



Plii jahimoonas

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Mõned küsimused...

- Keskkonna saastamine on aktsepteeritav isegi kui seda on võimalik ära hoida vähese vaevaga?
- Inimene võib põhjustada kannatusi teistele liikidele, kui neid on võimalik ära hoida ning antud meetmed on mõistlikud ja põhjendatud teaduslikult?
- Kes on nõus sööma mürgise ainega saastunud toitu, neurotoksiini, kartsinogeenset ainet?

Usk/kuulujutud vs faktid/teaduslikud katsed



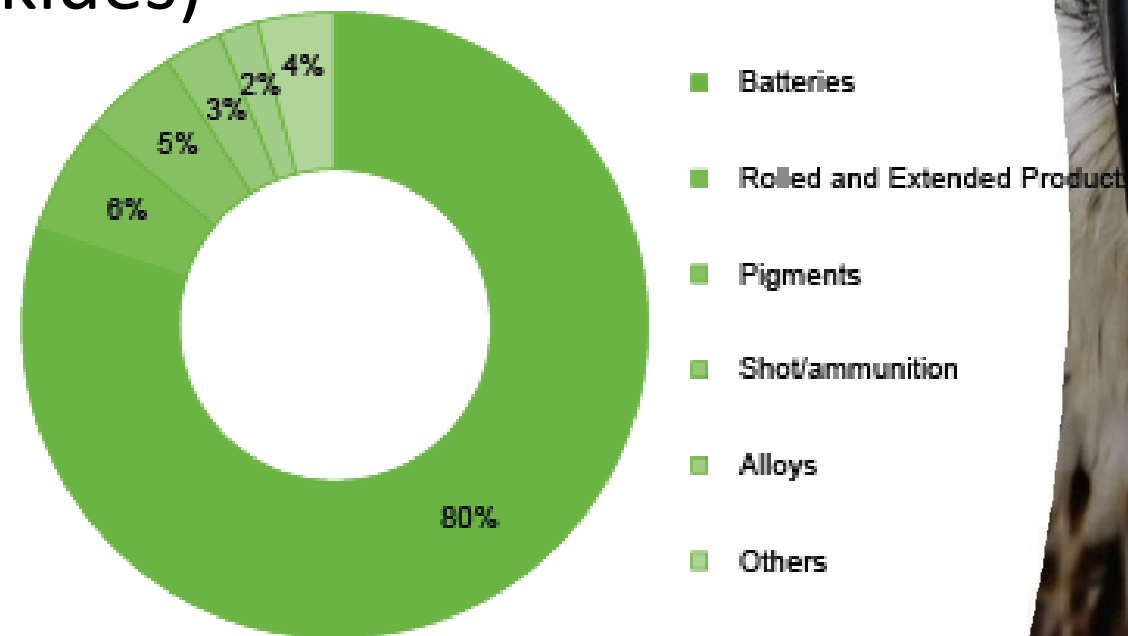
Plii ajalugu

- Plii (Pb) on raskemetall mis esineb maakoores
 - enamasti mitte puhtal metallilisel kujul
 - tuntud ka kui seatina
- Inimkonnale juba tuttav kaugest ajast
 - arheoloogilises avastused 6,500 e. Kr.
 - keskkonda jõudnud tänu inimtegevusele
 - >1000 kordne tõus keskkonnas viimasel poolsajandil
- Umbkaudselt 3.6 miljonit tonni pliidi aastast (Eisler 2000)



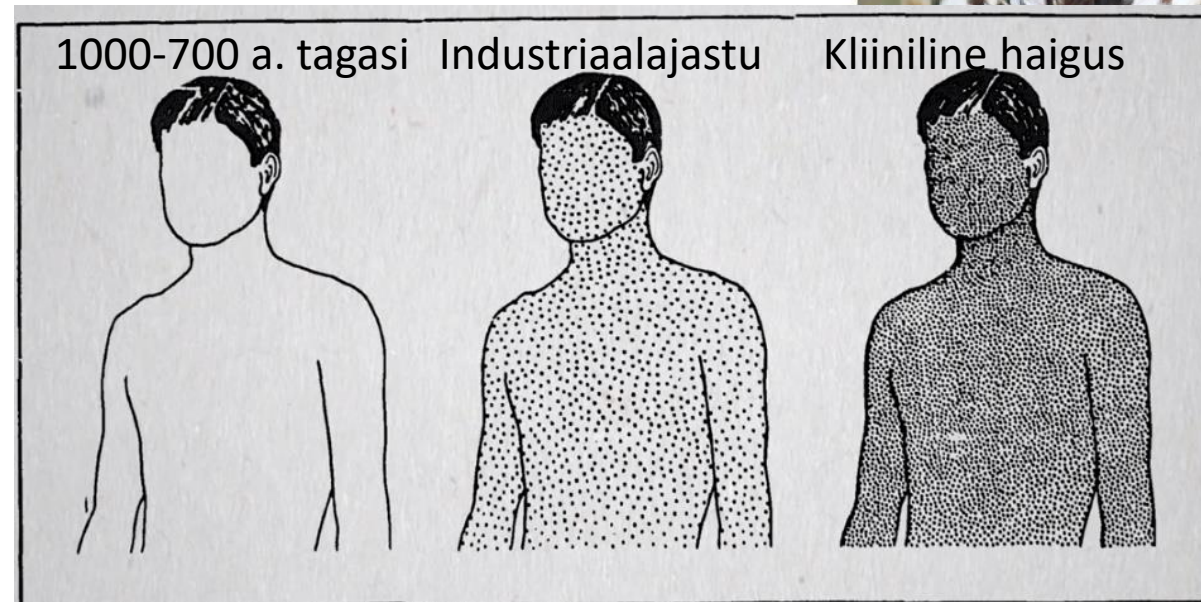
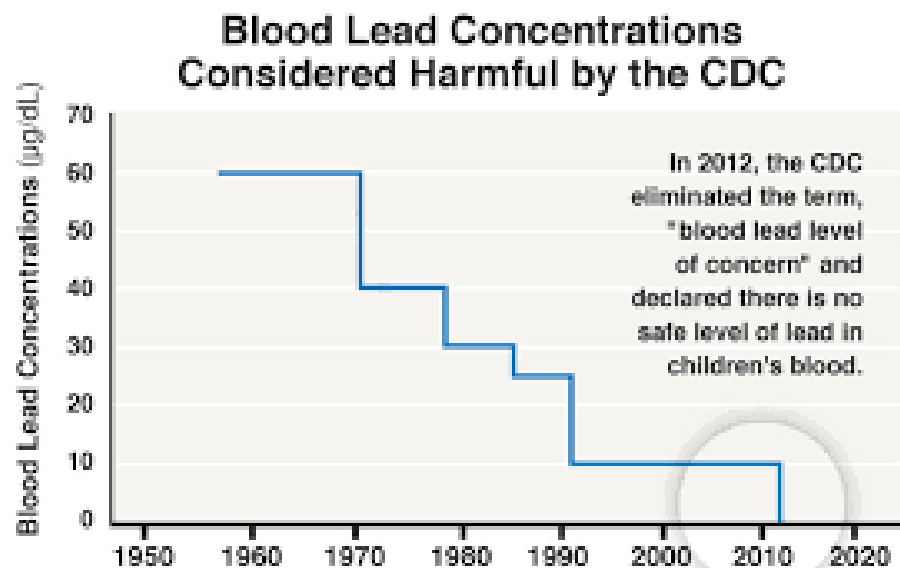
Plii kasutamine

- Tööstuslik emisioon
 - kaevandamine, töötlemine jne.
 - Eestis suurimad tööstuslikud emiteerijad soojuselektrijaamad ja Kunda tsemenditehas
- Autokütused (mõningates riikides)
- Plii lõpptarbimine
 - akumulaatorid
 - **jahipidamine**
 - värvide-, klaasi- ja emailitööstus
 - muud tööstussektorid



„Normaalne“ plii tase organismis

- Veri – organid – luud

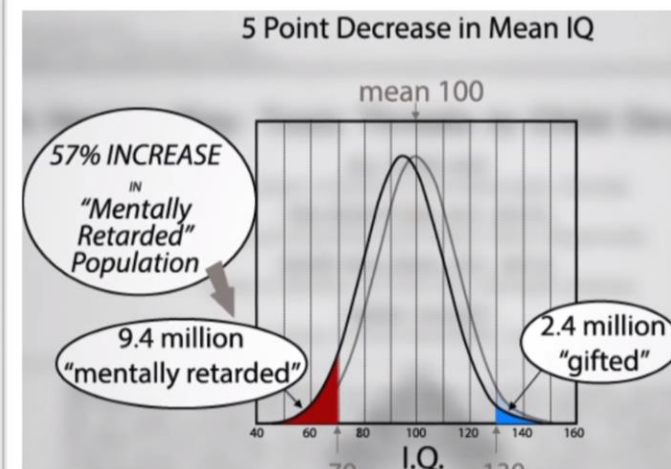


- USA's 90' sündinud lapsed kelle vereplii tase madalam kui ennem 70' sündinud on IQ 2,2-4,7 palli kõrgemal, mis aga tähendab majandusele +110-319 miljardit dollarit (u. 1%)

Economic Gains Resulting from the Reduction in Children's Exposure to Lead in the United States

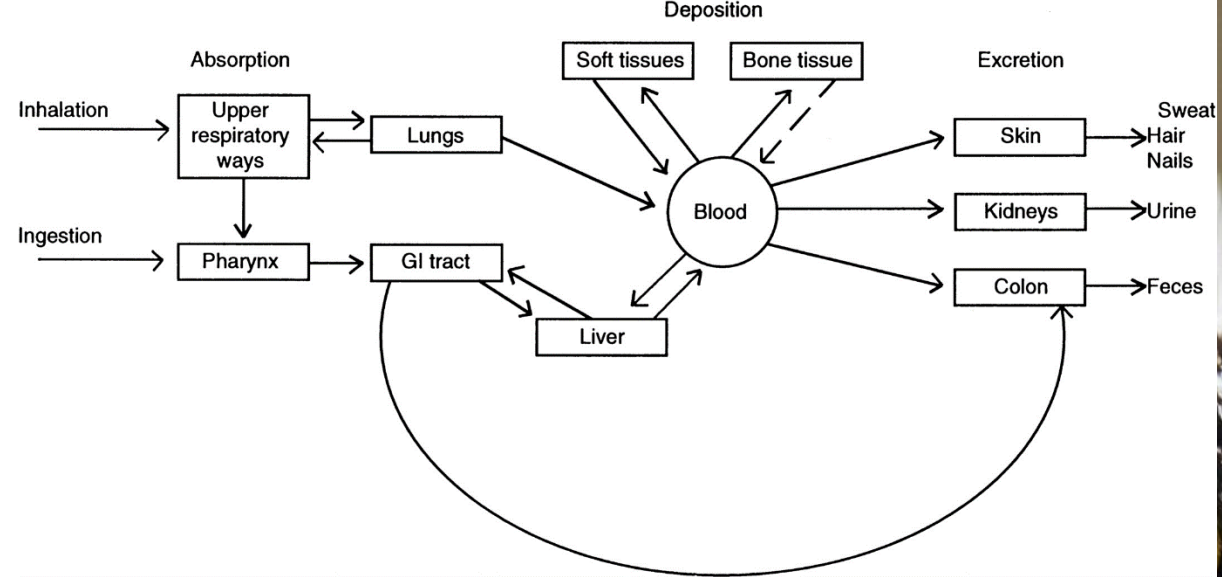
Scott D. Grosse,¹ Thomas D. Matte,¹ Joel Schwartz,² and Richard J. Jackson¹

¹National Center for Environmental Health, Centers for Disease Control and Prevention, Atlanta, Georgia, USA; ²School of Public Health, Harvard University, Cambridge, Massachusetts, USA



Plii toksikokineetika

- Suukaudne plii imendumine
 - täiskasvanud inimene u. 10%
 - lapsed u. 50%
 - oleneb paljudest faktoritest, nt. nälgimisel kuni 80%
- Imendunud plii transporditakse vere abil kehas laiali kõiki organitesse (maks, neerud, kopsud, aju, põrn, lihased ja süda)
 - Eritumine aeglane ja vähene
 - Ladestumine luudesse
 - Remobilisatsioon luudest nt. rinnaga imetamise ajal



Plii olulisus tervise seisukohast

- Pliil puudub organismis bioloogiline funktsioon ning on üheks mürgiseimaks metalliks
- Mõjutab praktiliselt kõiki organeid organismis. Haavatavaim on närvisüsteem
- Nüüdisaegne teadusmeditsiin on seisukohal, et plii on organismile ohutu vaid nulldoosis
- Varem ohutuks peetud kogused, põhjustavad tervisehäireid sh. püsivaid tunnetus- ja teadmishäireid
- Lapsed on tunduvalt tundlikumad kui täiskasvanud



Plii olulisus tervise seisukohast

- Mitmekülgne toksiline mõju, olenevalt kontsentratsioonist ja toimeajast
 - Ensüümide inhibitsioon
 - Aneemia
 - Häired närvi-, immuun-, ja reproduktiivsüsteemis
 - Neerude ja kardiovaskulaarsüsteemi fn. pärssimine
 - Surm
 - Kartsinogeensus (2A — tõendatud kartsinogeen loomadel, tõenäoliselt kartsinogeene inimestel)
- Kognitiivsete võimete langus (IQ, õppe ja töövõime, impulsside kontrollimisvõime, sh. leitud seos plii ja kriminaalse käitumise vahel)



April 16, 2019

7 **Screening for Elevated Blood Lead Levels in Children and Pregnant Women**

Adam J. Spanier, MD, PhD, MPH¹; Pat McLaine, DrPH, RN²; Robyn C. Gilden, PhD, RN²

✓ [Author Affiliations](#)

¹University of Maryland School of Medicine, Baltimore

²Family and Community Health, University of Maryland School of Nursing, Baltimore

JAMA. 2019;321(15):1464-1465. doi:10.1001/jama.2019.2594

- Lead exposure in children is associated with significant neurologic effects, including deficits in IQ and increased risk of hyperactivity.
- Elevated lead levels in pregnant women are associated with gestational hypertension and spontaneous abortion.
- While changes in public policy have led to substantial declines in prevalence of lead poisoning and elevated lead levels in children, prevention of lead exposure and its consequences remains of paramount importance.



Association of Childhood Lead Exposure With Adult Personality Traits and Lifelong Mental Health

Aaron Reuben, MEM; Jonathan D. Schaefer, MA; Terrie E. Moffitt, PhD; Jonathan Broadbent, PhD; Honalee Harrington, BA; Renate M. Houts, PhD; Sandhya Ramrakha, PhD; Richie Poulton, PhD; Avshalom Caspi, PhD

CONCLUSIONS AND RELEVANCE In this multidecade, longitudinal study of lead-exposed children, higher childhood blood lead level was associated with greater psychopathology across the life course and difficult adult personality traits. Childhood lead exposure may have long-term consequences for adult mental health and personality.

Toiduohutus

RESEARCH ARTICLE

Lead content in wild game shot with lead or non-lead ammunition – Does “state of the art consumer health protection” require non-lead ammunition?

Antje Gerofke^{1*}, Ellen Ulbig¹, Annett Martin², Christine Müller-Graf², Thomas Selhorst², Carl Gremse¹, Markus Spolders¹, Helmut Schafft¹, Gerhard Heinemeyer², Matthias Greiner², Monika Lahrssen-Wiederholt¹, Andreas Hensel³

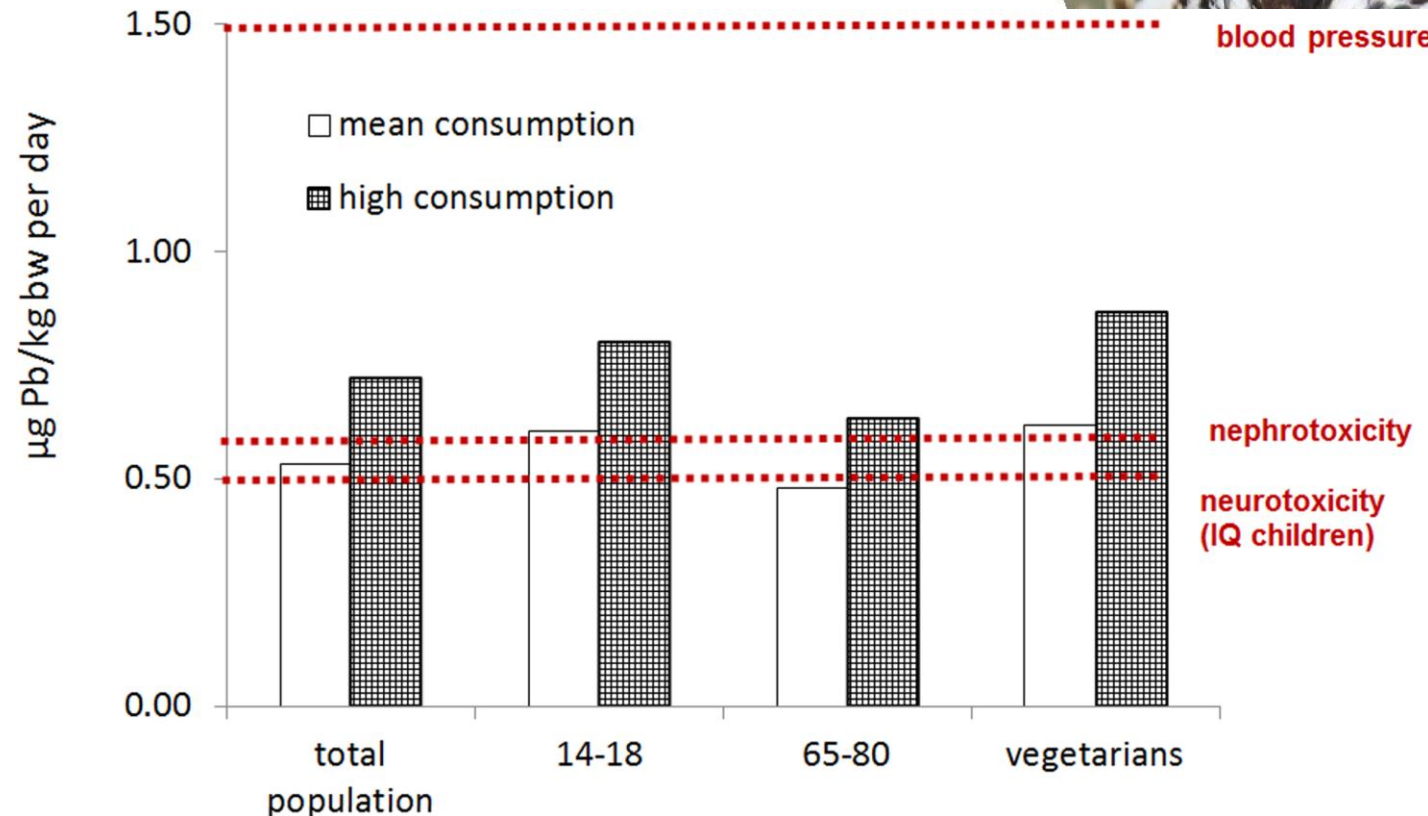
1 Department Safety in the Food Chain, German Federal Institute for Risk Assessment, Berlin, Germany,

2 Department Exposure, German Federal Institute for Risk Assessment, Berlin, Germany, **3** German

Federal Institute for Risk Assessment, Berlin, Germany

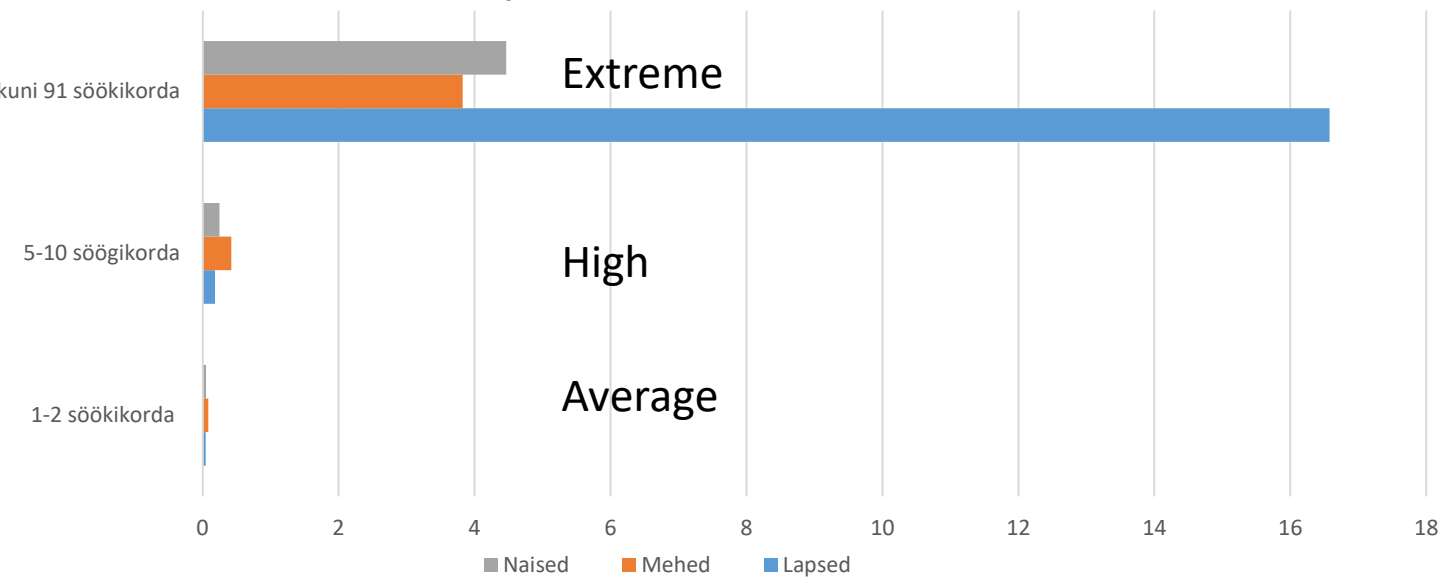


- Igapäevane toiduga sissesöödava plii kogus võib ületada tervise referentsväärtused ilma ulukiliha tarbimiseta, mis on lisanduv riskifaktor plii moonaga jahipidamisel
- mean amount of lead taken up by **all consumer groups via intake of all food groups is generally so high**, that adverse health effects are possible according to the assessment model. **Toxicological reference points are already reached or even exceeded by the German population** according to the exposure model



Blume K, Lindtner O, Heinemeyer G, Schneider K, Schwarz M. Aufnahme von Umweltkontaminanten über Lebensmittel (Cadmium, Blei, Quecksilber, Dioxine und PCB)–Ergebnisse des Forschungsprojektes LExUKon. BfR-Informationsbroschüre 2010; 60 pp. Berlin, Germany: 2010.

- For the average consumer of game meat in Germany the additional uptake of lead only makes a minor contribution to the average alimentary lead exposure. However, **for consumers from hunters' households the resulting uptake of lead—due to lead ammunition—can be several times higher than the average alimentary lead exposure. Non-lead bullets in combination with suitable game meat hygienic measures are therefore recommended** in order to ensure “state of the art consumer health protection”.



Scenario	men	women
	Pb-uptake (µg/kg bw per day)	
average consumption (1 to 2 meals)		
Lead content and consumption	men	women
1a: mean* lead content and mean consumption	0.0841	0.049
1b: median** lead content and mean consumption	0.0003	0.0002
1c: 95 ^{th***} percentile of lead content and mean consumption	0.023	0.013
high consumption (5 to 10 meals)		
Lead content and consumption	men	women
2a: mean* lead content and 95 th percentile of consumption	0.4204	0.2452
2b: median** lead content and 95 th percentile of consumption	0.0016	0.0009
2c: 95 ^{th***} percentile of lead content and 95 th percentile of consumption	0.113	0.066
extreme consumption (up to 91 meals)		
Lead content and consumption	men	women
3a: mean* lead content and “extreme” consumption	3.8252	4.4627
3b: median** lead content and “extreme” consumption	0.0142	0.0166
3c: 95 ^{th***} percentile of lead content and “extreme” consumption	1.030	1.202
children		
	Pb-uptake (µg/kg bw per day)	
1 meal of 50 g		
4a: mean* lead content and mean consumption	0.0455	
4b: median** lead content and mean consumption	0.0002	
4c: 95 ^{th***} percentile of lead content and mean consumption	0.012	
1 meal of 200 g		
5a: mean* lead content and consumption like mothers	0.1822	
5b: median** lead content and consumption like mothers	0.0007	
5c: 95 ^{th***} percentile of lead content and consumption like mothers	0.049	
91 meals of 200 g		
6a: mean* lead content and “extreme” consumption	16.5798	
6b: median** lead content and “extreme” consumption	0.0617	
6c: 95 ^{th***} percentile of lead content and “extreme” consumption	4.465	

*mean lead content: 5.37 mg/kg;
**median lead content: 0.02 mg/kg;
***95th percentile of lead content: 1.446 mg/kg

Plii olulisus tervise seisukohast

Rootsi uuringus leiti, et plii veretasemed olid üle EFSA poolt seatud riskipiiri

70% meestel,

30% naistel ja

40-50%lastel, kes tarbisid jahist saadud liha

Livsmedelsverkets rapportserie nr 18/2014, Del 3 Bly i viltkött – riskvärdering

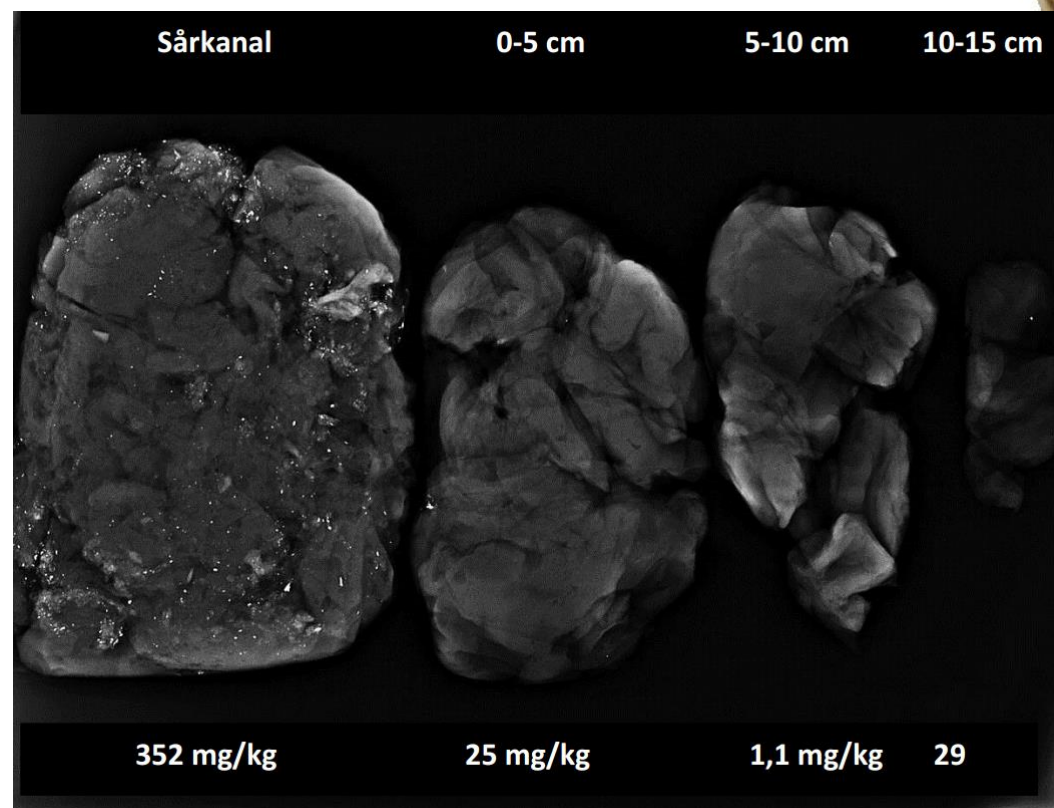


Foto: SVA och SJF, 2014.



Lead and copper in hunted wild boars and radiographic evaluation of bullet fragmentation between ammunitions

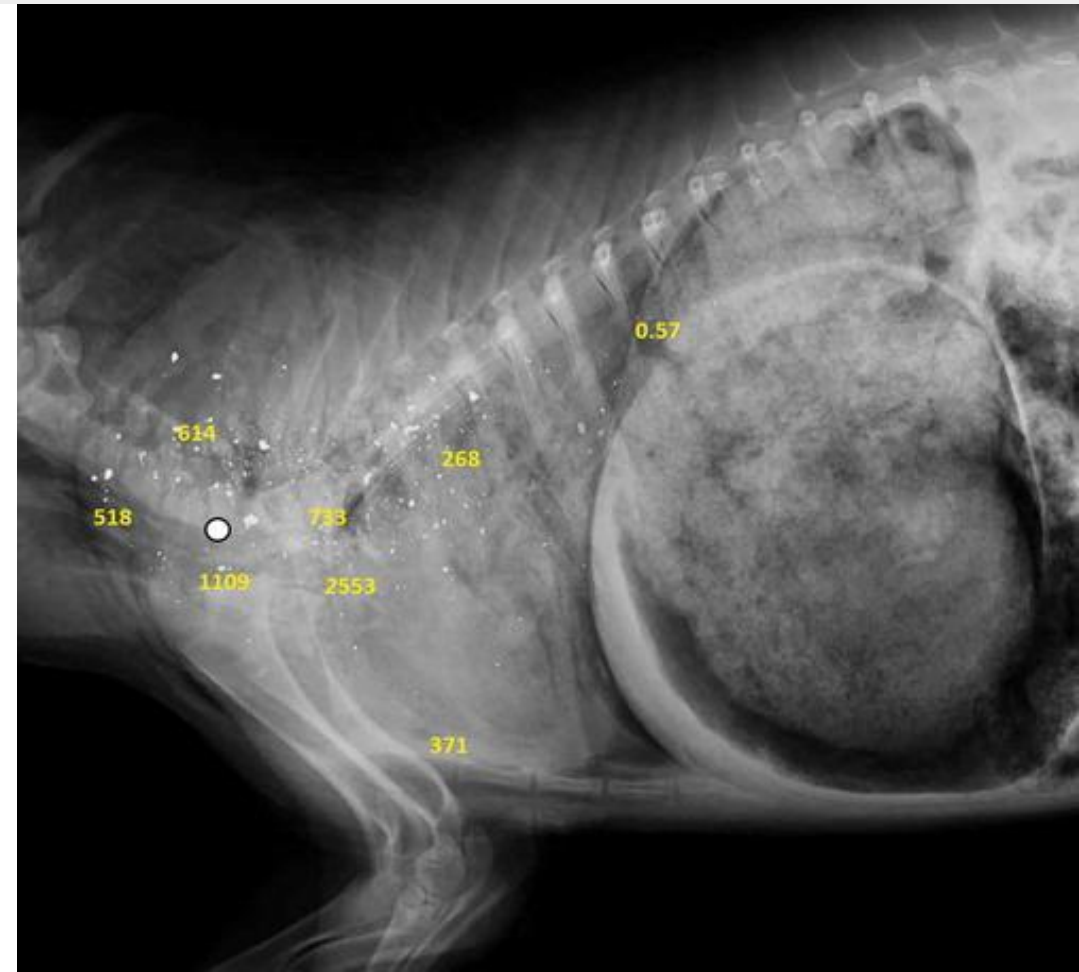
Alessandro Menozzi , Simonetta Menotta, Giorgio Fedrizzi, Antonio Lenti , Anna Maria Cantoni, Rosanna Di Lecce, ...show all

Pages 182-190 | Received 18 Oct 2018, Accepted 24 Feb 2019, Published online: 28 Mar 2019

 Download citation  <https://doi.org/10.1080/19393210.2019.1588389>



- The results of this study suggest that commonly employed lead ammunitions, because of the high level of fragmentation, are able to disperse a high content of this toxic metal in the body of wild boars, raising serious concerns for the consumer's health. Even though the highest levels of lead were found in samples close to wound channel, **a careful carcass finishing does not seem to grant sufficient protection against a dangerous lead absorption, since a toxic concentration of lead was detected also in the meat taken 15–25 cm from bullet trajectory.** Moreover, a careless finishing of the carcass might greatly increase the risk of lead poisoning.

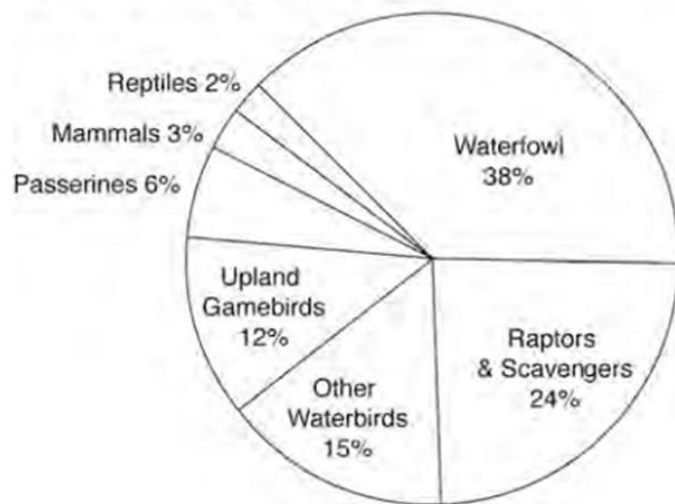


Toiduahelas

- Umbkaudselt 15% of veelindude vere pliitase kõrgem kui inimtoiduks aktsepteeritud piirmäär (Beintema 2001)
- Umbkaudselt rohkem kui 20 miljonit lindu ja imetajat sureb igaaastaselt pliimürgistusse Ameerika Ühendriikides

(Center of Biological Diversity)

Species affected by lead ammunition



TRANEL, M. A., AND R. O. KIMMEL. 2009



© Diogo Guerra 2015

Plii kasutamine jahinduses ja kalanduses

- Üheks oluliseks otsereostus allikaks on pliid sisaldav laskemoon
- Emisioon keskkonda Euroopas
 - 14 000 tonni/aastas haavlitena Euroopas
 - 350 tonni pliid jahikuulidega
 - sportlaskmine 10 000-20 000 tonni/aastas
 - Arvutuslik jahimoona kasutamine maailmas 2003 aastal oli 120 000 tonni.
- Lisaks kalastuse tõttu jõuab Euroopas veekeskkonda 2 000- 6 800 tonni/aastas



Ohtlik kõigile elusorganismidele

Tervise ja heaolurisk

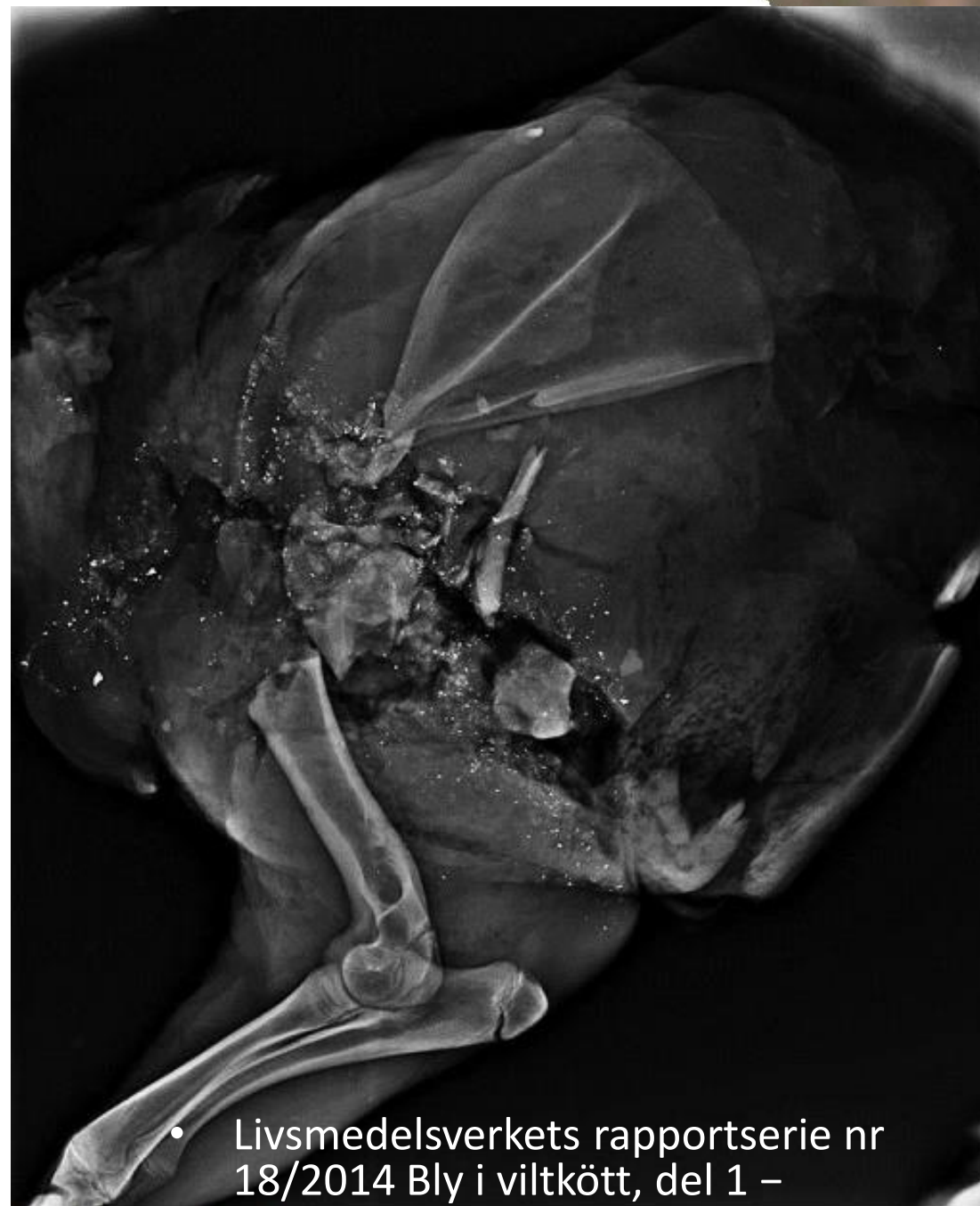
~1,5 eur/lask

~3,5 eur/lask



Plii sisuga
poolmantelkuul koos
fragmentidega peale
pehmete kudede läbimist

Vask-kuul
jahipidamiseks peale
pehmete kudede
läbimist



- Livsmedelsverkets rapportserie nr 18/2014 Bly i viltkött, del 1 –

Foto: SVA och SJF, 2014.



Palju pliid metsa viiakse?

- Fennoskandias 2013/2014 jahihoojal põdrajahiga vähemalt 690 kg pliid põdra jahipraagis
- Väga lihtsustatud arvutused analoogial Eesti kohta, eeldusel et moonakasutus samalaadne...

Kokku 16/17 Lihakehas Jahipraagis

		70%	30%
Põder	7390	21,845	9,362
Punahirv	1664	4,919	2,108
Metskits	10973	32,436	13,901
Metssiga	17610	52,054	22,309
Kokku		111,253	47,680

Original Article

Metal deposition of copper and lead bullets in moose harvested in Fennoscandia

Sigbjørn Stokke , Scott Brainerd, Jon M. Arnemo

First published: 13 February 2017 [Full publication history](#)

DOI: 10.1002/wsb.731 [View/save citation](#)

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Volume 41, Issue 1
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Pages 98–106

ABSTRACT

Fragments from bullets used for moose (*Alces alces*) hunting contaminate meat, gut piles, and offal and expose humans and scavengers to lead and copper. We sampled bullets ($n = 1,655$) retrieved from harvested moose in Fennoscandia (Finland, Sweden, and Norway) to measure loss of lead and copper. Concordant questionnaires ($n = 5,255$) supplied ballistic information to complete this task. Hunters preferred lead-based bullets (90%) to copper bullets (10%). Three caliber classes were preferred: 7.62 mm (69%), 9.3 mm (12%), and 6.5 mm (12%). Bullets passed completely through calves (76%) more frequently compared to yearlings (63%) or adults (47%). Metal deposition per bullet type (bonded lead core, lead core, and copper) did not vary among moose age classes (calves, yearlings, and adults). Average metal loss per bullet type was 3.0 g, 2.6 g, and 0.5 g for lead-core, bonded lead-core, and copper bullets, respectively. This corresponded to 18–26, 10–25, and 0–15% metal loss for lead-core, bonded lead-core, and copper bullets, respectively. Based on the harvest of 166,000 moose in Fennoscandia during the 2013/2014 hunting season, we estimated that lead-based bullets deposited 690 kg of lead in moose carcasses, compared with 21 kg of copper from copper bullets. Bone impact increased, whereas longer shooting distances decreased, lead loss from lead-based bullets. These factors did not influence loss of copper from copper bullets. In conclusion, a significant amount of toxic lead from lead-based bullets is deposited in the tissue of harvested moose, which may affect the health of humans and scavengers that ingest it. By switching to copper bullets, Fennoscandian hunters can eliminate a significant source of lead exposure in humans and scavengers. © 2017 The Wildlife Society.

Surmapõhjused meri- ja kaljukotkal

Raskemetallid Pb, Hg, Cd ja kloororgaanilised pestitsiidid
Pliimürgistus oluline haigestumus ja surmapõhjus, samuti
eetiline probleem

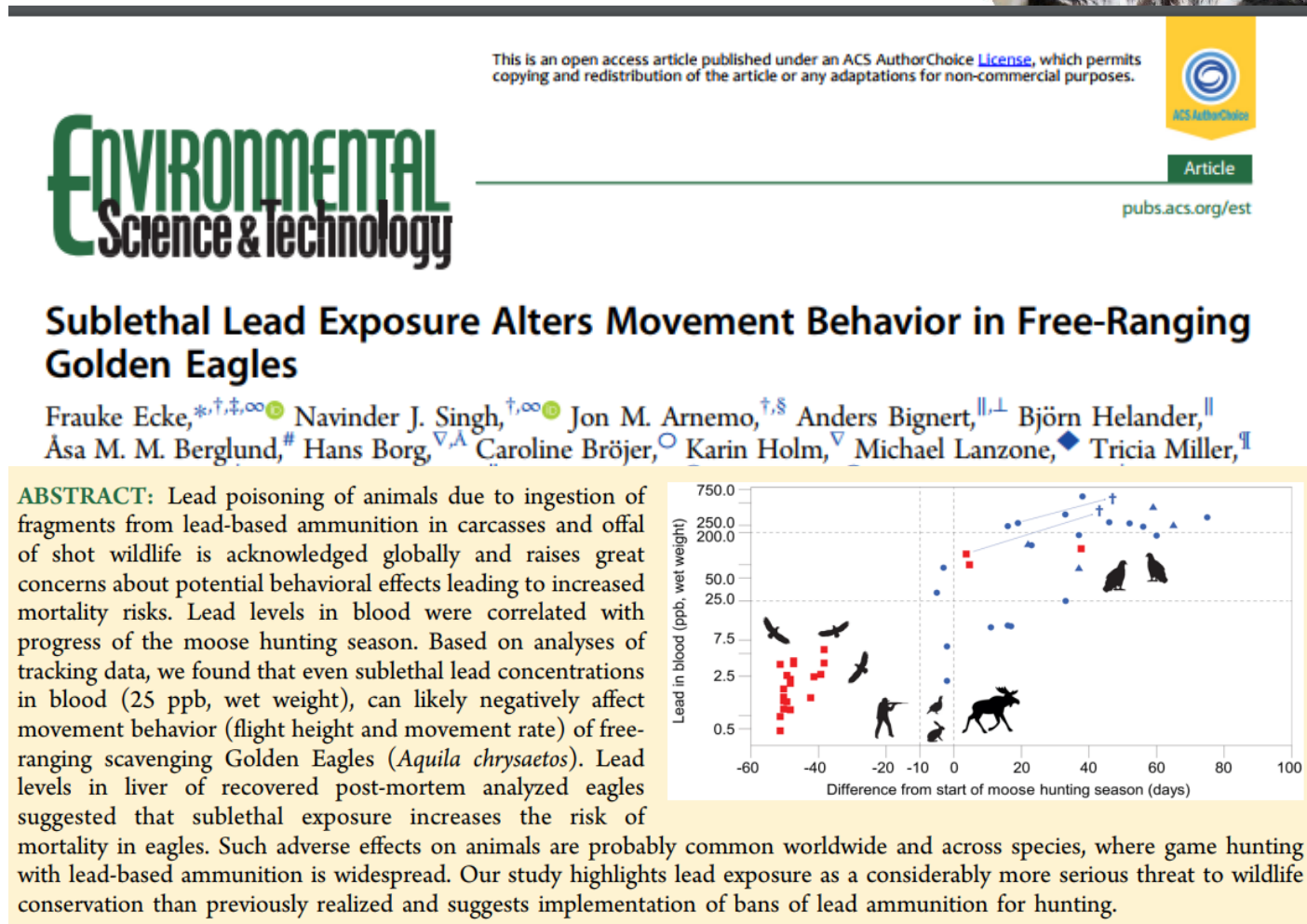
2014, 2015, 2017, 2018

Surma põhjus	Nr	%
Plii mürgistus	32	53,33%
Trauma, projektiil (lask)	5	8,33%
Trauma, kokkupõrge (transport)	3	5,00%
Trauma, infrastruktuur (tuulegeneraator)	2	3,33%
Trauma, põhjus teadmata	10	16,67%
Muud mürgistused	2	3,33%
Teadmata põhjus	2	3,33%
Trauma, kokkupõrge (rong)	2	3,33%
Trauma, liigisisene agressioon	2	3,33%
Kokku	60	100%



Plii subkliinilised mõjud kotkastele???

- Raske looduslikus populatsioonis hinnata
 - Pikaajalised kokkupuude madalate pliiikogustega võivad olla sama tõsised mõjud kui lühiajalised kokkupuuted kõrgete kontsentratsioonidega.
 - Antud uuringu tulemused näitasid, et lindude lennuvõimekus kahjustus juba 1/8 keskkondliku taustkontsentratsiooni juures.
 - Tugev korrelatsioon plii kontsentratsioonide ja surmapõhjuste nagu kurtumus, kokkupõrked rongide ja autodega ning muude traumadega.



Plii karude veres Rootsis ja Norras..

Assessment of the LeadCare[®] Plus for Use on Scandinavian Brown Bears (*Ursus arctos*)

Amanda H. Boesen^{1*}, Alexandra Thiel¹, Boris Fuchs¹, Alina L. Evans¹, Mads F. Bertelsen²,
Iliia Rodushkin³ and Jon M. Arnemo^{1,4}

¹ Department of Forestry and Wildlife Management, Faculty of Applied Ecology, Agricultural Sciences and Biotechnology, Inland Norway University of Applied Sciences, Koppang, Norway, ² Center for Zoo and Wild Animal Health, Copenhagen Zoo, Frederiksberg, Denmark, ³ ALS Scandinavia AB, Luleå University of Technology, Luleå, Sweden, ⁴ Department of Wildlife, Fish and Environmental Studies, Faculty of Forest Sciences, Swedish University of Agricultural Sciences, Umeå, Sweden

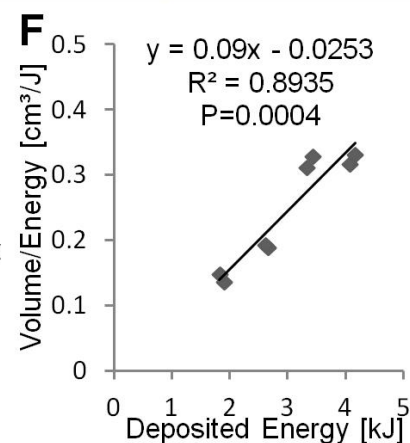
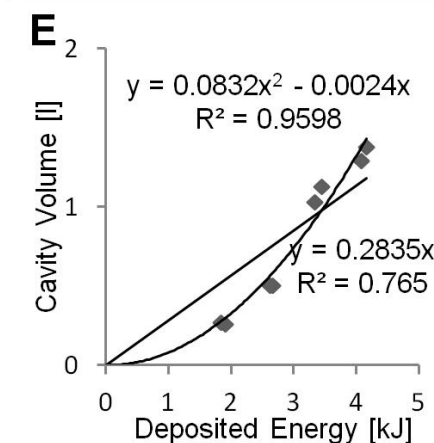
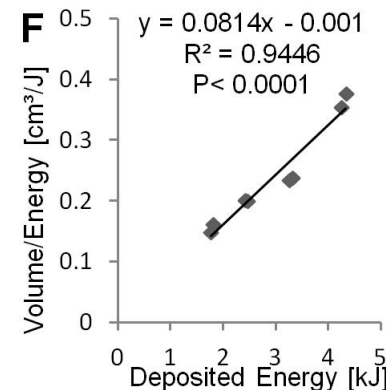
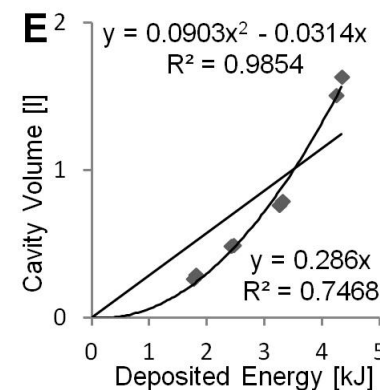
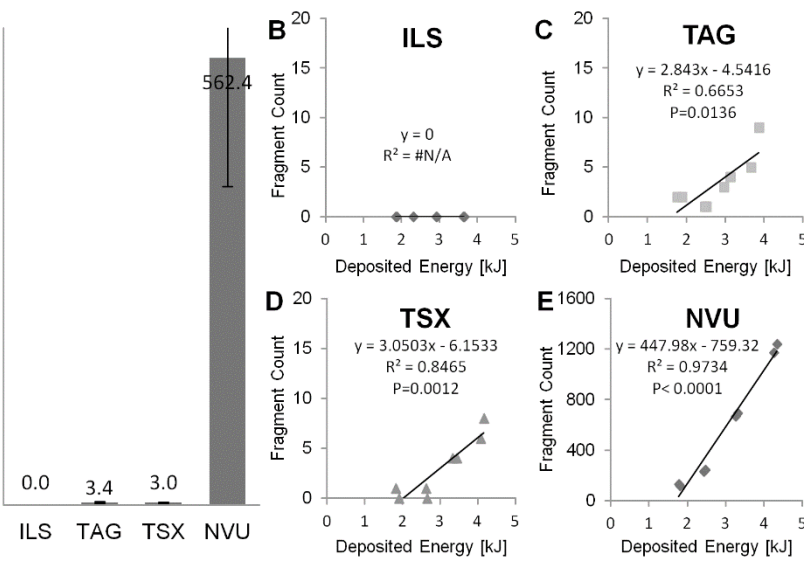
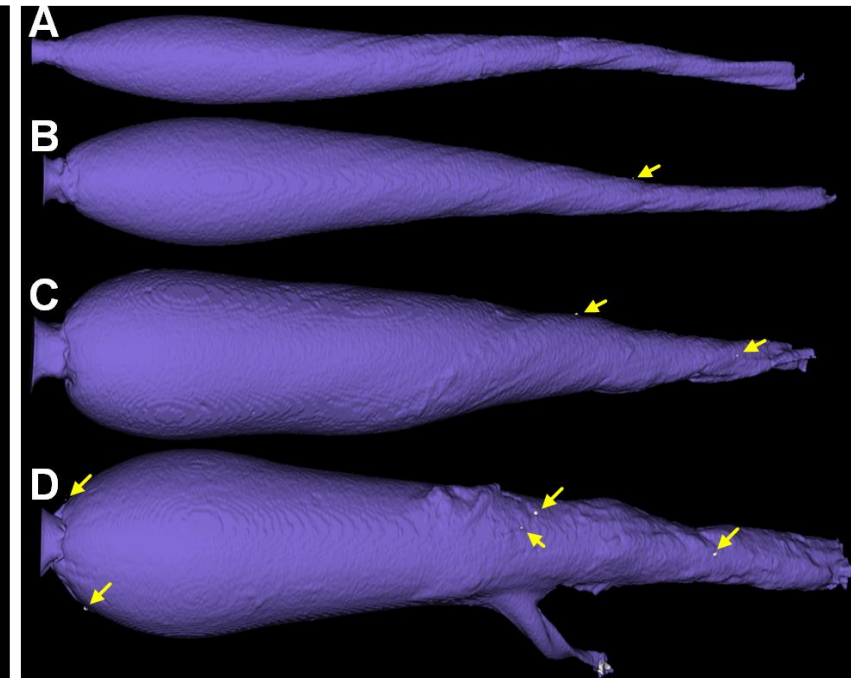
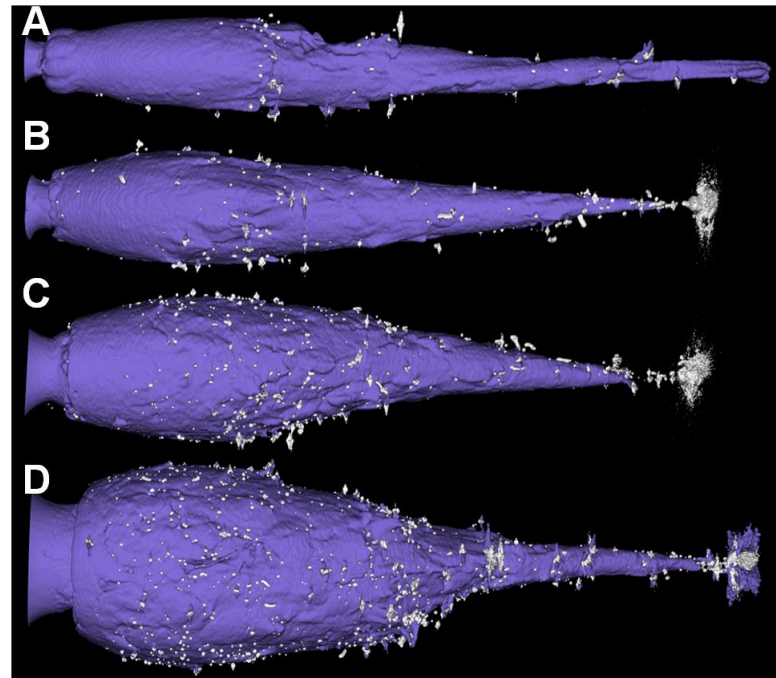
- Karude vere plii keskmine sisaldus oli 88.1 µg/L (mediaan 83 µg/L). Mõõtmistulemuste vahemik oli 32.5–173.0 µg/L.
- Kontsentratsioonid on üllatavalt kõrged!
- Arvestades, et vereplii pigem näitab lühiajalist kokkupuudet, võrreldes maksa ja luudega, mis on paremad kesk ja pikemaajalise kokkupuute indikaatoriteks.
- Mõju karudele
- Keskkonna indikaatorid...



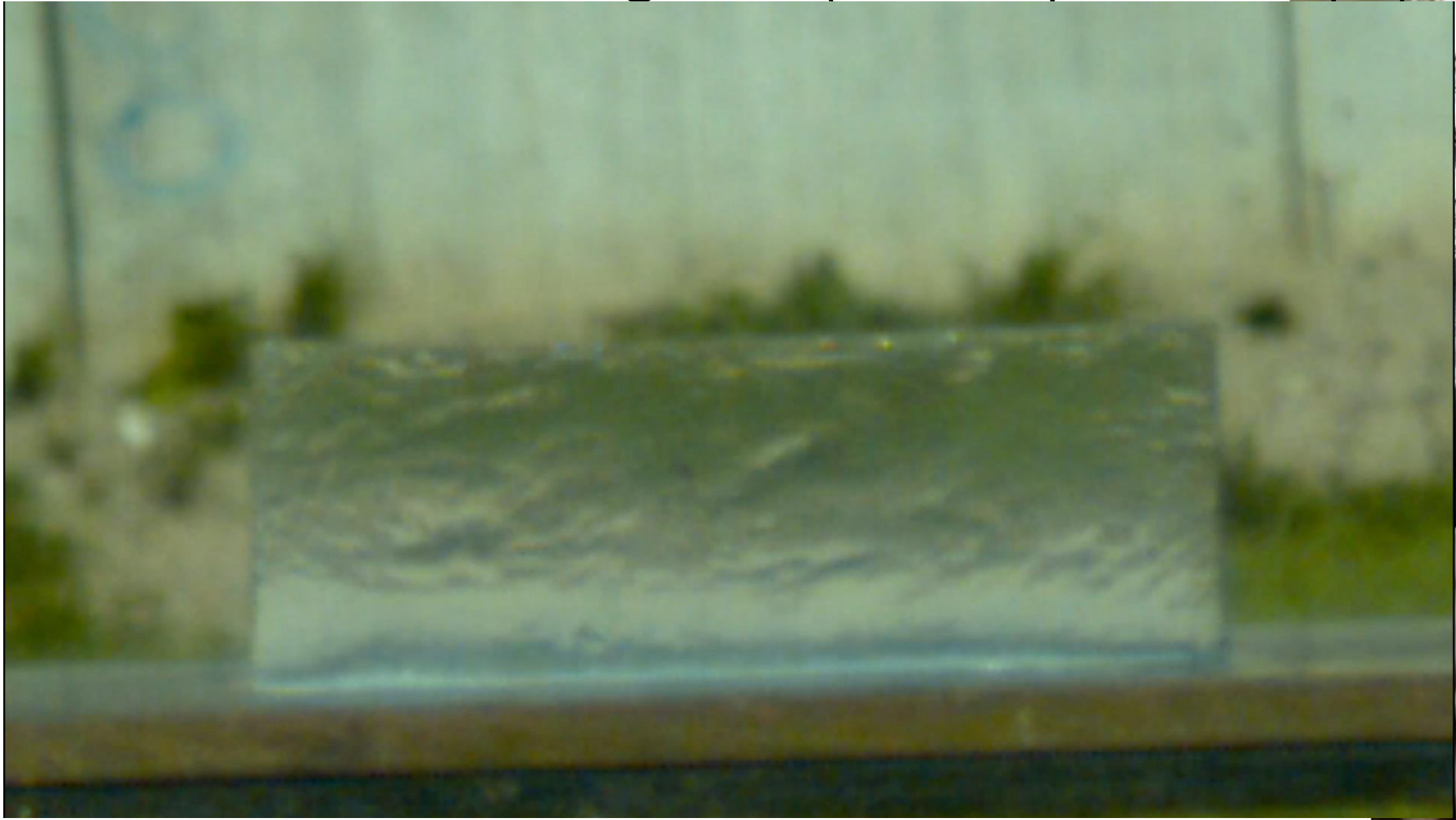
Tapmisvõime

- The deforming lead-free bullet closely resembled the deforming lead-containing bullet in terms of energy conversion, deflection angle, cavity shape, and reproducibility, showing that similar terminal ballistic behavior can be achieved.

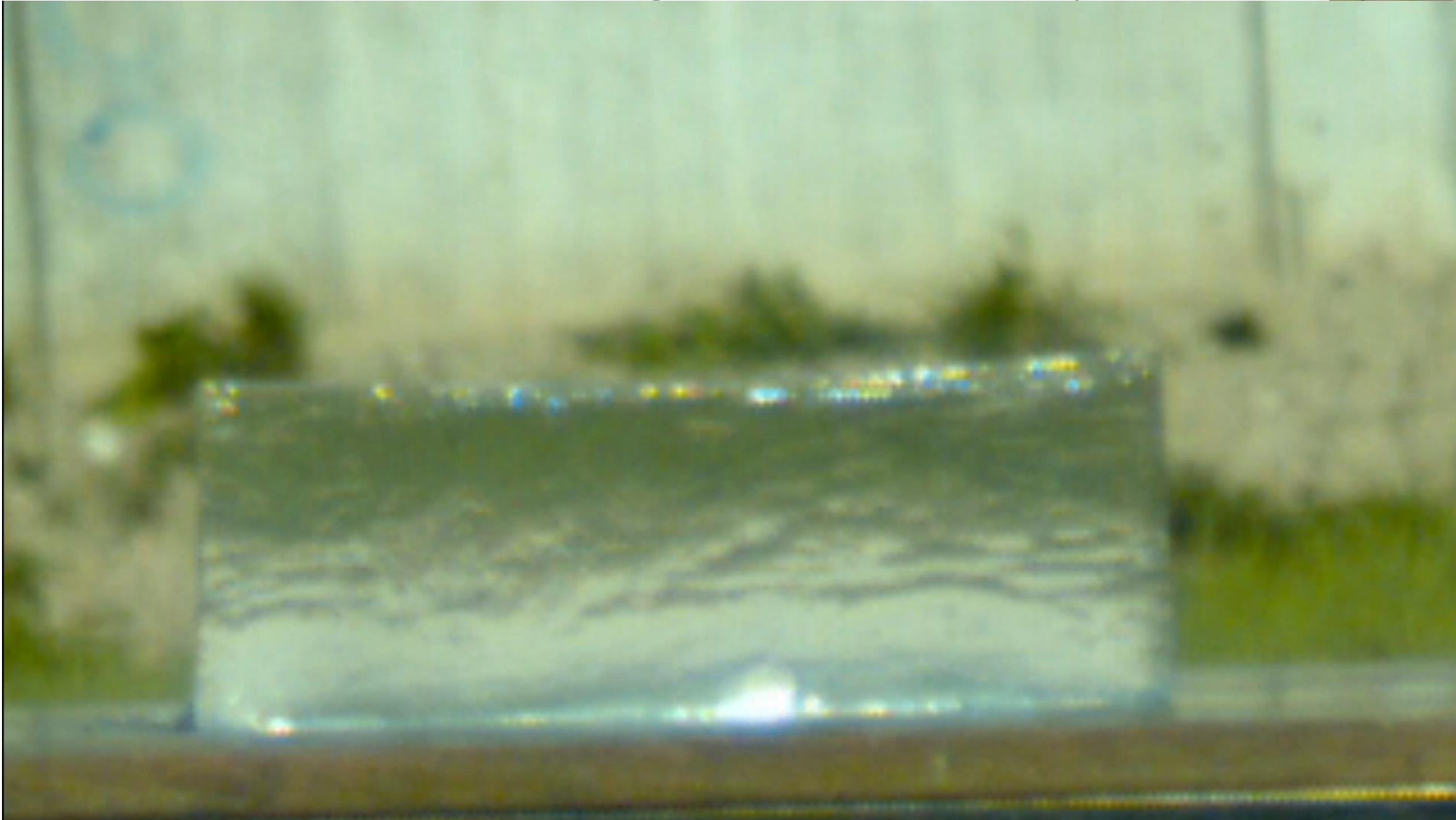
Gremse, F., Krone, O., Thamm, M., Kiessling, F., Tolba, R.H., Rieger, S. and Gremse, C., 2014. Performance of lead-free versus lead-based hunting ammunition in ballistic soap. PloS one, 9(7), p.e102015.

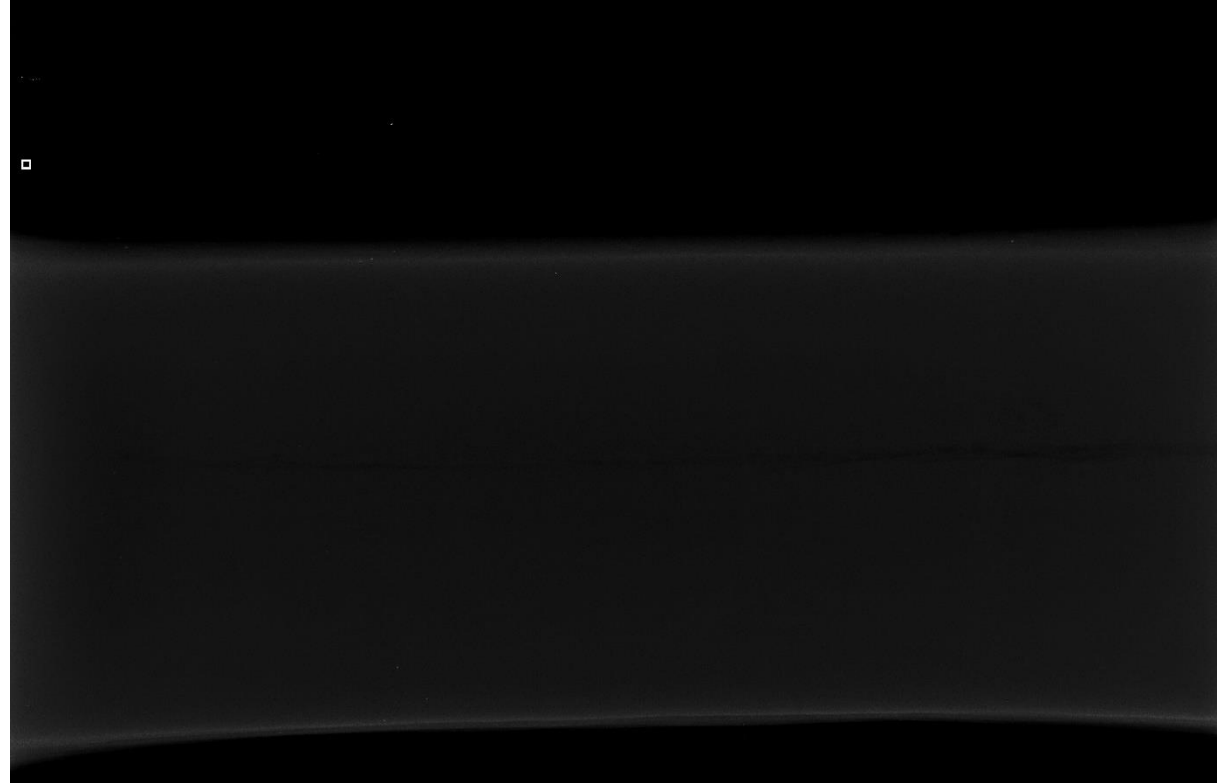
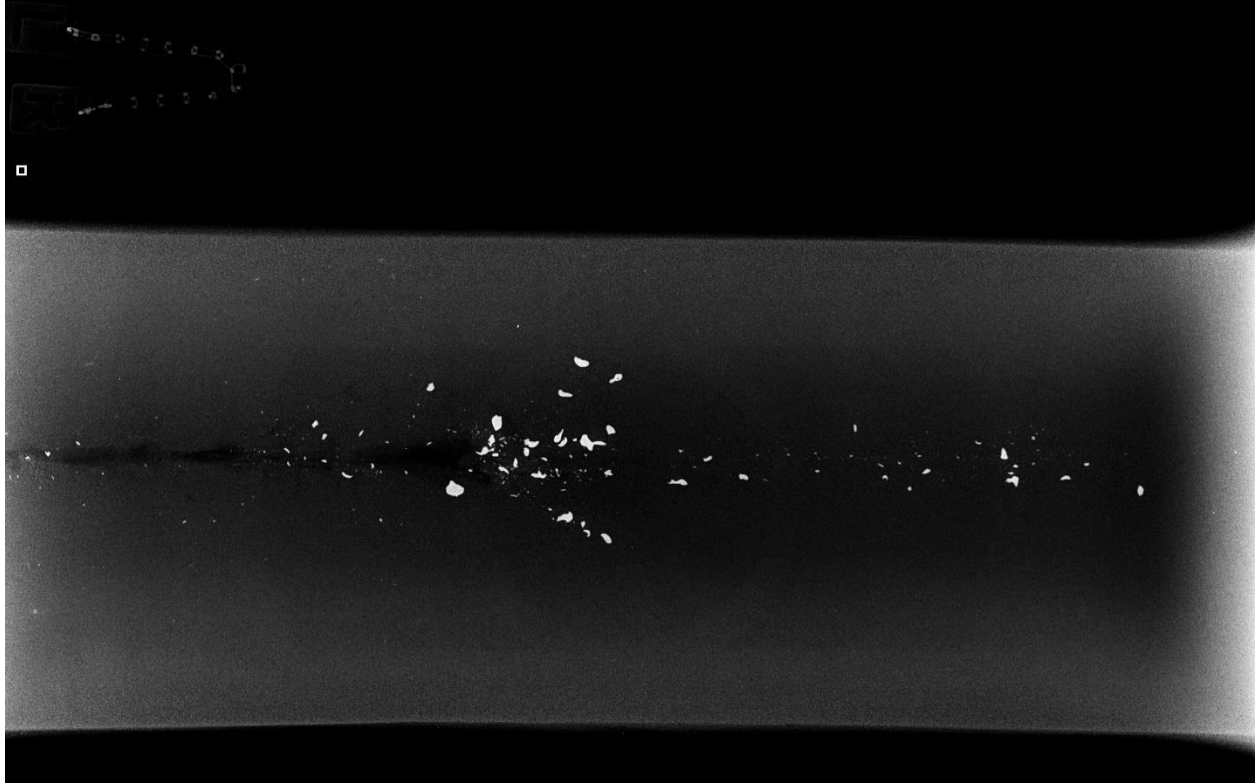


Pliikuul ballastilises geelis (F 20k fps, P 30 fps),



Vaskkuul ballistilises geelis (F 20k fps, P 30 fps)





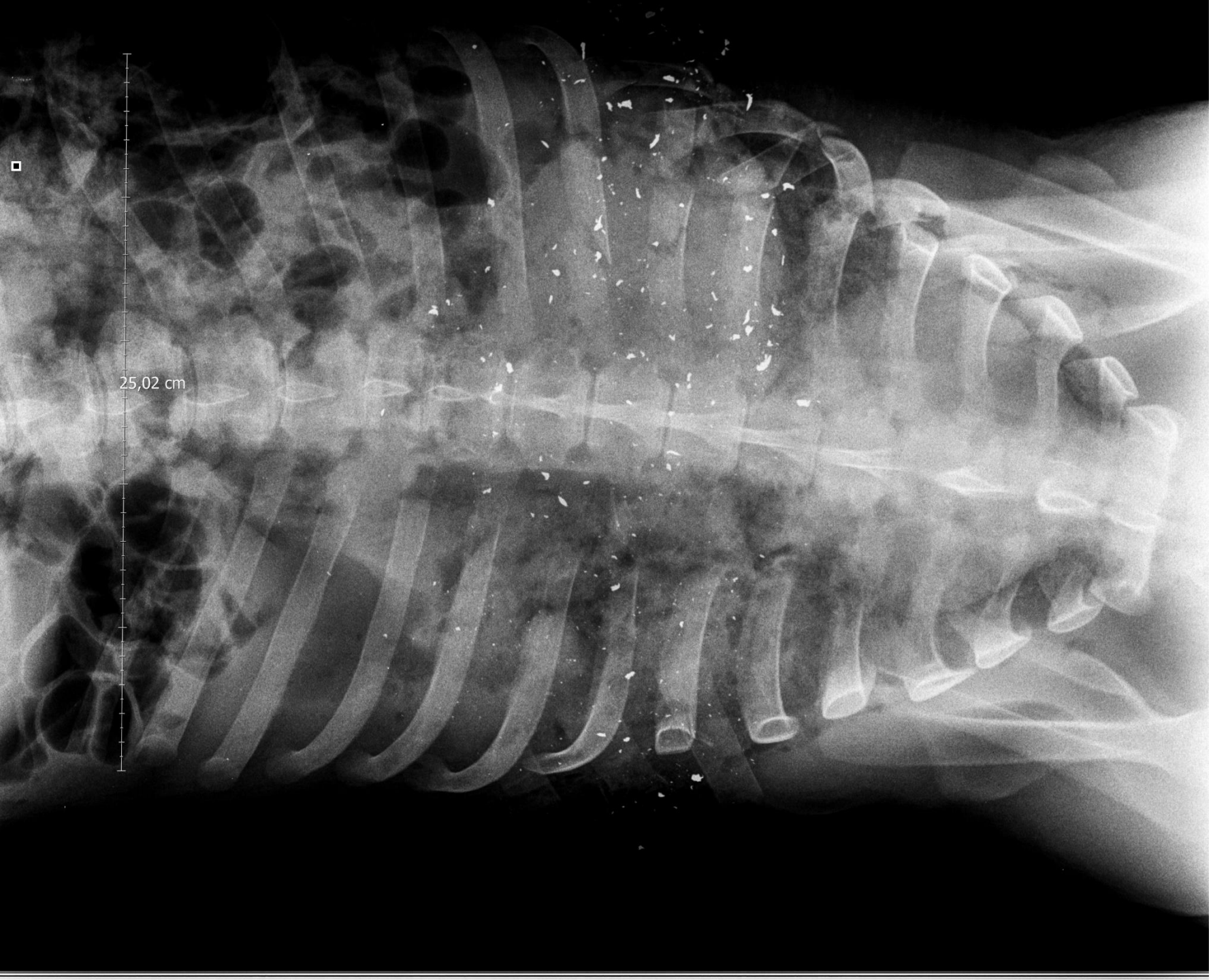


Pliikuuliga lastud siga





Pliikuuliga lastud siga





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Are lead-free hunting rifle bullets as effective at killing wildlife as conventional lead bullets? A comparison based on wound size and morphology

Anna Trinogga ^{*}, Guido Fritsch, Heribert Hofer, Oliver Krone

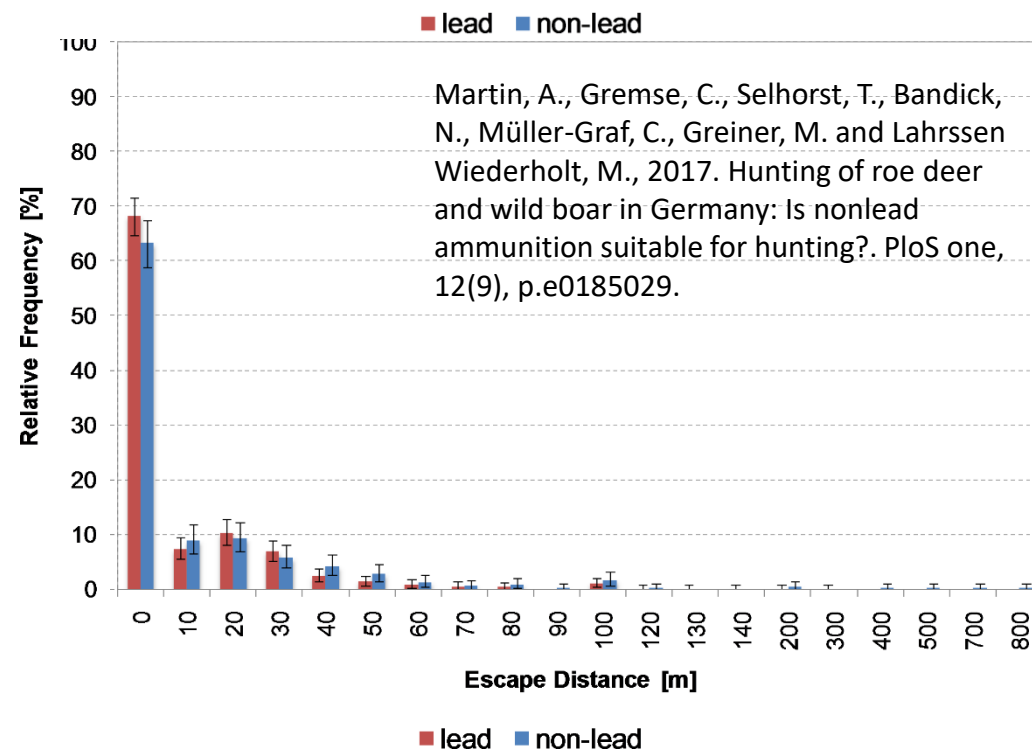
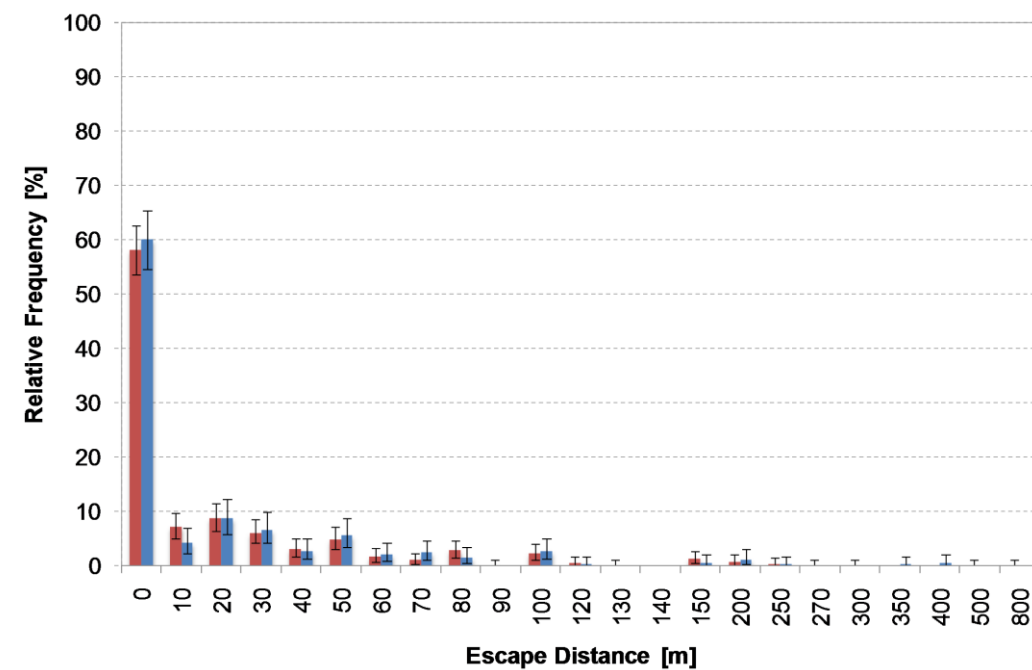
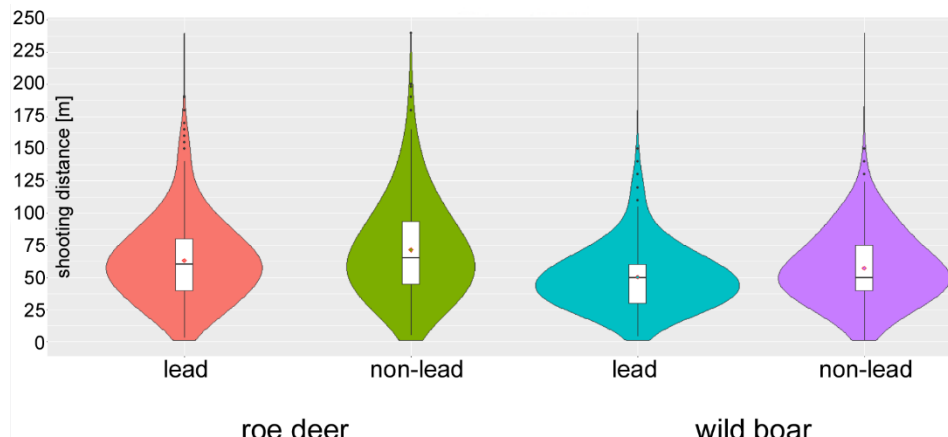
Leibniz Institute for Zoo and Wildlife Research, P.O. 601103, D-10252 Berlin, Germany

- As bullet material did not exert a significant influence on wound dimensions under real life hunting conditions, this study clearly demonstrates the equality of lead-free bullets to conventional hunting bullets in terms of killing effectiveness.
- Lead-free hunting rifle bullets thus meet the welfare requirements of killing wildlife without superfluous pain as good as do conventional bullets.



Põgenemisdistsants metskits/metssiga

- Põgenemisdistsants ei ole sõltuvuses laskemoona materjalist (plii vs. vask)
 - Metskitse puhul sõltus põgenemisdistsants lasu tabamiskohast ja jahipidamise meetodist. Suurem laskmisdistsants suurendas põgenemisdistsantsi.
 - Metssea puhul sõltus põgenemisdistsants lasu tabamiskohast ja looma vanusest.



A Comparison of Lead and Steel Shot Loads for Harvesting Mourning Doves

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ABSTRACT With approximately 100 million shots fired at mourning doves (*Zenaida macroura*) annually, it is incumbent on managers to determine whether changes in ammunition will substantially alter harvest metrics or hunter satisfaction. We compared mourning dove harvest metrics for 1 lead (Pb 7½, 32 g) and 2 steel (Fe 7 and Fe 6, 28 g) 12-gauge ammunition types using a double-blind field test in central Texas, USA. There were no differences in the number of attempts, or number of shots fired among ammunition types. Hunters were unable to distinguish the ammunition type being used in the field, and we detected no relationship between ammunition type and level of hunter satisfaction. Field analyses detected no difference in doves bagged per shot, wounded per shot, bagged per hit, or wounded per hit among the 3 ammunition types. Necropsy analyses detected no difference in the proportion of birds with through-body strikes, mean penetration depth of through-body strikes, or mean embedded pellet depth among ammunition types. Ammunition and choke combinations that produced higher pattern densities yielded more hits per shot and produced more total strikes per bird, resulting in a higher percentage of birds with embedded pellets, more embedded pellets per bird, and a higher proportion of birds with broken legs. All 3 ammunition types retained sufficient lethality to harvest mourning doves under typical hunting conditions. Our results demonstrate that when the ammunition type used provides sufficient lethality for pellets to penetrate vital organs, pattern density becomes the primary factor influencing ammunition performance. © 2014 The Wildlife Society.

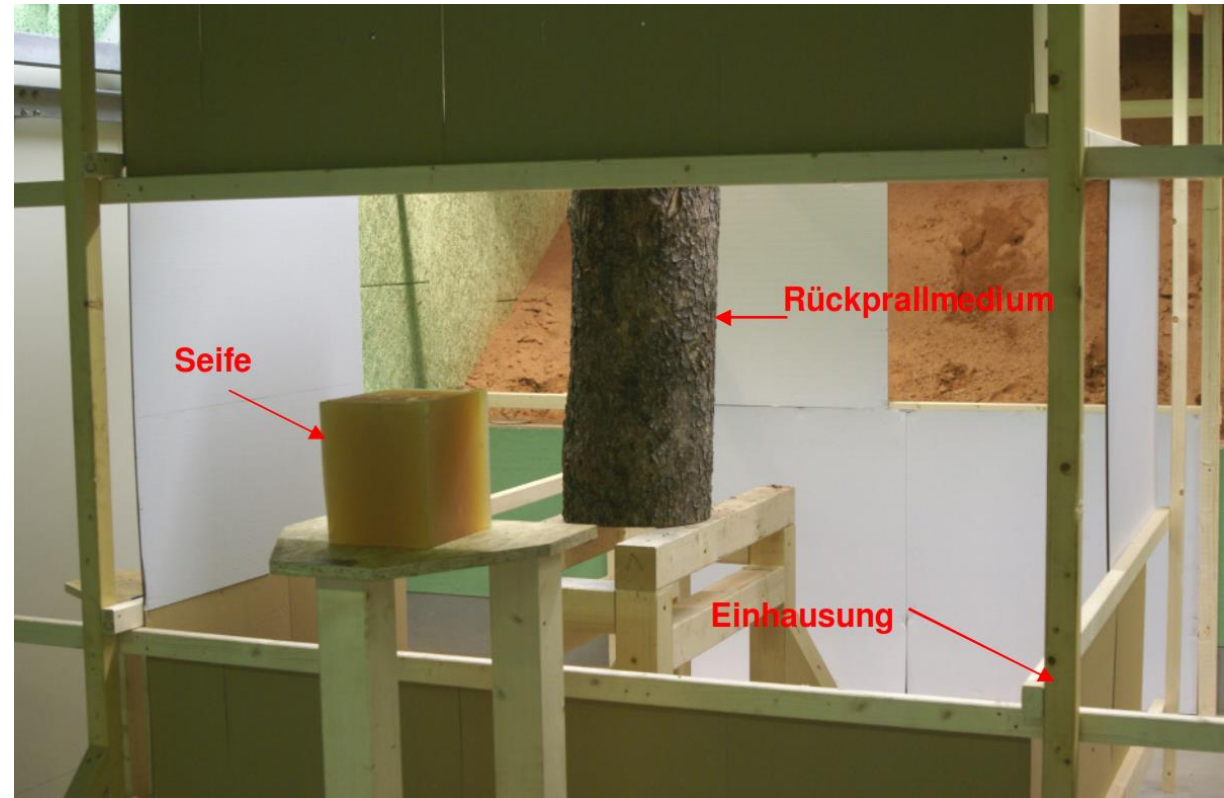
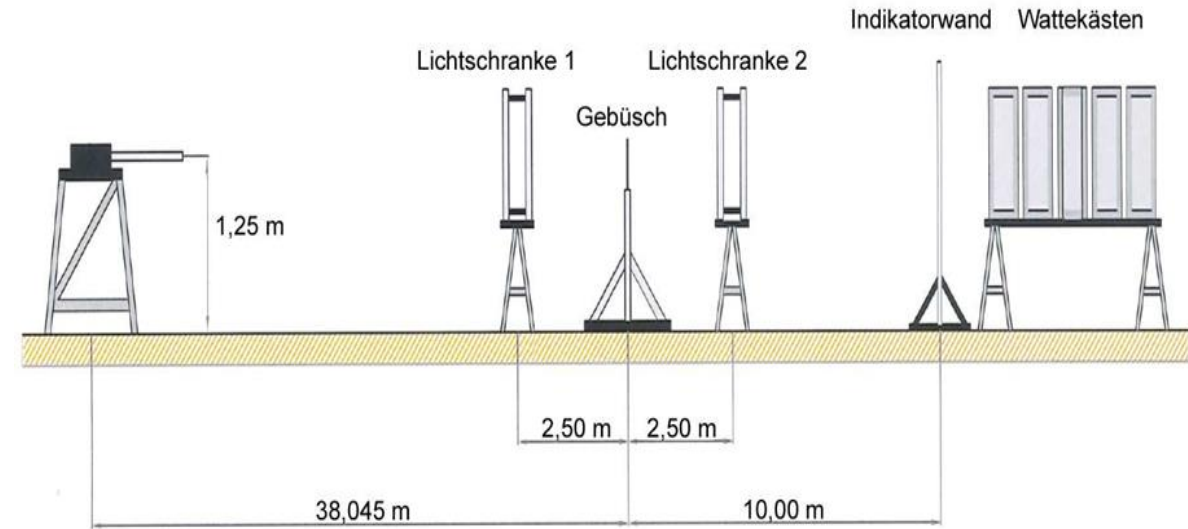
Distance category	Metric ^b	Pb 7½	Fe 7	Fe 6
<28.3 m	Shot distance (m) [*]	21.78 ± 0.23	21.07 ± 0.23	21.00 ± 0.23
	Bagged per shot	0.261 ± 0.02	0.293 ± 0.02	0.298 ± 0.02
	Wounded per shot	0.124 ± 0.01	0.155 ± 0.01	0.138 ± 0.01
	Hits per shot [*]	0.385 ± 0.02	0.448 ± 0.02	0.436 ± 0.02
	Bagged per hit	0.677 ± 0.03	0.654 ± 0.02	0.683 ± 0.02
≥28.3 m	Wounded per hit	0.323 ± 0.03	0.346 ± 0.02	0.317 ± 0.02
	Shot distance (m) [*]	37.58 ± 0.23	36.45 ± 0.23	37.46 ± 0.23
	Bagged per shot	0.158 ± 0.01	0.187 ± 0.01	0.154 ± 0.01
	Wounded per shot	0.157 ± 0.01	0.155 ± 0.01	0.140 ± 0.01
	Hits per shot	0.315 ± 0.02	0.342 ± 0.02	0.293 ± 0.02
All distances	Bagged per hit	0.502 ± 0.03	0.546 ± 0.03	0.524 ± 0.03
	Wounded per hit	0.498 ± 0.03	0.454 ± 0.03	0.476 ± 0.03
	Shot distance (m) [*]	29.68 ± 0.17	28.76 ± 0.16	29.23 ± 0.17
	Bagged per shot	0.209 ± 0.01	0.240 ± 0.01	0.225 ± 0.01
	Wounded per shot	0.141 ± 0.01	0.155 ± 0.01	0.139 ± 0.01
	Hits per shot [*]	0.350 ± 0.01	0.395 ± 0.01	0.364 ± 0.01
	Bagged per hit	0.598 ± 0.02	0.608 ± 0.02	0.618 ± 0.02
	Wounded per hit	0.402 ± 0.02	0.392 ± 0.02	0.382 ± 0.02

Shell type	Shot outcome	<28.3 m	≥28.3 m	Total
Pb 7½ ^a	Bagged	218 (26.1% ^b) A ^c	134 (15.8%) B	352 (20.9%)
	Wounded	104 (12.4%) A	133 (15.7%) A	237 (14.1%)
	Missed	514 (61.5%) A	580 (68.5%) B	1,094 (65.0%)
	Total	836 (100.0%)	847 (100.0%)	1,683 (100.0%)
Fe 7 ^a	Bagged	255 (29.3%) A	160 (18.7%) B	415 (24.0%)
	Wounded	135 (15.5%) A	133 (15.5%) A	268 (15.5%)
	Missed	480 (55.2%) A	564 (65.8%) B	1,044 (60.5%)
	Total	870 (100.0%)	857 (100.0%)	1,727 (100.0%)
Fe 6 ^a	Bagged	248 (29.8%) A	131 (15.4%) B	379 (22.5%)
	Wounded	115 (13.8%) A	119 (14.0%) A	234 (13.9%)
	Missed	469 (56.4%) A	602 (70.7%) B	1,071 (63.6%)
	Total	832 (100.0%)	852 (100.0%)	1,684 (100.0%)



Ohutus

- Deutsche Versuchs- und Prüf-Anstalt für Jagd- und Sportwaffen e. V. (DEVA)
- Kaliibrid .243 Win., ,304 Win. ja 9,4x74 R
- Laskeaugused 25 m, 50 m ja 100 m
- erinevaid looduslike substraate, põõsas oksajämedusega 6 mm, puutüvi jämedusega 30-35 cm, kivi, pehme- ja kõva pinnas,
- Tabamisnurgad $2,5^\circ$, 5° , 10° , 15° , 25° , 45° ja 90°) korral.
- Ballastilise seebi blokke (25 cm x 25 cm x 40 cm), et imiteerida looma tabamise järgselt kuuli käitumist.
- Iga stsenaariumi kohta tehti 3-10 lasku.



Ohutus - järeldused

- Vaskkuulid olid oma käitumiselt (deformeerumine, häirumine, massikaotus jne) oluliselt ühtlasemad, kuivõrd erineva ehitusega pliikuulid käitusid väga erinevalt olenevalt olukorrast.
- Katsete tulemusena leiti, et enamasti pole oluline millest kuul tehtud on, vaid kuidas ta on ehitatud, millest sõltus ka tema käitumine.
 - Paksuseinalised ja massi säilitavad pliid sisaldavad kuulidkäitusid katsetes rohkem vaskkuulile omaselt, kuid kutsudes esile plii osa fragmentatsiooni.
- Kuna pliivaba projektikivide külgnurgad ei erine oluliselt pliid sisaldavatest neist, on kahe tüüpi projektipaaside oht sama.
 - Pliikuuli jäänuste suurem mass ja pliivaba projektori parem energia säilimine ei mängi rolli, sest selles valdkonnas on mõlemat tüüpi projektiklassitest energia tihedus tunduvalt suurem kui ohupiirang. Kuuli kiiruse vähenemisel suurenes häirumine.



Jahinduseetika...?

- Inimene ei tohi põhjustada teistele loomadele põhjendamatuid kannatusi, eriti kui neid on võimalik ära hoida
- Pliimürgistus on väga kannatusterohke
 - Lämbumine
 - Nälgimine
 - Võivad täiskõhu puhul surnuks nälgida
 - Traumad
 - Kahjustused kogu eluks



<https://youtu.be/yOzgccbC7Dg>

Küsimus pole liikide arvukuses, vaid põhjendamatute kannatuste vähendamine teistele loomadele, puhtam keskkond ja parem tervis kõigile

Soovitused pliimürgituse riski vähendamiseks

- Kasutada pliid mittesisaldavat laskemoona
- Rasedad ja lapsed vanuses 0-7 a. peaksid hoiduma plii moonaga jahitud- Kasutades pliid sisaldavat jahimoona, eemaldada tabamuspiirkond (lasketraumale iseloomulike visuaalse muutustega kude nn. „bloodshot“) ja sellest veel vähemalt 10cm raadiuses (Swedish National Food Agency)
 - Antud kude tuleks hävitada - käsitle kui ohtlikke jäätmeid
 - Kindlasti mitte süüa loomadele või jätta metsa vedelema!



ECHA identifies risks to terrestrial environment from lead ammunition

ECHA/PR/18/14

The European Chemicals Agency (ECHA) recommends that measures are needed to regulate the use of lead ammunition in terrestrial environments in addition to those proposed for wetlands.

Helsinki, 12 September 2018 – ECHA's new report on non-wetland uses of lead in ammunition (gunshot and bullets) and in fishing weights has found sufficient evidence of risk to justify additional measures. The report concludes that measures are needed because they would:

- limit additional pollution with lead and improve the quality of the environment. While about 5 000 tonnes of lead are currently dispersed into wetlands due to hunting, other shooting activities such as lead gunshot used in non-wetland areas spreads a further 14 000 tonnes of lead into the environment, and the use of lead bullets and fishing weights adds to this quantity. In addition, between 10 000 to 20 000 tonnes of lead are used in sports shooting activities;
- reduce the mortality of an estimated 1 to 2 million birds, such as pheasants and partridges, that may inadvertently swallow the lead shot, or scavenge or prey on lead poisoned birds in the terrestrial environment; and
- reduce health risks to a significant population of hunters and their families who frequently eat game meat killed with lead shot or bullets.

ECHA found that the costs of replacing lead shot are limited as alternative steel shot is available, can be used in most shotguns, and is not significantly more expensive. As such, the extra costs to the individual hunter would be small.

**benefits of the restriction to society will outweigh its costs
and that the cost to hunters seems to be affordable**



Inimeste tegevused plii vastu

- Pliid sisaldavate mootorikütuste kasutamise lõpetamine
- Kontroll tööstuses emiteeritava plii üle
- Pliid sisaldavate toodete kogumine (patareid, akud, jne.)
- Pliid sisaldavate värvainete kasutamise lõpetamine
- Riskantsete toodete kontroll ja seire
- Õnnetina valamise keelustamine
- **Plii moona kasutuse lõpetamine???**
 - Ennetatav probleem!
 - Haavlite keelustamine poolik lahendus



Plii arutelu...



Eestlaste vanasõna on, et mis ei tapa teeb tugevamaks... või hoopis võib mittetappev häda kurnata organismi, põhjustada funktsioonihäireid või lausa invaliidistada. Ka kroonilise kuluga