The Peregrine Fund
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Fact Sheet on Lead Exposure from Spent Ammunition

[1] Each year about 12.5 million Americans ages 16 and older take to the nation's forests and fields to hunt. Maintaining and preserving America's hunting heritage is important for many reasons including benefits to wildlife management and habitat conservation, economic benefits, especially in rural communities, and Americans' enjoyment of their natural resources.

Lead was originally the metal of choice for ammunition because of its mass, malleability, and other physical characteristics. Its chemical properties, however, have long been known to be harmful to health, and research in the last 25 years has increasingly led wildlife researchers and health professionals to urge hunters to choose lead-free ammunition. This Fact Sheet is intended to explain their case (the most essential facts are highlighted), and contains a sample of science citations supporting it.

Lead Toxicity and Human Health

- [2] Lead is toxic, even at very low levels once thought harmless, and well below the CDC's benchmark for intervention in children of 10 micrograms per deciliter (µg/dL) in the blood.
- [3] Although the arms and ammunition industry refers to the current screening guideline of 10 µg/dl as a safety limit presumed to have special biological significance, the CDC intended it to be interpreted as a risk management tool rather than as a threshold for adverse effect.
- [4]Symptoms of lead toxicity may lag physiological changes. People may be unaware of any symptoms even though they are experiencing lead toxicity. Lead's health effects in people span a spectrum from very low levels with subclinical effects like:
    - [5] Decreased IQ, learning disabilities, and behavioral problems in children at levels below 10 µg/dL, with greatest impact on IQ at lead levels from 0 to 10 µg/dL, and
    - [6] Increased probability of dying from a heart attack or stroke in adults with blood lead levels of 2 µg/dL and above.
- These effects are insidious, like that of cholesterol causing heart disease, and like cholesterol, they should be treated with primary prevention.
- [7] Lead's health impacts increase to clinical effects like:

Mild	Mild fatigue or exhaustion; emotional irritability or lability; difficulty concentrating; sleep disturbances
Moderate	Headache; general fatigue or somnolence; myalgia, arthralgia, tremor; nausea; decreased appetite; abdominal cramps, constipation or diarrhea; decreased libido
Severe	Colic (intermittent, severe abdominal cramps); peripheral neuropathy; encephalopathy
Fatal	Death

- [8] As public health measures have reduced average blood lead levels in the population, it has become possible to detect health effects at lower and lower levels.

- [9] Benchmark levels of concern have declined repeatedly over the last five decades as science has revealed toxic effects at lower levels, from 60 µg/dL in 1960 to 25 µg/dL in 1985 and 10 µg/dL in 1991.
- [10] The CDC's current benchmark of 10 µg/dL does not reflect current knowledge of toxic health effects of lead at lower levels, and is therefore inappropriate as a benchmark for health effects in people who eat game:
    - [11] doctors and scientists have argued for a new benchmark level of 2 micrograms per deciliter in the blood,
    - [12] in 2005 the CDC published that *there is no safe minimum level of lead in the blood*, especially of children,
    - While the current benchmark of 10 µg/dL of lead in blood of children is still used by states to trigger intervention on behalf of a child to find and remove the source of lead exposure,
    - [13] some states and counties have opted to reduce this "decision benchmark" to 5 µg/dL.
- [14] The *average* or *typical* level of exposure to a chemical in a population is not necessarily the same as the *natural* or physiologically *acceptable* level. We now know that there is no safe minimum level of lead in the blood of a child.
- Thus, claims by the gun lobby that eating lead-bullet-harvested game has no health impacts because the study groups' mean blood lead level in the CDC's North Dakota study was less than US average, are misleading. For example,
    - [15] Mean blood lead levels in the US population have decreased dramatically since a 1976 high of 16 µg/dL (well above the current level for intervention), as a result of removing lead from gasoline and paint. Blood lead levels continue to decrease while state and federal health agencies respond to remaining causes of lead exposure, like deteriorating lead paint in older homes, and lead from ammunition loading, firing ranges, stained-glass window construction, ceramics, home health remedies, and many other sources.
    - [16] Mean blood lead level in US children had declined to1.7 µg/dL in 2006, and is still declining.
    - [17] 25% of US children ≤6 yr old (6.9 million) have blood lead levels between 2 and 10 µg/dL; and 194,000 are ≥10 µg/dL (NHANES 2003-2006).
    - A best-case target for mean blood lead level in the US might be [18]pre-industrial levels of 0.016 µg/dL, which is still 80 times less than the mean level in the CDC's North Dakota study group, and 90 times less than the US average.
    - Thus, the only legitimate conclusion that can be drawn from the CDC's North Dakota study is that because people who ate game meat had 50% more lead in their blood than those that did not, and the difference was statistically significant, eating game harvested with lead ammunition causes exposure to lead. Other studies have shown that lead exposure is bad and something to be avoided.

Lead Exposure from Spent Ammunition in People

- While the gun lobby claims that no one has ever been poisoned by lead from eating game meat harvested with traditional lead ammunition, infact:

- [19] Lead from spent ammunition ingested with game meat has elevated blood lead levels with clinical effects in communities of people who eat game meat as a subsistence diet.
- [20] The CDC's 2008 study in North Dakota showed that game eaters had 50% more lead in their blood than non-game-eaters, and the difference was statistically significant.
- Other studies have
  - [21] found lead bullet fragments in 26% to 60% of ground venison packages from commercial processors, and
  - [22] experimentally shown that eating meat with metallic lead bullet fragments causes blood lead levels to rise above 2 µg/dL with each meal.
- [23] Children, pregnant women, and women of childbearing age, are at highest risk for negative health effects of lead.
- [24] Based on these studies, state health and wildlife agencies have recommended that:
  - women and children do not eat game harvested with lead ammunition,
  - food pantries and shelters do not accept game meat harvested with lead bullets, or at least provide a warning that the meat may contain lead, and
  - hunters avoid lead contamination of game meat by using lead-free ammunition.

Lead Exposure from Spent Ammunition in Wildlife

- [25] Ingestion of lead from spent ammunition (both bullet fragments and shot) regularly sickens and kills wildlife including waterfowl, doves and other upland game birds, bald and golden eagles, California condors and other raptors, and other species.
- [26] Lead exposure from bullet fragments is having a major population level impact on at least one critically endangered species. Without intensive and expensive management, lead poisoning from spent ammunition in animal remains would prevent the recovery of the California condor population being reintroduced in northern Arizona.
- [27] Preventing lead exposure from ammunition has proven to be beneficial to wildlife. The 1991 federal ban on lead shot for waterfowl hunting, implemented to prevent lead poisoning of waterfowl and their predators including bald eagles, resulted in an annual saving from lead poisoning of 1.4 million ducks nationwide estimated in 1997.
- [28] The weight of scientific evidence behind these claims is abundant, peer reviewed and published in reputable scientific journals. The data are rock solid.

How Bullets and Shot Contaminate Game Meat

- [29] High velocity rifle bullets were invented around 1900, with the development of smokeless gun powder; they have been around for about 100 years. They fragment into hundreds of tiny pieces upon impact with skin and flesh, or ballistic gelatin (bone impact is not needed to cause fragmentation).
- [30] Tests on a variety of bullet types show that even high mass-retention lead bullets tend to fragment into many tiny pieces.
  - [31] Deer shot with one of the most popular deer hunting bullets was shown to contaminate meat over a 3-dimensional volume spanning up to 17 inches surrounding the bullet's trajectory through the animal, and
  - Standard butchering practices have proven insufficient to completely prevent lead contamination of meat prepared for human consumption.

- [32] Lead residues are found in game birds even when individual shot are removed before consumption.
- [33] Shot accumulates on the ground in high densities in popular game bird shooting areas and is consumed by doves and other seed eaters that mistake it for seed or grit.
- Ingested metallic lead is converted to soluble salts by stomach acids and enzymes and absorbed into the blood.

Solutions: Avoiding Lead Exposure from Spent Ammunition

- **Based on these facts, health professionals and wildlife biologists have concluded that preventing exposure to lead from spent ammunition fragments in both wildlife and humans is important. It is most effectively achieved by hunters and others sports shooters using already-available lead-free bullets and shot.**
- [34] Many hunters say that lead-free ammunition performance is at least as good as, or even better than, traditional lead-based ammunition.
- A box of premium lead-free bullets (e.g., .30-06 150 grain Hornady GMX or Federal Premium with Barnes Triple-shock at Cabela's is $39 to $44) costs the same as a box of premium leaded bullets (e.g., .30-06 150 grain Winchester XP3 or Federal Premium Trophy Bonded Tip at Cabela's is $38 to $44).
- A box of premium bullets, however, is about $25 more than a box of low-cost leaded bullets (e.g., .30-06 150 grain Remington Core-Lokt at Cabela's is $14).
- [35] Lead-free bullets are available in most popular calibers, including .22 rimfire. With appropriate advertising and awareness, market driven demand could improve availability and reduce costs.
- Although careful butchering to remove more meat around the bullet trajectory in a harvested game animal may reduce lead contamination of venison,
    - it does not help wildlife exposed to lead fragments in game remains discarded in the field,
    - it increases meat wastage, and
    - it has not proven 100% effective in preventing human exposure.

- [36] **The AZGFD and The Peregrine Fund's strategy:**
    - Provide hunters with accurate facts so that they have an opportunity to make an informed decision about whether it is worth the extra money and effort to avoid eating lead in their game meat or poisoning wildlife that unwittingly ingest lead from spent bullets and shot.
    - Work with hunting groups and state fish and game agencies to encourage hunters to either use lead-free ammunition or remove all remains of harvested game from the environment.
    - [37] This volunteer strategy has helped condors in Arizona, and is proposed for Utah within the condors' range.
    - Hunters in Arizona provide an important source of food for condors, provided they use lead-free bullets, and can be proud of their actions on behalf of conserving this critically endangered species, which now enhances the experience of visitors to Grand Canyon National Park, Zion National Park, and other sites of touristic value.

  - Given that the American public has been in transition from the use of traditional lead ammunition projectiles to lead-free substitutes for more than 25 years, the current efforts to promote lead-free bullets and shot are a logical and appropriate extension of our modern understanding that this source of lead exposure can now be eliminated without seriously infringing the right of firearms users to shoot effective ammunition.

- **The industry's response:**
- [38] Industry representatives have claimed that:
  - *There is no credible science demonstrating that lead from spent ammunition affects condors or people.* The sampling of abundant and solid evidence presented in this Fact Sheet and its references reveals this claim to be untrue.
  - *Efforts to educate hunters about the dangers to wildlife and humans of lead exposure from spent ammunition are aimed at eliminating hunting as a sport in the US.* Support for the use of lead-free ammunition by several state agencies that benefit from hunter revenue contradicts this claim.
  - *Promoting the use of lead-free ammunition will stop significant numbers of people from hunting and contributing to the US economy*. The 1991 mandatory switch to non-lead shot for waterfowl hunting raised the same fear but did not cause a significant reduction in hunting of ducks and geese.
- By publishing distorted facts and fabrications aimed at discrediting the science and intentions of researchers, industry representatives and lobbyists leave hunters misinformed and unable to consider reasonably the benefits of switching to lead-free ammunition. With such polarization, the government may indeed intervene with further regulations on the use of lead-based ammunition projectiles on behalf of human health and wildlife survival (e.g., populations of California condor).
- The dogmatic, non-negotiable, and fear-based misinformation campaign of industry and user advocates creates a political atmosphere that compromises the interests of their own constituents by forcing government to consider actions necessary to protect the general public's welfare and wildlife heritage. Their tactics are, therefore, more likely to result in a ban of lead-based ammunition than the science-based information campaign provided by private, state, and federal researchers.

CITATIONS

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