



THE FOOD SAFETY OF GAME MEAT: POTENTIALLY TOXIC ELEMENTS IN WILD HUNTED MALLARDS (*ANAS PLATYRHYNCHOS*) MEAT

Raffaella Branciari¹, Raffaella Franceschini², Caterina Altissimi¹, Andrea Cantarini³, Rossana Roila¹, David Cappelletti⁴, Chiara Petroselli⁴, Federica Bruschi⁴, David Ranucci¹

¹Dipartimento di Medicina Veterinaria, Università degli Studi di Perugia, Italy; ²Dipartimento di Medicina Sperimentale, Università degli Studi di Roma Tor Vergata, Roma, Italy; ³Istituto Zooprofilattico Sperimentale dell'Umbria e delle Marche "Togo Rosati", Perugia, Italy; ⁴Dipartimento di Chimica, Biologia e Biotecnologie, Perugia, Italy.

Although game meat is widely perceived as a natural product because it originates from free-living animals inhabiting natural ecosystems, these environments can also represent sources of exposure to chemical contaminants. As a result, such substances may accumulate in edible tissues, raising concerns regarding consumer health and food safety. Hunting material could also introduce a further source of trace elements contamination. Information on the occurrence of toxic and potentially toxic elements in the meat of hunted wild mallards (*Anas platyrhynchos*) remains scarce. This species, which inhabits wetland ecosystems, may be exposed to environmental contaminants characteristic of these habitats. The results of a preliminary study on toxic and potential toxic trace elements in mallard meat and the relevant food safety implications will therefore be presented.

Twenty hunted mallard breast muscles (*Pectoralis major*) were sampled for the determination of toxic element including Pb, Cd, methylmercury, inorganic As and Ni; while V, Al, Sr, Ba, Cr and Sb were considered non-essential or potentially toxic at high doses. Microelements were determined by ICP-MS or ICP-OES according to the analyte. Results for toxic elements were interpreted with reference to Regulation (EU) 2023/915 and regulation dealing with toxic microelements.

The mean concentrations of toxic elements in mallard breast meat were as follows: 0.045 mg/kg ($\pm$ 0.046 standard deviation, s.d.) for Pb, 0.009 mg/kg ($\pm$ 0.028 s.d.) for Cd, 0.018 mg/kg ($\pm$ 0.014 s.d.) for methylmercury, 0.002 mg/kg ($\pm$ 0.001 s.d.) for inorganic arsenic and 0.023 mg/kg ($\pm$ 0.014 s.d.) for nickel. Non-essential elements potentially toxic at high doses were generally detected at low concentrations: V 0.001 ($\pm$ 0.001 s.d.) mg/kg, Al 0.529 ($\pm$ 0.225 s.d.) mg/kg, Sr 0.082 ($\pm$ 0.039 s.d.) mg/kg, Ba 0.037 ($\pm$ 0.094 s.d.) mg/kg, Cr 0.009 ($\pm$ 0.004 s.d.) mg/kg and Sb 0.001 ($\pm$ 0.001 s.d.) mg/kg. Although mean values were below the reference limits used for comparison, Pb exceeded 0.10 mg/kg in 3 out of 20 samples, indicating the need for specific attention to hunting-related contamination.

There are no specific legal limits for small wild game meat with regard to chemical contaminants. The presence of low concentrations of the main toxic or potentially toxic trace elements suggests that this meat is safe for consumers. However, the presence of lead (Pb) concentrations exceeding the legal limit for poultry meat in three samples indicates that lead shot is still being used in wetlands despite the moratorium. Indeed, appropriate monitoring and control of environmental and ammunition-related contamination are therefore essential in order to promote the safety of mallard meat, particularly in view of the new materials used for ammunition. Further risk-benefit studies could also raise awareness of the combined safety-health aspects of these meats.

There are no specific legal limits for small wild game meat with regard to chemical contaminants. The presence of low concentrations of the main toxic or potentially toxic trace elements suggests that this meat is safe for consumers. However, the presence of lead (Pb) concentrations exceeding the legal limit for poultry meat in three samples indicates that lead shot is still being used in wetlands despite the moratorium. Indeed, appropriate monitoring and control of environmental and ammunition-related contamination are therefore essential in order to promote the safety of mallard meat, particularly in view of the new materials used for ammunition. Further risk-benefit studies could also raise awareness of the combined safety-health aspects of these meats.