

Lead from hunting ammunition in wild game meat: research initiatives and current legislation in Germany and the EU

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ABSTRACT

Lead exposure from hunting bullets used in regular hunting practices for cloven-hoofed game in Germany is a major cause of death in raptors, especially white-tailed sea eagles *Haliaeetus albicilla* and attracts considerable political attention in Germany. We give an overview of related research projects since 2006. We focused on the use of hunting bullets of both lead and non-lead construction in hunting for cloven-hoofed game from an animal welfare perspective, on the rebound characteristics of lead and non-lead bullets and on bullet residues in marketable game meat from a consumer protection point of view. A timeline of research and policy-related responses from the various relevant organisations and agencies is presented. An overview of the current legislation in Germany for the use of lead and non-lead ammunition for rifle and shotgun hunting is given with pending legislative changes. There is a definite trend within state and federal governments to end the use of lead in hunting as a result of the scientific evidence on the risks to human and wildlife health. We summarise an European Union process concerning “lead in consumer articles”, that excluded ammunition specifically by declassifying it as a “consumer article” and thus omitted addressing the issue of ammunition also being used in food production of game meat.

Key words: *lead, hunting, rifle, bullets, animal welfare, consumer protection, legislation, game meat, Germany, research initiatives*

NARRATIVE

Lead exposure has been found to be a major cause of death for raptors, especially white-tailed sea eagles *Haliaeetus albicilla* in Germany (Kenntner *et al.* 2001, Krone *et al.* 2003). Rifle bullets containing lead have been identified as a main source of lead exposure (Krone and Hofer 2005). This evidence prompted extensive political activity and research into the avoidance of lead as a bullet material in hunting. In 2006 the German Federal State of Brandenburg launched investigations into

the suitability of alternative materials for rifle bullets to be used in hunting in state forests. In 2007, hunters from the states of Schleswig-Holstein and Bavaria joined the project (Gremse and Rieger 2007). In 2008, the State of Brandenburg halted the field research involving the use of non-lead bullets (State of Brandenburg 2008) due to safety concerns about the rebound characteristics of lead-free bullets. In 2010, the Federal German Government commissioned research into the rebound characteristics of rifle bullets, shotgun slugs¹ and shot of both

¹ A single, heavy shotgun projectile as opposed to “shot”, where many individual, small spheres make up the charge of one cartridge.

lead and non-lead composition and continued research into the terminal ballistics of hunting bullets (Gremse *et al.* 2014a).

In 2010, the European Food Safety Authority Panel on Contaminants in the Food Chain published a Scientific Opinion on Lead in Food (EFSA 2010), concluding, "that the current PTWI [provisional tolerable weekly intake] of 25 µg/kg bw² is no longer appropriate as there is no evidence for a threshold for critical lead-induced effects." Shortly after, the Federal German Institute for Risk Assessment (BfR) released a statement regarding lead contamination of game meat from hunting ammunition (BfR 2010). In 2011, the results of the tests of bullet rebound characteristics (DEVA e. V. 2011) and an expert consultation on this report (Kneubuehl 2011a) were published, showing no increased risks associated with rebounds in the use of non-lead projectiles (Kneubuehl 2011b). A conference at BfR held in 2011 summed up the research progress, the state of political decision making and stakeholder dialogue (BfR 2011). In 2012, a Public-Private-Partnership-Project (LEMISI) was started by the federal and state governments in cooperation with private sectors (game meat processors, vendors, ammunition manufacturers, federal and state non-governmental hunting organisations) to monitor the lead, copper and zinc content of marketable game meat and to distinguish between hunting bullets and environmental sources (BfR 2013, Gremse *et al.* 2014b).

A first report was published (Gremse and Rieger 2012), linking observations of animal reactions to being shot, especially focusing on the animals' flight distance and situation specific, terminal ballistic performance data for the bullets used (n=2,881). The study showed a correlation between hunter satisfaction and animal escape distances after the shot. Animal escape distances were found to be dependent on bullet material only if terminal ballistic performance parameters were not included. In other words, when comparing equal terminal ballistic performance levels, escape distances do not differ between lead and non-lead bullets. A different study found wound size and morphology, and bullet material (lead/non-lead) to be independent (Trinogga *et al.* 2013). Test results and consultations on the rebound characteristics of shotgun slugs and shot were published in 2013 (DEVA e. V. 2013a, 2013b). For shotgun slugs, the rebound risks and areas do not differ between lead and non-lead projectiles. For shot, the evidence was reported to be inconclusive, as variation for factors like "mass retention" and "energy retention" in each material category was too highly influenced by characteristics individual

to a specific product (Kneubuehl 2013). The status of research in this area was recently reported at a BfR conference (BfR 2013).

Research into the properties of lead and other bullet material was continued until spring 2014. Further analysis was carried out on the 2012 data linking field observations on the use of bullets to hunt roe deer *Capreolus capreolus*, red deer *Cervus elaphus*, fallow deer *Dama dama* and wild boar *Sus scrofa*, and terminal ballistic testing data (Gremse and Rieger 2014). At the 2014 BfR conference the status of research in this area was again presented, focusing especially on the methods and results of the now completed LEMISI Study.

A total of 2,201 animals consisting of roe deer, red deer and wild boar were shot with both lead and non-lead bullets during routine hunting in three states of Germany, and then sampled at the game processor by trained and licensed professionals. Three samples were obtained from each carcass (haunch, saddle and chest) after the carcass was judged fit for human consumption. Samples were analysed at independent laboratories for lead, copper and zinc content (Gremse *et al.* 2014b).

The use of lead bullets was shown to increase lead content in marketable game meat above the levels attributable to other environmental sources. The use of non-lead bullets was shown to significantly reduce meat lead content. Lead content was shown to be highest closest to the shot channel, progressively declining with distance from it (BfR 2014).

A new method of terminal ballistic analysis using computed tomography scanning of ballistic testing material was used and validated against conventional methodology (Gremse *et al.* 2014a). This approach not only allows a comparison of bullets and their ballistic properties, but also assesses bullet fragmentation into adjacent tissues. The study showed a dramatic reduction in bullet material deposition for non-lead bullets compared with lead bullets. The study showed equal terminal performance of one type of tested non-lead bullet with the lead control. Further research is in progress and will be reported in time.

State of Legislation

The use of ammunition for hunting in Germany is legislated through federal and state laws following the principle of "competing legislation". In practice, a third venue of rule has been

² PTWI: Provisional Tolerable Weekly Intake, expressed as amount of intake per kilogram body weight (bw) per week.

established – the rule of “ownership” (Heider 2013)(see below).

FEDERAL LEGISLATION

The German Federal Hunting Act (CGERLI 2008), as amended in 2013, does not give specific parameters for the use of shot for hunting, but rather prohibits its use for cloven-hoofed game and seals, both for shooting healthy and previously wounded game. The use of rifle ammunition is legislated by a minimum bullet diameter (calibre) of 6.5 mm (0.257”) and minimum impact energy at 100 m for all cloven-hoofed game, except roe deer, of 2000 joules (~1.475 foot pounds). For roe deer, no minimum calibre is specified and a minimum impact energy of 1000 joules (~738 foot pounds) applies. No specifications are given for bullet or shot material composition. The Federal German Ministry for Food and Agriculture announced plans to change the Act to provide a standard national solution for the utilisation of hunting rifle ammunition. “The new act aims to minimize the lead contamination of game and environment through hunting ammunition and to ensure the utility of projectiles for hunting” (BMEL 2014). During the legislative process, this draft for a ‘first law to change the Federal German Hunting Law’ was commented on by the Federal Assembly (Bundesrat) on 27th March, 2015. The Federal Assembly moved to include a ruling in the draft with the objective to 1) ban lead ammunition for hunting and 2) ensure reliable terminal ballistic performance (German Federal Assembly 2015).

FEDERAL STATES LEGISLATION

The 16 German Federal States pass state hunting legislation, in which rulings of the federal act can be extended.

1. USE OF LEAD SHOT

Some 14 of 16 German Federal States implemented rulings against the use of lead shot over and around wetlands and waterbodies for hunting waterbirds (BMU 2011), in accordance with the “Agreement on the Conservation of African-Eurasian Migratory Waterbirds” (AEWA 2012). The Free State of Saxony, extended the ruling to include all game hunted with shot, not only waterfowl, starting 1st April, 2014 (Free State of Saxony 2012).

2. USE OF LEAD BULLETS

Some three of 16 German Federal States (Schleswig Holstein (LTSH 2014), Baden-Wuerttemberg (MLRV 2014) and Saarland (CdS Saarland 2014)) have moved to regulate the use of lead

bullets for hunting. In Schleswig Holstein the use of lead bullets and shotgun slugs for hunting has been banned since 1st April, 2015. This action was based on the results of Gremse and Rieger (2012, 2014)(LTSH 2014). In Baden-Württemberg, the use of lead bullets will be banned for hunting cloven-hoofed game with effect from 2016. At Saarland, state-wide restrictions of bullets containing lead are in place, effective from 1st April, 2014, with a grace period granted to phase out their use by 2017. At time of writing the Federal State of North Rhine Westphalia is in the process of passing hunting legislation, which will restrict the use of lead bullets and shotgun slugs in hunting (MKULNV 2014).

3. OWNERSHIP RULINGS

In Germany hunting rights are tied to land ownership. There is a differentiation between the ‘hunting right’ and the ‘right to hunt’. The former is the inalienable right of the landowner to gain from hunting of the owned land, whereas the ‘right to hunt’ “denotes the exclusive entitlement to care for and protect, to hunt and appropriate those animals living in the wild state which are subject to the right to hunt (game), on a specified area of land” (CGERLI 2008). Land is mostly owned by private, municipal, conventual, state and federal entities. Ten of the 16 forestry services of the Federal States, the Federal Forest Service and the 14 National Park Offices have rulings in place banning the use of lead rifle bullets on their land (DJV 2014). The City of Rostock municipal forest (City of Rostock 2011), the German Federal Environmental Foundation (DBU 2011), the City of Greifswald (Greifswald 2011) and the City of Fuerstenwalde (City of Fuerstenwalde 2014), restricted the use of lead bullets in 2008, 2012 (both DBU and Greifswald), and 2013 respectively. A summary of current federal, state and ownership rulings restricting the use of lead bullets, shot and slugs for hunting is given in Table 1.

EUROPEAN UNION INITIATIVE “LEAD IN CONSUMER ARTICLES”

In 2012 Sweden submitted a ‘Proposal for a Restriction of Lead and its Compounds in Articles intended for Consumer Use’ (ECHA 2013a) under REACH-Regulation. REACH is a regulation of the European Union, adopted to improve the protection of human health and the environment from the risks that can be posed by chemicals, while enhancing the competitiveness of the EU chemicals industry³. It also promotes alternative methods for the hazard assessment of substances in order to reduce the number of tests on animals. The goal of the Proposal

³ <http://echa.europa.eu/regulations/reach>

Table 1: **Legislation relating to bans on lead ammunition in German regions and legislature**

Entity	Rifle non-lead only	Shotgun non-lead only
Federal Hunting Act	in progress [‡]	
Baden-Württemberg	State Forests since 2014, state-wide by 2016	In line with AEWA
Bavaria	no provisions	In line with AEWA
Berlin	State Forests since 2013	In line with AEWA
Brandenburg	State Forests since 2013	In line with AEWA + State Forests
Bremen	no provisions	no provisions
Hamburg	no provisions	no provisions
Hesse	State Forests by 2015	In line with AEWA
Lower Saxony	State Forests since 2013	In line with AEWA
Mecklenburg-Vorpommern	State Forests since 2014	In line with AEWA
North Rhine- Westphalia	State Forests since 2013	In line with AEWA
Rhineland-Palatinate	State Forests since 2013	In line with AEWA
Saarland	State Forests since 2011, state-wide since 2014 [†]	In line with AEWA
Saxony	provisions in place, not executed	All game species
Saxony-Anhalt	no provisions	In line with AEWA
Schleswig-Holstein	State Forests since 2013, state-wide by 2015	In line with AEWA
Thuringia	no provisions	In line with AEWA
Federal Forest Service	Since 2013	
German Federal Environmental Foundation	Since 2012	
City of Greifswald	Since 2011	
Zity of Rostock	Since 2008	
City of Furstenwalde	Since 2013 ^{††}	

* Legislative action by Federal Government to change the Federal Hunting Act

† With a grace-period until 2017 excluding state forests

†† With exclusion of game drives

is stated as “Lead and its compounds shall not be placed on the market or used in articles or individual parts of articles, which are supplied to the general public and can be placed in the mouth by children, if the concentration of lead (expressed as metal) is equal or greater than 0.05% by weight” (ECHA 2013a). “Shot and ammunition” were identified as a “world end use of lead”, identifying end consumer products (SCA 2012). During the first public consultation arguments were submitted by an anonymous, ‘international, non-governmental organisation’ from Belgium ‘as to why ammunition should be out of the scope from the proposed Restriction’ and confirmation was received “that ammunition will formally be excluded from the final text of the proposed restriction” (ECHA 2014a). The Association of European Manufacturers of Sporting Ammunition (AFEMS) refers to this process on their website⁴ and states to be “involved with other European Associations in providing the necessary information and support concerning the use of metallic lead in ammunition.” In the European Chemicals Agency (ECHA) Committee for Risk Assessment (RAC) “Opinion on the Swedish Proposal”, it is “assumed that ammunition is kept out of reach for children due to member states implementation of existing EU legislation related to

the safe-keeping of such articles. Normal and reasonably foreseeable conditions of use would not occur as the other hazards of ammunition would necessitate such articles being securely stored away from children” (ECHA 2013b). The ECHA Committee of Socio-economic Analysis (SEAC) follows this assumption in their opinion (ECHA 2013c).

Later documentation (compiled opinion by RAC and SEAC) (ECHA 2014b), the final background document to RAC and SEAC Opinions on “lead and its compounds in articles” repeat this opinion and fail to introduce differing views (ECHA 2014c). Alternate views to the RAC (Mullooly 2013) and SEAC (Knoflach 2014) opinions have been documented, touching on, only amongst other things, the topics of cultural, traditional and/or religious handcraft figurines and similar objects (objets d’art), writing instruments, keys, locks and musical instruments. However, the use of lead ammunition in sourcing food for human consumption has not been considered to date. The process does not therefore address the introduction of lead into food for human consumption from ammunition used in the production of game meat. Whether or how this will be addressed in time by this particular process remains to be seen.

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⁴ <http://www.afems.org>

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Moribund white-tailed eagle *Haliaeetus albicilla* in final stages of lead poisoning: found due to satellite transmitter.

Photo Credit: Oliver Krone/Leibniz Institute for Zoo and Wildlife Research, Berlin