

COMMENTARY

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THE INGESTION OF LEAD FROM AMMUNITION affects large numbers of birds annually resulting in sub-lethal effects and mortality. In some species, especially raptors (California Condor, Steller's Seaeagle), population effects occur; in others lower levels of mortality occur along with sub-lethal effects that compromise welfare and may reduce survival. The problem is global in nature—where lead ammunition is used and birds are exposed they will be affected.

Lead is a non-essential highly toxic persistent heavy metal and lead poisoning in birds is likely to occur wherever birds feed in areas where lead has been deposited, or where predators or scavengers feed on game species. Whilst the majority of research over the last 125 years has been conducted in North America and Europe, this is a global problem, and wherever we look we find new species to add to the list of lead poisoning casualties. Scientific evidence identifying lead from ammunition as a major cause of lead poisoning and mortality in birds has existed for decades—evidence for this goes beyond all reasonable doubt. People that are not convinced by the mountain of existing evidence are unlikely to be convinced by additional research into the causes of poisoning and mortality.

On day one of this meeting, Milton Friend indicated that in any such situation three things are needed: (1) identification of the problem, (2) finding acceptable alternatives, and (3) ensuring that there is the authority to act.

There were several components to identifying the problem, i.e. What, Where, When, Who and Why. The answers to these have been comprehensively covered over the last three days:

What—birds eat lead from ammunition or ammunition fragments, suffer sub-lethal effects and mortality from lead poisoning—in their millions.

Where—globally wherever lead ammunition is used for any purpose and where birds feed in areas of lead deposition, or prey upon or scavenge game or other hunted species.

When—every year—constantly in some areas, temporally and spatially correlated to hunting season in others.

Who—caused by anyone using lead ammunition for hunting or target shooting.

Why—It appears that lead ammunition continues to be used, possibly because hunters (a) do not believe or are not fully aware that there is a problem—additional research into the problem is unlikely to help here although better communication may, (b) are resistant to change—and they are not alone in this, and (c) perceive this to be anti-hunting, which it is not.

This last point seems to be one of the main stumbling blocks—where much of the problem lies, and one of the areas that we need to look to for a solution.

The second point described by Milton Friend was the identification of acceptable alternatives. Legislative change can happen in the absence of these when a problem is deemed sufficiently serious; however, it is always far better if acceptable alternatives can be found, as solutions require compliance, and the social and economic impacts of change must be managed. Alternatives to lead shot and expanding nose bullets are available, as we heard from Barnett Rattner and Vic Oltroge. Indeed, John Harradine from BASC commented that alternative gunshot in the UK is very effective. Slightly different shooting techniques may be required, some alternatives may cost a bit more (others may cost less), and the work of John Schulz indicated that alternative shot are unlikely to increase crippling rates. Alternatives exist, they work well, and their effectiveness, cost and choice will all improve with market forces. However, as Vernon Thomas indicated, market forces require that a guaranteed market exists, and this requires legislation. I believe that the ‘acceptability’ of alternatives goes back to the ‘Why’ part of the equation above. Many hunters may not find it acceptable to use alternatives to lead, and there is work to do here; motivating a change in behavior requires excellent communication and clear messages.

So what are the options for seriously reducing this problem?

On the first day, Barnett Rattner suggested that options included:

(1) Restricting the use of lead ammunition in localities where it poses an unacceptable hazard, or

(2) Phasing out the use of lead ammunition with a goal of complete elimination.

I believe that phasing out lead ammunition where it poses an unacceptable hazard is not a practical option. First, what is ‘unacceptable’? Is unacceptable different in different circumstances, cultures, and for different species? After all, lead poisoning affects birds wherever lead ammunition is used and they are exposed, i.e. across much of the globe. Even within individual countries or states, do we really want to do detailed research to define the level of lead poisoning everywhere, and then argue about what is acceptable and what is not? This would certainly take a ‘totally unacceptable’ amount of time and resources, and the delays caused would result in considerable additional wildlife mortality.

To guarantee a significant reduction in the risk to birds a phase out of the use of lead with the goal of complete elimination is needed. This would also have the advantage of solving the majority of other environmental and wildlife problems associated with the use of lead ammunition—and—importantly—would tackle the human health issues. It is in this that I believe there may be a way forward that will help us to deal with the apparently widespread belief by hunters that anti-lead is anti-hunting. The human health risks from lead ammunition provide an argument against lead ammunition that has been demonstrated throughout this meeting, and one that should help change hunters’ views of the acceptability of using alternatives to lead.

One of the excellent things about this conference is that it has bridged an important gap. To my knowledge, this is the first time that experts on the impact of lead on human health and lead in wildlife have been brought together. It is also very timely, as there is now good evidence to show that lead ammunition can affect human health. We heard from Lori Verbrugge of risks from lead ammunition to subsistence hunting communities, and to people using indoor shooting ranges. Exposure was through ingestion of lead particles in ingested meat and inhalation of dust, and some exposure levels were of concern for human health, including children with elevated blood lead levels. Grainger Hunt and other

authors showed the extent to which lead ammunition fragments on hitting a target, even without hitting bone. There is consequently the real and concerning potential for anyone cooking and eating game to be exposed to unacceptably high levels of a very toxic metal. And finally, and most importantly, we heard from Michael Kosnett about the health effects of low dose lead exposure in children and adults. We heard of evidence that the risk of abortion in pregnant women increases as blood lead level increases above 5 µg/dL and that increased pre-natal exposure to lead is associated with a reduction in post-natal IQ, with the steepest declines in IQ at maternal blood leads of <10 µg/dL. We heard that gastrointestinal absorption of lead by children was higher than by adults, and that eating just one game bird, even cooked after the removal of obvious shot pellets, is likely to result in increased exposure. Much of this information is from studies published over the last few years.

The impacts of lead from ammunition on wildlife alone have long been sufficient to justify the phase out of all lead ammunition. However, there is now an additional concern, that of human health. Together they make a more than compelling case. The potential risks to human health may be key in helping to persuade hunters that being anti-lead is not anti-hunting—it is simply common sense. Chris Parish made me laugh when he said yesterday that we are reticent to quit things even when they are bad for us—this is certainly true of myself where chocolate is concerned. However, on a rather more serious note, we are rather less reticent to change things that have been shown to be bad for our children and for pregnant women.

To remove the threat of lead from ammunition to wildlife, and to humans, as rapidly as possible:

- (1) We must work towards the phase out and eventual elimination of all lead ammunition. Identifying the most appropriate legislation through which to work in different geopolitical regions will be key to this.
- (2) In the short term, in cases where lead from ammunition poses a serious conservation problem,

it is important to continue to work with hunters at a local level to gain acceptance for and voluntary use of alternatives. Several studies described during this meeting have shown that with a great deal of effort, at some cost and with excellent communication and participation programs, voluntary use of alternatives can reduce the problem for wildlife. Examples include parts of the range of the California Condor, and the White-tailed Eagle in Germany described by Oliver Krone. Better knowledge, including social science studies, of the best ways of influencing stakeholders will help.

- (3) We must make sure that we have sufficient information on the toxicity of alternative ammunition types. As Barnett Rattner told us, a non-toxic approval protocol exists for shotgun ammunition and many alternatives have been approved through this process. We need to ensure that the materials used in all ammunition are suitably non-toxic, and to have the available information at our fingertips to prevent unnecessary delays in eliminating lead.
- (4) Further work is needed to investigate the impacts and potential impacts of lead from ammunition on children and adults, both in food that is eaten, and in the people that eat it.
- (5) We must create public awareness and develop good education programs on the public health and wildlife effects of lead from ammunition. We must continue to find creative ways of engaging hunters and other stakeholders in this process, and make it clear that this is not an anti-hunting agenda. It is a sustainable and wise-use of wildlife resources agenda, and increasingly also a human health agenda.

Biography.—**Deborah Pain, Ph.D.** is Conservation Director at the Wildfowl and Wetlands Trust and was, until recently, Head of International Research at the Royal Society for the Protection of Birds, UK. She has studied the effects of lead shot on waterfowl and published extensively about lead in wildlife.