

# Lead in ammunition contaminates game meat

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This is a radiograph of a pigeon with four pellets and small pieces of ammunition. Credit: Deborah J. Pain et al./PlosOne

Eating the meat of animals hunted using lead ammunition can be more dangerous for health than was previously thought, especially for children and people who consume large quantities. This is reflected in a study carried out by British and Spanish researchers that has been published by the journal *PLoS ONE*.

A team of scientists from the Wildfowl & Wetlands Trust (WWT), along with researchers from other British institutions and from the Spanish Research Institute on Cynegetic Resources (IREC in Spanish), has proven that the levels of lead in some game meat that has already been cooked exceed the maximum allowances set by the European Union, due

to the presence of remains of ammunition.

"Depending on the species and type of recipe used, between 20 and 87.5% of the samples analysed exceeded the maximum level of lead set by the EU in meat from livestock animals of 100 parts per billion (0.1 mg/kg of the fresh weight of meat)", Rafael Mateo, co-author of the study and researcher for IREC (a joint centre composed of the University of Castilla-La Mancha, the Community Board of Castilla-La Mancha and the CSIC), indicates to SINC.

To carry out the study, published recently in the free access journal [PLOS ONE](#), the researchers analysed the meat of six species of game birds (red partridge, pheasant, wood pigeon, grouse, woodcock and mallard) shot by hunters in the United Kingdom. "In Spain and other countries hunting is done in the same way and using the same ammunition, meaning that the issue with this type of contamination in meat is the same across the board", Mateo points out.

## **Cooked pellets**

The pieces were x-rayed to detect the presence of pellets and minute fragments of lead. Afterwards, the pellets in the meat were cooked and removed, as we would normally do when eating. Finally, the concentration of the metal in the food was measured using atomic absorption spectroscopy.

"Although the levels set by the EU are for meat that is consumed more frequently than game, in species like the woodcock, 5.4% of the birds cooked displayed more than 10 mg/kg, which indicates that by eating 200g of this meat on a single occasion, the tolerable weekly intake of lead for a person weighing 80g could be exceeded", the researcher highlights.

The study concludes that the potential [health](#) risk of consuming game shot with lead could be greater than was thought up until now, especially for vulnerable groups like children and people who consume large quantities of this [meat](#).

## **Vinegar increases lead contamination**

Today at the conference of the Society of Environmental Toxicology and Chemistry (SETAC), that is taking place in Seville this week, Mateo explained how the bioavailability of lead varies: "In metallic form it cannot be absorbed easily by the intestine, but when cooked, especially with recipes done in pickle, it transforms into forms of lead that can reach the blood more easily through the digestive system".

"In big game hunting, and contrary to what is believed, the lead bullets also fragment", explains Mateo, who, with his team, has confirmed the presence of high concentrations of lead in samples of deer and wild boar from Sierra Madrona (Ciudad Real): "Mining sites in the region can influence the results, but they alone do not explain the extremely high levels detected in some samples".

## **Alternatives to lead**

Lead is a heavy metal that is very toxic, which explains why its use is being restricted more and more. For the same reason, lead pellets and bullets have started to be substituted by others made from different materials.

For small game hunting steel ammunition already exists, especially recommended for use in humid areas (where there is little risk of ricochet), and in cases when shooting into the air is required, like in driven partridge shoots. When you have to aim at the ground -to shoot

rabbits and hares, for example-, the alternative is pellets made from tungsten or bismuth in different compounds and alloys with metals or plastics.

For big game hunting, some countries like Germany and the United States have already started to use copper bullets. This material hardly fragments and is not as toxic as [lead](#).

**More information:** Deborah J. Pain, Ruth L. Cromie, Julia Newth, Martin J. Brown, Eric Crutcher, Pippa Hardman, Louise Hurst, Rafael Mateo, Andrew A. Meharg, Annette C. Moran, Andrea Raab, Mark A. Taggart y Rhys E. Green. "Potential Hazard to Human Health from Exposure to Fragments of Lead Bullets and Shot in the Tissues of Game Animals". Plos One 5 (4): e10315. [Doi:10.1371/journal.pone.0010315](https://doi.org/10.1371/journal.pone.0010315).

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