The Prevalence of Lead Fragments from Shotgun Slugs/Muzzleloader Bullets in Ground Venision Meant for Human Consumption

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The Prevalence of Lead Fragments from Shotgun Slugs/Muzzleloader Bullets in Ground Venison Meant for Human Consumption

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Introduction

- Hunting is an important population management tool for white-tailed deer (Odocoileus virginianus) in Illinois. The State of Illinois allows the use of vertical bows and crossbows, shotguns with slugs, muzzleloading rifles, centerfire revolvers, and centerfire single-shot handguns for hunting deer.
- The majority of firearm hunters in Illinois use lead shotgun slugs, which fragment upon impact when striking bone in wild game (Grund et. al., 2010; Figure 1).
- Few studies have documented the presence of lead fragments. People who consumed wild game on a regular basis had elevated blood-lead levels (Iqbal et. al., 2009).
- The absence of lead in areas of the packets not surrounding possible lead fragments may be due to that fact that small, dust-like lead particles may not be created due to the lower slug/muzzleloader bullet velocity compared to bullets from high-powered rifles (Grund et. al., 2010).
- The initial results of this pilot study suggest that deer killed with lead ammunition may have contained lead fragments. The presence of lead in areas of the packets not surrounding possible lead fragments may be due to that fact that small, dust-like lead particles may not be created due to the lower slug/muzzleloader bullet velocity compared to bullets from high-powered rifles (Grund et al., 2010), which had CMYK K-values (a measure of darkness) $\geq 49\%$.

Methods

- Ground venison packets (13x7 cm, N = 10; Figure 2) were obtained from hunters who harvested deer with shotguns/muzzleloaders from Bureau, Brown and McLean Counties, IL, during the 2012-13 and 2013-14 hunting seasons. Ground venison packets (13x7 cm, N = 10) were also obtained from a hunter who harvested two deer with a crossbow in McLean County in 2013. All samples were x-rayed at the Prairie Oak Veterinary Clinic in Bloomington, Illinois, to detect potential fragments (Figure 3). Adobe Photoshop was used to identify possible lead fragments, which had CMYK K-values (a measure of darkness) $\geq 49\%$.
- Six out of ten meat processing plants surveyed mixed together deer killed by multiple hunters when preparing ground venison.
- The initial results of this pilot study suggest that deer killed with lead ammunition may have contained lead fragments. The absence of lead in areas of the packets not surrounding possible lead fragments may be due to that fact that small, dust-like lead particles may not be created due to the lower slug/muzzleloader bullet velocity compared to bullets from high-powered rifles (Grund et al., 2010), which had CMYK K-values (a measure of darkness) $\geq 49\%$.

Results

- X-rays revealed there was a significantly greater frequency of shotgun-killed venison packets that contained possible lead fragments (6/10 packets) compared to bow-killed venison packets (2/10 packets; $X^2 = 6.23, p = 0.013$).
- The mean number of possible lead fragments per shotgun-killed venison packet (1.05 ± 1.35) was significantly greater than the mean number of possible lead fragments per bow-killed venison packet (0.20 ± 0.42; $F_{1,18} = -2.24, p = 0.023$, one-tailed).
- Fragments ranged in diameter from 0.22 to 4.83 mm, with a mean diameter of 1.05 ± 1.35 mm.
- All of the venison samples sent to Washington State University which were taken from areas not immediately surrounding the fragments tested negative for lead.
- Six out of ten meat processing plants surveyed mixed together deer killed by multiple hunters when preparing ground venison.

Discussion

- In order to determine if the fragments are lead, venison samples that surrounded the fragments will be dissolved with a protein liquefying reagent (sodium salicylate, potassium sulfite, sodium hydroxide, isopropyl alcohol, and water). The positive presence of lead will be determined through dissolution with nitric acid, and then through the formation of a precipitate when added to acetic acid and potassium chromate.

Future studies

- In order to determine if the fragments are lead, venison samples that surrounded the fragments will be dissolved with a protein liquefying reagent (sodium salicylate, potassium sulfite, sodium hydroxide, isopropyl alcohol, and water). The positive presence of lead will be determined through dissolution with nitric acid, and then through the formation of a precipitate when added to acetic acid and potassium chromate.

Literature Cited


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