FOREWORD

In 1983, Professor Richard Southwood chaired the Royal Commission on Environmental Pollution's report on Lead in the Environment (RCEP 1983). This report resulted from concern being progressively extended to the possible effects on humans of lead at ever-decreasing blood concentrations, and the high level of associated public debate. The report was seminal, and most of its recommendations have been implemented by successive governments.

Recommendations included that lead should be phased out of petrol additives and progressively reduced in paint, that research should continue into the effects of lead at low concentrations, particularly on children, and that the anthropogenic dispersal of lead and man's exposure to it should be reduced further. These have all now happened. Among other recommendations were that urgent efforts should be made to develop alternatives to lead shot and lead fishing weights (to protect wildlife from unnecessary poisoning), and that as soon as these alternatives are available, the Government should legislate to ban any further use of lead shot and fishing weights in circumstances where they are irretrievably dispersed in the environment. Lead fishing weights were banned in 1986, and alternatives to lead gunshot were developed some decades ago. However, only limited regulations requiring the use of non-toxic shot have been introduced in the UK, compliance with these remains poor (at least in England)(Cromie *et al.* 2015), and thousands of tonnes of lead shot continue to be deposited in the environment annually. Thus, the use of lead ammunition is the remaining significant source of unregulated dispersal of lead into our environment; one that presents risks to the health of wildlife and humans today, and one that builds an ever increasing toxic legacy.

I was delighted to chair the Oxford Lead Symposium in December 2014 and learn more about this important and topical issue.

It is notable that in addition to the extensive evidence reviewed and presented at this symposium, some 60 experts from both wildlife and human health disciplines have recently signed consensus statements on the strength of the science surrounding risks and impacts of lead from ammunition, and the need to move to the use of non-toxic alternatives (Group of Scientists 2013, 2014; Appendix 2). This level of scientific agreement is impressive, although perhaps not surprising given the long history of research into the subject.

Several international political imperatives exist for the UK Government to move towards the use of non-toxic ammunition (Stroud 2015). These include the African-Eurasian Migratory Waterbirds Agreement, which required the use of non-toxic shot in all wetlands by the year 2000 (AEWA 1999), and more recently the Convention on Migratory Species (CMS)(UNEP-CMS 2014). In November 2014 Contracting Parties to the CMS adopted a resolution, the guidelines of which recommend the phase out of all lead ammunition, in all habitats, within three years. Such Multilateral Environmental Agreements are politically binding to signatory countries, of which the UK is one, and give a clear indication of the necessary direction of travel.

The Symposium heard that alternatives to lead ammunition are technically possible, not prohibitively costly, and many are already available (Gremse and Reiger 2015, Thomas 2015). Alternatives to lead shot are in use in parts or all of many countries; Denmark for example required the use of non-toxic gunshot for all shooting almost 20 years ago (Kanstrup 2015). Alternative bullet types are already in use in some places, and others, such as California State, are phasing in their use (Thomas 2015). Several major landowners and managers in the UK have already taken steps to phase out lead bullets on their landholdings.

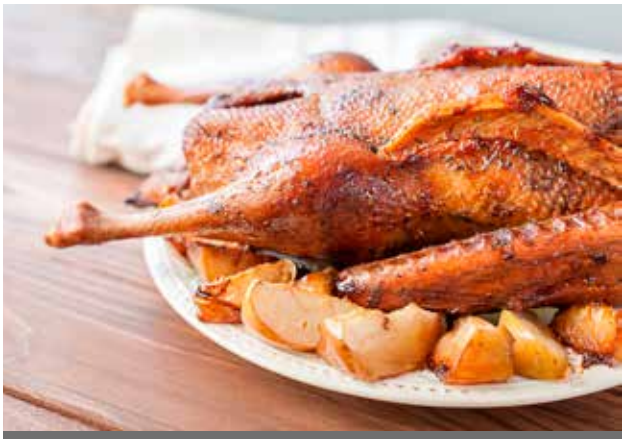
The decisions to be made now are political. The organisations represented at this symposium stressed that they are not progressing an anti-shooting agenda, but rather advocating that shooting sports must act in a sustainable way that does not put wildlife and human health at risk, especially when such risks are avoidable. Those with an interest in this topic may wish to consider the analogies in the protracted debate surrounding the removal of lead from petrol presented in the European Environment Agency report 'Late Lessons from Early Warnings' (Needleman and Gee 2013).

Although estimates of numbers of birds killed by consuming lead from ammunition in the UK cannot readily be made with precision, at least tens and possibly hundreds of thousands of birds are estimated to die annually from this cause; many more suffer welfare impacts (Pain *et al.* 2015). More recent information, including that from the European Food Safety Authority (EFSA 2010) and the agencies responsible for food safety of a number of EU countries (including the UK)(Knutsen *et al.* 2015) have already highlighted the risks that frequent game consumption

presents to human health, particularly that of young children. It is estimated that at least thousands and possibly tens of thousands of young children are currently consuming sufficient game to potentially risk health effects in the UK (Green and Pain 2015).

Lead ammunition may be traditional (Cromie *et al.* 2015) but it is doubtful whether future generations would perpetuate a tradition of knowingly adding lead to food or exposing wildlife to poisoning. It will be for politicians to decide whether these wildlife and human health risks and impacts combined are sufficient to require sports shooters in the UK to use the non-toxic ammunition available, and to set a timetable for implementing the recommendation, made in 1983, of the Royal Commission on Environmental Pollution.

The Lord Krebs Kt, MA, DPhil, FRS, FMedSci, Hon DSc.



Wild shot game is increasing in popularity: lead levels in game are currently unregulated.

Photo Credit: Denis Vermenko/Shutterstock.com

REFERENCES

AEWA (1999). Resolution 1.14 Phasing out of lead shot in wetlands. First Meeting of the Parties to the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA), 6–9 November 1999, Cape Town, South Africa. Available at: http://www.unep-aewa.org/sites/default/files/document/final_res1_4_0.doc. Accessed: August 2015.

CROMIE RL, NEWTH JL, REEVES JP, O'BRIEN MF, BECKMANN KM, BROWN MJ (2015). The sociological and political aspects of reducing lead poisoning from ammunition in the UK: why the transition to non-toxic ammunition is so difficult. In: Delahay RJ, Spray CJ (eds). *Proceedings of the Oxford Lead Symposium. Lead ammunition: understanding and minimising the risks to human and environmental health.* Edward Grey Institute, The University of Oxford. pp 104-124. Available at: http://oxfordleadsymposium.info. Accessed: October 2015.

EFSA PANEL ON CONTAMINANTS IN THE FOOD CHAIN (CONTAM) (2010). Scientific opinion on lead in food. *EFSA Journal* 8(4), 1570. DOI:10.2903/j.efsa.2010.1570. Available at: http://www.efsa.europa.eu/sites/default/files/scientific_output/files/main_documents/1570.pdf. Accessed: August 2015.

GREEN RE, PAIN DJ (2015). Risks of health effects to humans in the UK from ammunition-derived lead. In: Delahay RJ, Spray CJ (eds). *Proceedings of the Oxford Lead Symposium. Lead ammunition: understanding and minimising the risks to human and environmental health.* Edward Grey Institute, The University of Oxford. pp 27-43. Available at: http://oxfordleadsymposium.info. Accessed: October 2015.

GREMSE C, RIEGER S (2015). Lead from hunting ammunition in wild game meat: research initiatives and current legislation in Germany and the EU. In: Delahay RJ, Spray CJ (eds). *Proceedings of the Oxford Lead Symposium. Lead ammunition: understanding and minimising the risks to human and environmental health.* Edward Grey Institute, The University of Oxford. pp 51-57. Available at: http://oxfordleadsymposium.info. Accessed: October 2015.

GROUP OF SCIENTISTS (2013). Health risks from lead-based ammunition in the environment: a consensus statement of scientists. March 22, 2013 Available at: http://www.escholarship.org/uc/item/6dq3h64x. Accessed: August 2015.

GROUP OF SCIENTISTS (2014). Wildlife and human health risks from lead-based ammunition in Europe: a consensus statement by scientists. Available at: http://www.zoo.cam.ac.uk/leadammunitionstatement/. Accessed: August 2015.

KANSTRUP N (2015). Practical and social barriers to switching from lead to non-toxic gunshot – a perspective from the EU. In: Delahay RJ, Spray CJ (eds). *Proceedings of the Oxford Lead Symposium. Lead ammunition: understanding and minimising the risks to human and environmental health.* Edward Grey Institute, The University of Oxford. pp 98-103. Available at: http://oxfordleadsymposium.info. Accessed: October 2015.

KNUTSEN HK, BRANTSÆTER A-L, ALEXANDER J, MELTZER HM (2015). Associations between consumption of large game animals and blood lead levels in humans in Europe: The Norwegian experience. In: Delahay RJ, Spray CJ (eds). *Proceedings of the Oxford Lead Symposium. Lead ammunition: understanding and minimising the risks to human and environmental health.* Edward Grey Institute, The University of Oxford. pp 44-50. Available at: http://oxfordleadsymposium.info. Accessed: October 2015.

NEEDLEMAN HL, GEE D (2013). Lead in petrol 'makes the mind give way'. *Late Lessons from early warnings: science, precaution, innovation.* European Environment Agency: Copenhagen, Denmark. Available at: http://www.eea.europa.eu/publications/late-lessons-2. Accessed: August 2015.

PAIN DJ, CROMIE RL, GREEN RE (2015). Poisoning of birds and other wildlife from ammunition-derived lead in the UK. In: Delahay RJ, Spray CJ (eds). *Proceedings of the Oxford Lead Symposium. Lead ammunition: understanding and minimising the risks to human and environmental health*. Edward Grey Institute, The University of Oxford. pp 58-84. Available at: http://oxfordleadsymposium.info. Accessed: October 2015.

RCEP (1983). Royal Commission on Environmental Pollution. Ninth report. Lead in the environment. (T.R.E. Southwood). CMND 8852 Monograph. HMSO. London.

STROUD DA (2015). Regulation of some sources of lead poisoning: a brief review. In: Delahay RJ, Spray CJ (eds). *Proceedings of the Oxford Lead Symposium. Lead ammunition: understanding and minimising the risks to human and environmental health.* Edward Grey Institute, The University of Oxford. pp 8-26. Available at: http://oxfordleadsymposium.info. Accessed: October 2015.

THOMAS VG (2015). Availability and use of lead-free shotgun and rifle cartridges in the UK, with reference to regulations in other jurisdictions In: Delahay RJ, Spray CJ (eds). *Proceedings of the Oxford Lead Symposium. Lead ammunition: understanding and minimising the risks to human and environmental health.* Edward Grey Institute, The University of Oxford. pp 85-97. Available at: http://oxfordleadsymposium.info. Accessed: October 2015.

UNEP-CONVENTION ON MIGRATORY SPECIES (2014). Resolution 11.15. Preventing poisoning of migratory birds. Adopted by the Conference of the Parties at its 11th meeting, 4-9 November 2014, Quito, Ecuador Available at: http://www.cms.int/sites/default/files/document/Res_11_15_Preventing_Bird_Poisoning_of_Birds_E_0.pdf. Accessed: August 2015.