

Changes in eggshell ultrastructure of *Falco naumanni* and *Tyto alba* exposed to pesticides and polychlorinated biphenyls (PCBs)

Gaetano Felice Caldara^{1*}, Chiara Maria Vitale^{2*}, Ornella Calderone³, Giovanni Lo Cascio⁴, Vincenzo Ferrantelli⁴ and Maurizio Sarà²

¹ DEMETRA Department, University of Palermo, v.le delle Scienze, 90128 Palermo, Italy

² Department of Environmental Biology and Biodiversity, University of Palermo, v. Archirafi, 92123, Italy

³ Department of Chemical Engineering, University of Palermo, v.le delle Scienze, 90128 Palermo, Italy

⁴ Istituto Zooprofilattico Sperimentale della Sicilia, v. G. Marinuzzi, 90129 Palermo, Italy

*Contributed equally

Changes in the quality of eggs of birds exposed to environmental contaminants have been described, but few reports concern eggshell ultrastructure. In this study, infertile or addled Lesser Kestrels (*Falco naumanni*) and Barn owls (*Tyto alba*) eggs were collected from the polluted area of Gela plain (Sicily) during 2007, and compared in terms of organophosphate and organochlorine pesticides, and PCBs levels, and eggshell ultrastructure as determined by scanning electron microscopy.

Pesticide and PCB residues in eggs were determined by Gas chromatography/mass spectrometry (GC/MS) [GC Agilent 7890A/MS Agilent 5975C (Agilent technology) using a DB-5 capillary column in the selected ion monitoring mode].

The GC/MS analysis revealed that eggs contained measurable amounts of some pesticides and PCBs. There was a low detection of organophosphate pesticides while the most abundant organochlorine residues detected were p,p' DDT, p,p' DDE, and Hexachlorobenzene. While, the most abundant PCBs detected congeners were PCB 138, 153, 170, 180, and 187. Although the general structure of the eggshell layers was maintained, the results showed ultrastructural differences in mammillary and palisade eggshell layers between high level and low level contaminated eggs in *Tyto alba*. Furthermore, mammillary cores of the eggshell had an increased distance between themselves with respect to well organized structures present in uncontaminated egg.

In this paper we verify the presence of environmental contaminants in the eggs and document structural changes in bird of prey eggshells. The data could suggest that some contaminants can contribute to reduced reproductive performance (infertile or addled egg) by structural changes in the eggshell. The alteration in morphological disposition of mammillary cores could also suggest an impairment of gas exchange.

Key words

PCB, pesticide, eggshell, scanning electron microscopy.