicity can affect the gastro-intestinal tract resulting in problems such as diarrhea, nausea, constipation, and abdominal pain. Signs of lead toxicity to the central nervous system can include varying levels of blindness, hearing loss, impaired con-



Fig 5. The side of the barrel above the ejector on this SAA proved positive for the presence of lead after only 30 rounds were fired.



Fig 6. Testing the side frame of this Lightning proved positive for the presence of lead after 60 rounds were fired. The area swabbed was 28” from the muzzle.

centration, fatigue, irritability, hysteria, seizures, and dementia. Reproductive effects can include miscarriages, reduced sperm count and motility, and abnormal sperm.



Fig 7. The conventional 18” square bandana (left) was fitted with elastic to help keep it in place and facilitate easy on and off during a match. Also fitted with elastic, the bandana on the right is 24” square to provide greater filter area and a better fit against the chest.

Testing the presence of lead on surfaces

Test kits are available to detect the presence of lead on surfaces (Fig. 4). Typically, these kits include a liquid and a swab or an all-in-one liquid/swab device. Most kits only allow for a few tests. But, rather than buying several test kits to evaluate your guns and clothes, this article should provide sufficient data that lead particulate exists on everything in the proximity of guns that have been fired.

Fig. 5 shows a swab from a 3M[®] test kit that was wiped along the middle of the barrel of a .45LC 7-1/2" SAA after having been fired at a match (30 rounds) and put away for five days before cleaning. The swab that turned red indicated that lead was present. Fig. 6 is a swab taken from the side frame of a .45LC Lightning rifle after firing 60 rounds at a match and put away for five days before cleaning.

First steps

My doctor's first recommendation regarding prevention of breathing lead particles was for me to wear a surgical mask when shooting. When I explained to him that a surgical mask violated the cowboy wardrobe guidelines, he gave me a look of "are you kidding?" But the idea of filtering the air made sense, and the thought of wearing a bandana certainly was well within our dress code so that was my first step. In order to not fuss with keeping the bandana tight, I sewed an elastic strap into the bandana, near the knot (Fig. 7). That way I could just pull the bandana over my nose, and it would stay in place without constantly adjusting a knot. After four months of shooting with a bandana, my second BLL test (10.6 mcg/dl) was 1.5 mcg/dl lower than my first test. Not all lead in blood is eliminated without some form of treatment, so it is important to control exposure.

Unfortunately, a bandana is not the perfect solution. The open bottom of the bandana still allows surrounding air to enter the mouth and nose, and the semi-loose weave of the typical cotton bandana doesn't do a great filtering job. I'm now attempting to use a bandana that is a 24" square (typical bandanas are 18") that has a layer of very finely woven fabric behind the two layers of the bandana. The larger bandana will allow a better seal against my shirt and vest. Unfortunately, I won't have the results of its effectiveness for several months after this article is published, and I get the results of my next BLL test.

What steps can you take to prevent breathing lead particulate

Here are some suggestions on how to keep lead out of your nose:

1) Wear a bandana that comfortably fits over your nose – the better it fits, the safer you will be. Wash the bandana after each use. (Cowboys wore bandanas to keep dust from their nose - you can, too!)

2) If you are a Timing Officer (TO), spotter or shell picker, be aware that your proximity to the firing line puts you at greater risk than shooters who are on the firing line for less than a minute. Don't hesitate to switch jobs often to reduce your exposure.

3) Wear a dust mask when cleaning guns, especially when wire-brushing the barrels and cylinders.

4) If using a dry tumbler, wait for it to sit for at least ten minutes before opening it to avoid being exposed to media dust and lead particulate. Wear a dust mask when opening the tumbler and when separating media from shells. (Better yet, use a wet tumbler.)

5) If you cast your own bullets, be sure to keep your pot in a well-ventilated area. (There's a lot of scattered information about this on the chat sites, and several professional bullet makers suggest that their BLL is within safe range even after daily exposure to lead fumes. Since lead starts to vaporize at about 1600°F, the casting temperatures for lead in the range of 675°F to 700°F should not produce hazardous fumes. Being in the presence of lead fumes is probably not dangerous, but why take a chance.)

What you can do to prevent ingestion of lead

Here are some pointers to keep lead out of your mouth:

1) When eating at the range, ensure that your hands do not come in contact with food or drink. If opening a stick of gum, a candy bar, a nutrition bar, a bottle of water, a bag of cookies or crackers, touch only the wrapper or cap – not the food.

2) If you smoke at the range don't touch either the filter or the mouth-end of your cigarette.

3) Be sure to wash hands thoroughly before lunch. (It is suggested that D-Lead is the ideal soap for lead removal from the hands.) When eating a sandwich, hold it by the wrapper. Minimize



Fig. 8. Spirulina, chlorella, and cilantro are available at most better food stores. The Hawaiian variety of spirulina is recommended.

direct contact with your food or snacks however you can. Do not lick your fingers.

4) If you pop open a can of soda, do not wipe the lid of the can with your fingers.

5) When done with reloading or cleaning, wash hands thoroughly – then wash them again. Better yet, wear rubber (nitrile) gloves when cleaning guns.

6) Be aware that when handling cowboy clothes, lead particulate is present and can easily be transferred to your hands. Wash your cowboy clothes often, and keep them separate from other clothing, if possible.

How to treat high BLL

The process of removing heavy metals from the blood is called chelation (pronounced “key-la-tion”). Medical treatment involving pharmaceuticals may be necessary if your blood lead level is excessive and your doctor recommends immediate medical treatment. However, there are some natural chelating options to help detox heavy metals from your system. Chelating agents bind to heavy metal ions and are removed from the body through normal excretory means. These readily available food agents include spirulina (Fig. 8), chlorella, and cilantro, and all of these can be obtained locally. You may want to consider including the recommended dosages of one of these in your diet. I am happy to report that I know of a half dozen shooters who opted to take

spirulina on a regular basis and have reported significant decreases in their BLL, and I know of one shooter who loves cilantro, has increased his consumption of it, and has reported a decreased BLL. (Note: Always check with your health care provider before using any dietary supplement and check for contraindications.)

Can you avoid all exposure to lead?

Probably not, but if you follow as many of these suggestions as you can, you will be one step further away from Lefty!

Give up cowboy shooting?

In doing research for this white paper, I’ve had some cowboy shooters say, “The heck with lead in my blood – I’d rather die than give up cowboy shooting!” I certainly share their love for our sport, but death doesn’t sound like a good alternative. An understanding of the pitfalls of lead, making informed decisions, and taking a few proactive steps will go a long way to keeping those six guns in your hands.

Some results (Sept 10, 2019)

During the first two years following the publication of this white paper several friends who adopted spirulina as part of their diet approached me with their results. At least eight shooters who previously had elevated BLL above 15 mcg/dl reported that their BLL dropped significantly in subsequent tests. One cowboy action shooter who had a BLL of 22 mcg/dl reported that eight months after beginning to take spirulina regularly, his BLL dropped to 14.

Epilogue (May 20, 2021)

In addition to how the coronavirus impacted our lives, beginning in February, 2020, the pandemic presented a major change in how we interfaced with each other while at the range. For those of us who could still shoot, masks were required at most ranges to prevent the spread and contraction of COVID19.

I don’t have empirical data on the number of matches I shot since February 2020, but it was probably 90% of the number of matches I shot in the prior year. Here are some interesting data points:

- During all of the matches since February, 2020 I wore a mask while at the range, while shooting, and while running the clock.
- I did not alter my gun-handling activities at home. I did not wear a mask while cleaning guns,

cleaning shells, reloading, and my general bullet handling habits did not change from prior time.

- I had a blood level test (Pb) performed in early May 2021 and the results showed that my BLL dropped from 12 to 5.1; well into the “approved” safety range.

- The significant drop in BLL can only be attributed to the reduction in inhalation of lead particulate while at the range and while shooting, with little or no bearing on the lead on my hands, clothing, or in my gun room.

More on Spirulina...

Spirulina (atrhospira) is an algae that has been used across cultures for centuries. According to WEBMC, the Aztecs used spirulina to treat various diseases, and perhaps used it as a supplement for the kingdom’s messengers to sustain themselves on their marathon runs. Spirulina is used in much the same way today, and has even made its way to space as a dietary supplement for the astronauts on NASA missions.

Now it appears everyone is interested in taking Spirulina. According to KBV Research, the global spirulina market is expected to reach \$652 million by 2025. Spirulina can bloom and grow naturally in alkaline lakes around the world and companies are also lab-growing this algae, which has an earthy seaweed-like taste, in massive tubes to ensure there’s enough supply for everyone.

Loaded with proteins:

Emmie Satrazemis, RD, a board-certified sports nutritionist, dietitian, and nutrition director at Tri-fecta, believes spirulina deserves a spot in most diets. As she points out, the naturally vegan food is packed with nutrients.

According to Satrazemis, spirulina is “...a fairly protein-dense and low-calorie food.” Plus, “it contains notable amounts of calcium, niacin, potassium, magnesium, B vitamins, and iron.” Strazemis also notes that 12 tablespoon of spirulina contains just 25 calories, .05 grams of fat, 1 gram of carbs, and 4 grams of protein.

Spirulina may reduce risk of developing macular degeneration.

Satrazemis also suggest that “Spirulina is also a notable source of phytonutrients – plant-based compounds that are thought to provide protective health benefits. More specifically, spirulina is rich in a certain group of phytonutrients called carotenoids.”

According to a Harvard University study, carotenoids are also beneficial for both eye health and immune health. A pair of the most common carotenoids – lutein and zeaxanthin – are found in the retina and may decrease your risk of developing macular degeneration by up to 43 percent.

It’s packed with brain-healthy omega-3 fatty acids.

Josh Schlopttman, a certified personal trainer and nutritionist, notes that spirulina is thought to be one of the best sources of omega-3 fatty acids. In fact, spirulina boasts both omega-6 and omega-3 fatty acids.

According to numerous studies, omega-3 fatty acids can help fight depression and anxiety, can ward off age-related mental decline and Alzheimer’s disease, and promote brain health during pregnancy and early life. Aside from giving your brain a boost, omega-3 fatty acids can also improve risk factors for heart disease, fight inflammation, and improve bone and joint health.



Fig. 8. Spirulina is available in several forms including liquid, tablets, and powder.

It fights cancer cells and inflammation.

“There are also other nutrients present such as chlorophyll and betacarotene which have been proven to fight cancer cells and protect vision from aging,” Schlottman adds. “There are many benefits to spirulina, including the fact that it can help fight inflammation, boost your immune system, improve your gut health, and regulate blood sugar levels.

Should you add it to your diet?

Schlottman also points out that there are countless benefits to adding spirulina to your daily diet. “Some of the most notable and important benefits include antioxidant protection, improved

vision health, increased energy levels, low blood sugar regulation, and immune system strengthening and boosting,” he explains. “Spirulina is also a great source of protein for vegetarians and vegans.”

Who should avoid spirulina.

According to Schlottman, there are some people who should avoid spirulina. “Those with anemia or low blood levels may want to stay away from spirulina because of its high iron content. It can also cause nausea in those without a healthy stomach. People on certain medications might need to avoid spirulina as well, so be sure to talk to your doctor before adding spirulina to your daily diet.

Per Live Science, those with certain autoimmune conditions such as multiple sclerosis, lupus, and rheumatoid arthritis may want to avoid spirulina as it could worsen symptoms. Spirulina may also weaken the effect of immunosuppressants. Pregnant or breastfeeding women should also avoid spirulina, as there is a lack of safety information regarding expectant and nursing moms who ingest it.

Getting and storing spirulina.

Spirulina is available in many forms including capsules and powders. It is also baked into other items such as bars, blended into smoothies, and can even act as a topper to popcorn.

It is best to store spirulina tablets and powder in the refrigerator. Though it doesn't technically go bad, its nutritional qualities will degrade over time.

References:

- Hipkins KL, Materna BL, Kosnett MJ, Rogge JF, Cone JE. Medical Surveillance of the Lead Exposed Worker. AAOHN Journal 46(7); 330-339, 1998
- Rempel D. The Lead-Exposed Worker, JAMA 262(4):532-534, 1989. US Department of Labor, OSHA, Lead in Construction. OSHA 3142, 1993
- The Merck Manual, 16th edition
- California Department of Public Health, Sacramento, California
- Dr. Francis Testoni, DVM, California
- pCenters for Disease Control (CDC), Agency for Toxic Substances & Disease Registry, CAS# 7439-92-1

For further reading:

“Bullet fragments linked to lead poisoning, CDC study says”

<http://www.cnn.com/2017/02/13/health/bullets-blood-lead-study/index.html>

D-Lead (hand wipes and cleaning solutions)
www.esca-tech.com

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