

# Using lead-free ammunition in practice

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Stakeholder workshop on lead in hunting and shooting

# Who is Niels Kanstrup????

- “Biocrat” and advisor for Danish hunters 1985-2007.
- Private consultant 2007-?.
- Senior scientist affiliated to Aarhus University 2017 - ?.
- A keen hunter 1974 - ∞. Hunted in most European countries, North and South America and Africa.
- Speaking on the background of a total phase out of lead shot in Denmark beginning in 1981 and completed in 1996.



# Content of this presentation

Three overall aspects:

- Safety: Does lead-free ammo kill the hunter and his gun?
- Efficacy: Does lead-free ammo kill the target animal?
- Availability: Is lead-free ammo available at affordable prices?



# But first: What is lead-free ammo?

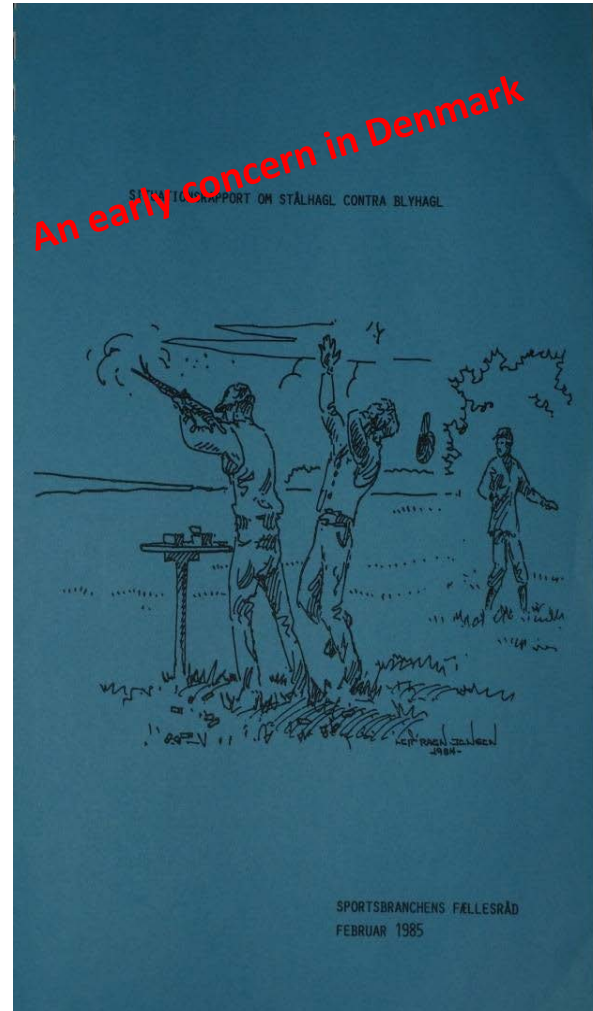
- Gunshot
  - Steel = soft iron
  - Bismuth/tin
  - Tungsten – mixtures or pure (in organic matrixes)
  - Tin
  - Copper
  - Zinc
- Bullets/slugs
  - Copper (and alloys)
  - Zinc
  - Tin
  - Tungsten (powder)
  - Steel = soft iron

It is generally believed, that lead is an almost perfect metal for ammunition purposes, due to its density and softness, supported also by the relatively low price.

However, this has never been proved scientifically, and the general preference of lead in hunting ammunition is likely to be a result of traditions.

# Safety for the shooter/hunter and his surroundings

- Exploding guns
- Ricocheting shot and bullets



The Danish Hunting Insurance registers reports on shooting accidents, including accidents caused by ricocheting gunshot which show that, following the phase-out of lead shot, **there was no increase in the frequency of such accidents.**

38 years after the first regulations were enacted there has been no detectable change in the frequency of such accidents, neither generally, nor accidents caused by ricocheting shot (Danish Wing Shooting Organisation, 2016). **So, this initial concern has proved groundless.**

Author's personal copy

Ambio  
<https://doi.org/10.1007/s13280-018-1125-9>

LEAD USE IN HUNTING

Lessons learned from 33 years of lead shot regulation in Denmark

Niels Kanstrup

KUNGL. VETENSKAPS-  
AKADEMIEN  
THE ROYAL SWEDISH ACADEMY OF SCIENCES

CrossMark

# Safety for the shooter/hunter and his surroundings

- Ricocheting bullets

.. nicht das Material (Blei oder bleifrei) ausschlaggebend für die Ablenkung war, sondern die Spitzenform.



## Key questions and responses regarding the transition to use of lead-free ammunition

Vernon G. Thomas<sup>1)</sup>, Niels Kanstrup<sup>2)</sup> & Carl Gremse<sup>3,4)</sup>

The issue of ricochet of lead-free bullets or gunshot has not arisen as a serious concern among US hunters, and has not been raised to prevent a transition to their use.

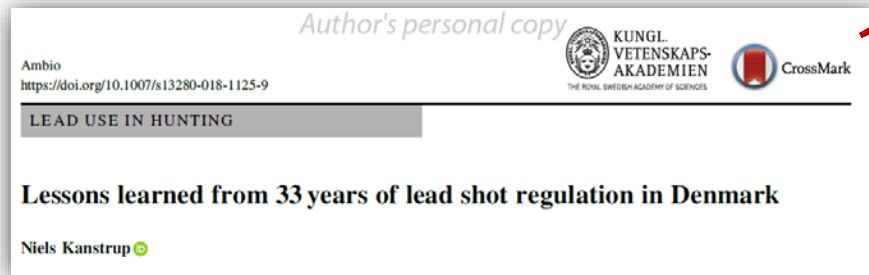
# Safety – gun damage

- Explosion
- Choke bulging

During the late 1980s and early 1990s [.....] the debate on guns was silenced as **the predicted damage to guns (explosions, etc.) caused by non-lead ammunition never realized.**

**Any gun that can fire lead shot cartridges safely can also fire non-toxic shot cartridges safely,** provided that they are the same length, and of an equivalent shot weight.

Concerns pertain to abruptly developed, as opposed to progressively-developed, **chokes in barrels.** [...] large steel shot [...] passing through an abruptly developed, tightly- choked [...] **barrel could cause a small ring bulge to appear,** simply because the steel shot do not deform when passing through the constriction.



# A comment on my own guns (not cars)





# Efficacy

- Gunshot

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### Key questions and responses regarding the transition to use of lead-free ammunition

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WILDLIFE  
SOCIETY BULLETIN



Original Article | Open Access |

A comparison of lead and steel shot loads for harvesting mourning doves

Brian L. Pierce , Thomas A. Roster, Michael C. Frisbie, Corey D. Mason, Jay A. Roberson

First published: 30 November 2014 | <https://doi.org/10.1002/wsb.504> | Citations: 6

The Danish Hunters' Association, 2015:

"Now we have become accustomed to using steel as well as the other alternatives, **and steel strikes just as good if not better than lead...**"

In summary, **shot material plays a secondary role in shot performance**. The right choice of shot sizes, shooting distances, and cartridge quality, i.e. sufficient energy and conformity of components, play a more important role.

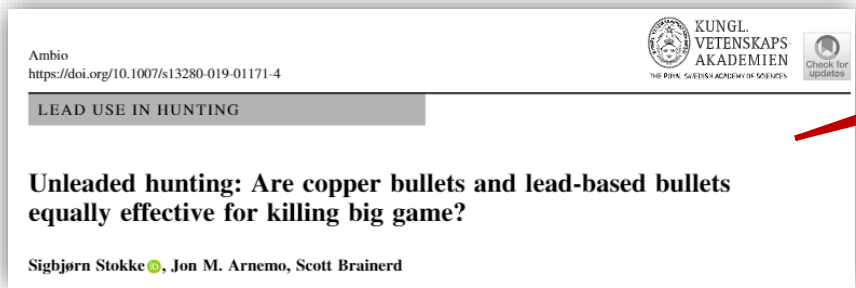
**Shooting efficacy and the success of the shot are related to the shooter rather than the ammunition**, though shooters may need to adapt to using different ammunition.

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.

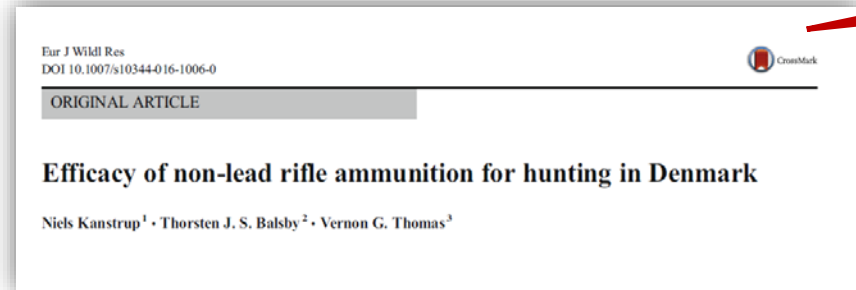
All 3 ammunition types retained **sufficient lethality** to harvest mourning doves under typical hunting conditions.

# Efficacy

- Rifle bullets: Impact



Our data demonstrate that the relative **killing efficiency of lead and copper bullets is similar** in terms of animal flight distance after fatal shots.



We conclude that in terms of lethality and animal welfare, **non-lead ammunition within the tested range of bullet calibers can be recommended as an effective alternative to lead-core bullets.**

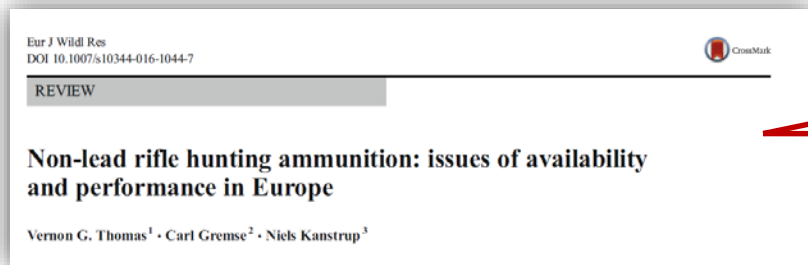


In Bezug auf die Diskussion um den Einsatz bleifreier Geschosse wird höchstsignifikant nachgewiesen, dass **die Herstellung tierschutzgerecht und jagdpraxiskonform anwendbarer Geschosse ohne Verwendung von Blei nachweislich möglich ist.**

# Efficacy

- Rifle bullets: Precision challenge in small calibers (extended bullet length to maintain weight)

[...] there remains a need to promote the technical and ballistic development of ammunition, especially for the small calibres (<6 mm).

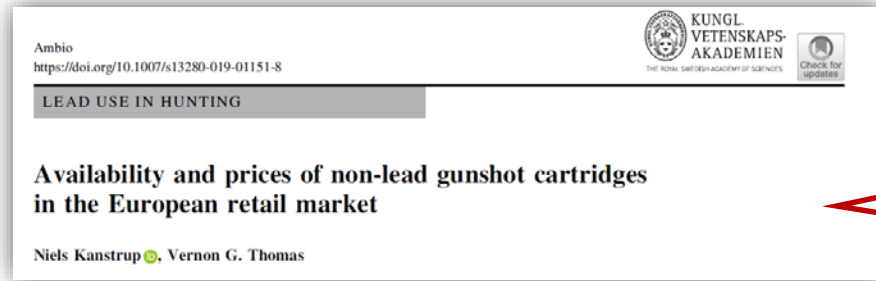


A change from using lead-core bullets to non-lead bullets may [...] challenge the twist construction of the particular rifle. This is particularly the case in **small calibres and most pronounced in older rifle models.**

**ENSURE PROPER TESTING AND ZEROING BEFORE HUNTING**

# Availability and price

- Gunshot



[...] this study demonstrated that non-lead shot cartridges **are available to purchasers in most European countries, but in a limited variety.**

Multiple manufacturers currently provide such ammunition and their products are available, or **can easily become available in any member state, regionally and locally, once the demand is there.**

**Table 2** Average prices of shot types in retail sale identified in the Internet search in 29 European countries

Type	N <sup>a</sup>	Price Euro/25 pcs	
		Average	Range <sup>b</sup>
Steel	36	11.90	7.50–25.25
Bismuth	8	57.81	42.25–60.00
Tungsten	2	85.00	79.25–90.00
Copper	3	37.28	21.50–41.25
Lead	25	10.45	6.50–18.25

<sup>a</sup>Number of web shops, <sup>b</sup>rounded up to nearest quarter Euro

# Availability

- Bullets

Eur J Wildl Res  
DOI 10.1007/s10344-016-1044-7



REVIEW

## Non-lead rifle hunting ammunition: issues of availability and performance in Europe

Vernon G. Thomas<sup>1</sup> · Carl Gremse<sup>2</sup> · Niels Kanstrup<sup>3</sup>

**Table 1** European manufacturers and major importers of non-lead hunting rifle ammunition, indicating the assembled rifle ammunition produced. This list is not an exclusive listing of European makers and importers, only the principal companies. The array of cartridge calibres is from company websites as of March 26, 2016. Website addresses for the companies listed are below

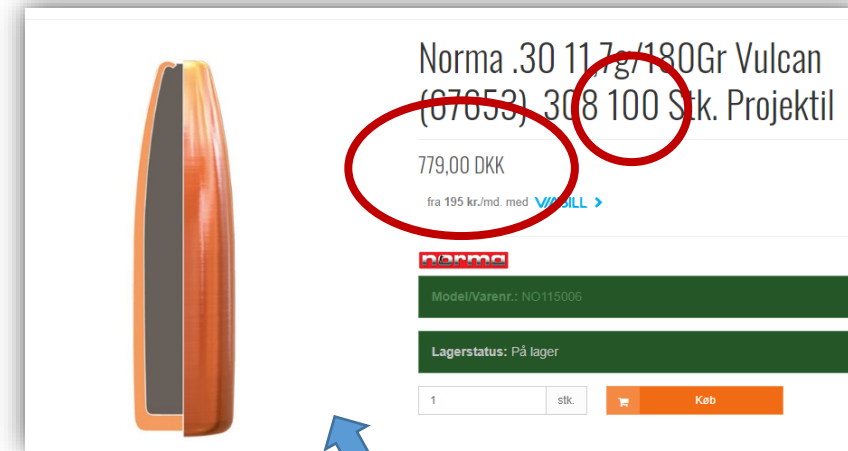
Brenneke Non-lead TUG Nature+	Brenneke Non-lead TAG	RWS Evolution Green	RWS HIT	RWS Bionic Yellow	Blaser CDC Bullet	Norma Barnes TSX	Norma Kalahari	Hornady International	Hornady Super- performance	Sako Powerhead Barnes TSX
7 × 57	.308 Win	.270 Win	.308 Win	.308 Win	7 × 64	7 mm Rem Mag	.270 Win	6.5 × 55	.223 Rem	270 Win
7 × 57R	.30–06	.308 Win	.30–06	.30–06	7 × 65R	.300 Win Mag	2.70WSM	7 × 64	.243 Win	.308 Win
7 × 64	.300 Win Mag	.30–06	.300 Win Mag	.300 Win Mag	7 mm Rem Mag	.375 H&H	.280 Rem	7 × 57	.25–06 Rem	.30–06
7 × 65R	8 × 57JS	.300 Win Mag	7 mm Rem	7 mm Rem	.308 Win		7 × 64	7 × 65R	.270 Win	9.3 × 62
.308 Win	8 × 57JRS	.30R Blaser Mag	.30R Blaser Mag	.30R Blaser Mag	.30–06		7 mm Rem Mag	8 × 57JS	7 mm Rem Mag	9.3 × 66 Sako
.30–06	9.3 × 62	7 × 57R	7 × 64	7 × 64	.300 Win Mag		.308 Win	8 × 57JRS	7 mm–08	9.3 × 74R
.30R Blaser	9.3 × 74R	7 × 64	7 × 65	7 × 65	.30R Blaser Mag		.30–06	9.3 × 62	.308 Win	.375 H&H
.300 Win Mag		7 × 65R			8 × 57JS		.300Win Mag	9.3 × 74R	.30–06	
8 × 57JS		7 mm Rem Mag			8 × 57JRS		.300 WSM		.300 Win Mag	
8 × 57JRS		8 × 57JS			8 × 68S				.338 Win Mag	
8 × 68S		8 × 57JRS			9.3 × 62				.375 H&H	
9.3 × 62		9.3 × 62			9.3 × 74R					
9.3 × 74R		9.3 × 74R								
Nickel-plated steel jacket, tin core	Copper	Tin core nickel-plated	Copper nickel-plated	Brass	Copper	Copper	Gilding metal nickel-plated	Copper	Copper	Copper
Fragmenting	Partially fragmenting	Partially fragmenting	Non- fragmenting	Partially fragmenting	Non-fragmenting	Non-fragmenting	Partially fragmenting	Non-fragmenting	Non-fragmenting	Non-fragmenting

Sako Powerhead II Barnes TTSX	Sako DGS Solid	Fiocchi Freccia Nera	Sellier & Bellot eXergy	Geco Zero	Sauvestre	Sax KGJ	Schnetz KG	Lapua Naturalis
.222 Rem	9.3 × 62	308 Win	6.5 × 55SE	.300 Win Mag	.243 Win	....cont.	.223 Rem	.243 Win
.243 Win	9.3 × 74R	.30–06	.270 Win	.30–06	6.5 × 57	.30 R Blaser	....cont.	.243 Win
6.5 × 55SE	.375 H&H		7 × 57	.308 Win	.270 Win	8 × 57JRS	.300 Win Mag	6.5 × 55SE
.30–06	.416 Rigby		7 × 57R	7 mm Rem Mag	.270 WSM	8 × 68S	.243 Win	.308 Win
.308 Win	.450 Rigby		7 × 64	7 × 57	.280 Rem	35 Whelen	6.5 × 55	.30–06
.300 Win Mag	.500 Jeffery		7 × 65R	7 × 57R	7 mm '08 Rem	9.3 × 62	8 × 57JRS	6 × 62
7 × 64			7 mm REM Mag	7 × 64	7 × 57R	9.3 × 74R	6.5–284	8 × 57JS
7 mm Rem Mag			.308 Win	7 × 65R	7 × 64	.338 Win Mag	8 × 68S	6 × 62R
8 × 57JS			.30–06	8 × 57JRS	7 × 65R	.375 H&H	8 × 68S	6.5 × 57
			.300 Win Mag	8 × 57JS	7 mm Rem Mag	.404NE	.338 Lap Mag	6.5 × 57
			9.3 × 62	9.3 × 74R	.308 Win	.458 Win Mag	7 mm Rem Mag	6.5 × 63 mm
			9.3 × 74R		.300 Win Mag	.458 Lott	.270 WSM	6.5 × 65
					.300 WSM		7 × 57	6.5 × 65R
					.300 Wby Mag		7 × 57R	6.5 × 65R
							9.3 × 72R	7 × 66
							7 × 64	7 × 75R
							7 × 65R	.30R Blaser
							7 mm Rem Mag	.300 Wby Mag
							7 mm WSM	.300 RUM
							7.5 × 55 Swiss	8 × 75RS
							.308 Win	.338 Win Mag
							.30–06	
Copper, plastic tip	Brass	Copper	Copper	Copper, tin core	Copper, plastic tip	Copper, plastic tip	Copper, plastic tip	Copper
Non-fragmenting	Non-expanding, Non-fragmenting	Non-expanding	Non-expanding	Fragmenting	Non-fragmenting	Fragmenting	Fragmenting	Non-fragmenting

URLs: [www.brenneke-ammunition.de](http://www.brenneke-ammunition.de), <https://rws-munition.de>, [www.blaser.de](http://www.blaser.de), [www.norma.cc](http://www.norma.cc), [www.homady.com](http://www.homady.com), [www.sako.fi](http://www.sako.fi), [www.fiocchigli.it](http://www.fiocchigli.it), [www.sellier-bellot.cz](http://www.sellier-bellot.cz), [www.geco-munition.de](http://www.geco-munition.de), [www.sauvestre.com](http://www.sauvestre.com), [www.sax-munition.de](http://www.sax-munition.de), [www.schnetz.at](http://www.schnetz.at), [www.lapua.com](http://www.lapua.com)

... and price (a check on a DK web store last week)



Norma 30.06 Tip Strike  
11g/170gr (17434)  
Riffelpatron  
Norma  
7393923318486  
✓ PÅ LAGER  
659,00 DKK



Norma 30.06 9.7g/150gr  
Ecostrike (17424)  
Norma  
7393923319513  
✓ PÅ LAGER  
729,00 DKK

Lapua 308W 9,7g/150gr  
Mega (503042)  
Lapua  
6418267101615  
✓ PÅ LAGER  
420,00 DKK



Lapua .308Win Naturalis  
11g/170gr  
Lapua  
6418267102827  
✓ PÅ LAGER  
640,00 DKK

Hornady 30 105 gr CMX  
(30470) .308 50 stk.  
(30470)  
090255304701  
✓ PÅ LAGER  
369,00 DKK

# Concluding remarks

- Lead ammunition is not just lead ammunition but covers a wide variation in terms of:
  - Applications
  - Construction
  - Performance
  - Quality
  - Price
- This applies to non-lead ammunition as well.
- Therefore, there are large overlaps and often hunters can't tell the difference.
- In general the ammunition material is of secondary importance.

# What matters is

- Chose the right combination of gun and ammunition for the actual quarry animal and hunting type.
- Avoid large hard shot types in tight chokes.
- Ensure proper zeroing – in particular small rifle calibers with non-lead.
- Regardless of ammunition material:
  - BE AWARE OF SAFETY!
  - BE AWARE OF THE IMPORTANCE OF SHOOTING DISTANCE!
  - TRAIN REGULARLY!



# AND NOT LEAST

## Enjoy hunting!

- There is a new generation of hunters that was not even born when lead shot was banned.
- They hunt just as efficient and successful as previous generations.
- Their needs are not to sustain lead ammunition but to enhance sustainability and public perception of hunting.