LEAD EXPOSURE IN FREE-RANGING KEA (*NESTOR NOTABILIS)*, TAKAHE (*PORPHYRIO HOCHSTETTERI)* AND AUSTRALASIAN HARRIERS (*CIRCUS APPROXIMANS)* IN NEW ZEALAND

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Abstract

Lead is a highly toxic metal that has been used by humans for over 2000 years. Over this time it has become increasingly apparent that despite its usefulness, lead is one of the most highly toxic substances known to man. Current research into lead exposure of humans focuses on low-level chronic exposure and its effects on learning and behaviour. However, investigations into lead exposure of wildlife are still focussed on mortalities, particularly of waterfowl and raptors, with little known about low-level exposures or the effects on other species.

This study examines the exposure of free-ranging kea (*Nestor notabilis*) from the Aoraki/ Mt Cook village and national park, takahe *(Porphyrio hochstetteri)* from Tiritiri Matangi, Kapiti and Mana Islands, and the lead associated syndrome of clenched-claw paralysis and leg paresis in harriers (*Circus approximans*) in New Zealand.

Thirty-eight kea had detectable blood lead with concentrations ranging from 0.028 mg/L to 3.43 mg/L (mean = 0.428 mg/L ± 0.581). Analysis of tissue samples found that seven of 15 birds died with elevated tissue lead. Lead exposure may be an important contributing factor in kea mortality. As a result of these findings, lead abatement in areas frequented by kea is being considered.

Eighteen of 45 takahe had detectable blood lead concentrations ranging from 0.015 mg/L to 0.148 mg/L (mean = 0.028 mg/L ± 0.042). Analysis of tissue samples from offshore island and Murchison Mountains birds found that all had detectable lead. Despite levels of lead exposure in the population being low and unlikely to result in overt clinical signs, it is widespread and there may be significant exposure of birds living around old buildings.

An investigation into the clinical signs, pathology and response to treatment of clenched-claw paralysis and leg paresis in wild harriers was carried out. Harriers with clenched feet had significantly higher blood lead concentrations than those without. In conclusion, lead is a major factor in the expression of this clinical syndrome but other factors not yet identified are playing a role.

This study demonstrates that lead is widespread in the New Zealand environment exposing a diverse range of avifauna, and has made some progress towards exploring some of its effects on health and survival.

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Abbreviations Used in Text

A/G ratio	Albumin:globulin ratio
AChE	Acetylcholinesterase
ALAD	aminolevulinic acid dehydatase
AST	Aspartate Aminotransferase
ASV	Anodic stripping voltammetry
BBB	Blood Brain Barrier
BUN	Blood Urea Nitrogen
CDC	United States Center for Disease Control
CK	Creatine Kinase
CNS	Central Nervous System
EP	Erythrocyte protoporphyrin
GGT	γ-glutamyl Transferase
H&E	Haematoxylin and Eosin
ICP-MS	Inductively coupled plasma mass spectrometry
ISIS	International Species Information System
IUCN	World Conservation Union
LH	Lutenising hormone
MCV	Motor Conduction Velocity
MUVTH	Massey University Veterinary Teaching Hospital
NZ	New Zealand
NZWHC	New Zealand Wildlife Health Centre
Pb	Lead
PbS	Lead Sulphide (galena)
PCV	Packed Cell Volume
PNS	Peripheral nervous system
RBC	Red blood cell
s.d.	Standard deviation
s.e.	Standard error
T ½	Half life
WCC	White Cell Count
WHO	World Health Organisation
ZN	Ziehl-Neelson