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**Lead exposure in an urban population of  
free-ranging kaka (*Nestor meridionalis  
septentrionalis*)**

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## Abstract

Anthropogenic lead use has resulted in widespread environmental lead contamination known to affect wildlife populations worldwide. Lead is a highly toxic, non-essential heavy metal recognised as a cause of morbidity and mortality in birds. Ecotoxicological investigations in wild birds have thus far prioritised waterfowl and raptor species and primarily addressed contamination in natural ecosystems. Urban areas are increasingly associated with high levels of heavy metal contamination, however the risk of lead exposure in urban wildlife is less well known.

This study aimed to identify the significance of lead exposure in a well-established urban population of kaka (*Nestor meridionalis septentrionalis*). Blood lead concentrations were assessed in adult and nestling birds to quantify exposure prevalence and magnitude. The impact of lead exposure on physiological and neurological function was assessed using behavioural and physiological parameters. Finally, lead stable isotope analysis was employed to identify the primary sources of lead in the urban environment.

Lead exposure is prevalent in this kaka population, with 43.2% of adults and 36.7% of nestlings with detectable blood lead concentrations. Blood lead concentrations in nestlings ranged from <3.3 to 42.9ug/dL, with no detectable neurological or physiological deficits. The pattern of exposure in chicks is suggestive of parental feeding of lead, however detection of lead in some eggshells suggests that maternal transfer is another route of exposure in this species. Blood lead concentrations in adult birds ranged between 3.4 to 50.7ug/dL. Although no acute clinical signs of toxicity were observed, lead exposure was associated with reduced body condition in adults. Behavioural changes were present in one individual with the highest recorded blood lead concentration. Lead isotope ratios in kaka blood samples overlap with isotope values of roof-collected rainwater, suggesting this to be an important source of exposure in this population.

The prevalence of lead exposure observed in this study suggests that lead is a threat to kaka interacting with urban areas. Wildlife intoxications largely result from anthropogenic lead sources and this study identifies a previously undescribed urban source of lead in wildlife. The well-described subclinical and persistent effects of lead highlight the need for abatement strategies to reduce lead exposure and its effects in this population.

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# Table of contents

ABSTRACT.....	i
ACKNOWLEDGEMENTS.....	ii
TABLE OF CONTENTS.....	iv
LIST OF FIGURES.....	vi
LIST OF TABLES.....	vii
<b>CHAPTER ONE <i>Introduction, literature review and research aims</i></b> .....	<b>1</b>
1.1 INTRODUCTION.....	2
1.2 OVERVIEW OF LEAD.....	4
1.2.1 Properties and use.....	4
1.2.2 Lead toxicity.....	5
1.3 ENVIRONMENTAL SOURCES OF LEAD EXPOSURE IN WILDLIFE.....	6
1.3.1 Ammunition.....	6
1.3.2 Soil.....	8
1.3.3 Atmospheric contamination.....	9
1.3.4 Urban environments and lead contamination.....	9
1.3.5 Source attribution using stable isotope analysis.....	10
1.4 TOXICO-KINETICS OF LEAD.....	11
1.4.1 Routes of exposure and absorption of lead.....	11
1.4.2 Distribution.....	12
1.4.3 Excretion.....	13
1.5 PATHOPHYSIOLOGY OF LEAD TOXICITY.....	15
1.5.1 Neurological system.....	15
1.5.1.1 <i>Pathophysiology</i> .....	15
1.5.1.2 <i>Effects on the developing neurological system</i> .....	16
1.5.1.3 <i>Clinical effects of neurotoxicity in humans</i> .....	17
1.5.1.4 <i>Clinical effects of neurotoxicity in birds</i> .....	17
1.5.2 Haematology.....	18
1.5.3 Effects of lead on other body systems.....	19
1.5.3.1 <i>Renal</i> .....	19
1.5.3.2 <i>Reproductive system</i> .....	20
1.6 INTERPRETING LEAD EXPOSURE AND EFFECT.....	21



1.7 BIOMONITORING OF LEAD EXPOSURE.....	22
1.7.1 Blood lead concentration.....	22
1.7.2 Tissue lead concentration.....	23
1.7.3 Other detection methods .....	24
1.8 LEAD EXPOSURE IN NEW ZEALAND WILDLIFE .....	25
1.9 RESEARCH AIMS AND THESIS STRUCTURE.....	26
LITERATURE CITED.....	28
<b>CHAPTER TWO <i>Evaluating lead exposure in urban free-ranging kaka</i></b> .....	37
2.1 INTRODUCTION .....	38
2.2 MATERIALS AND METHODS.....	42
2.3 RESULTS.....	45
2.3.1 Blood lead survey.....	45
2.3.2 Physiological changes.....	45
2.3.3 Rainwater and blood lead isotope ratios.....	47
2.4 DISCUSSION .....	48
LITERATURE CITED.....	56
<b>CHAPTER THREE <i>Lead exposure in nestling kaka: Investigating prevalence, source and effect</i></b> .....	61
3.1 INTRODUCTION .....	62
3.2 MATERIALS AND METHODS.....	65
3.3 RESULTS.....	68
3.3.1 Prevalence and blood lead concentration .....	68
3.3.2 Patterns of exposure.....	69
3.3.3 Nestling survival and condition.....	71
3.3.4 Eggshell lead content.....	71
3.4 DISCUSSION .....	72
3.5 CONCLUSION.....	79
LITERATURE CITED.....	80
<b>CHAPTER FOUR <i>General discussion</i></b> .....	85
4.1 General discussion .....	86
4.2 Conservation and management implications .....	89
LITERATURE CITED.....	90

# List of figures

<b>FIGURE 1.1</b> Map of Wellington showing study site outlined in red in proximity to the urban zone.....	3
<b>FIGURE 2.1</b> Blood lead concentrations (ug/dL) of adult kaka in urban Wellington.....	45
<b>FIGURE 2.2</b> Relationship between blood lead concentration and body condition index in lead exposed adult kaka in urban Wellington.....	46
<b>FIGURE 2.3</b> $^{208/206}\text{pb}$ and $^{206/207}\text{Pb}$ isotope ratios of kaka blood samples (o) and roof-collected rainwater samples ( $\Delta$ ). Mean ratios of $^{208/206}\text{Pb}$ and $^{206/207}\text{Pb}$ found in kaka blood samples ( $\bullet$ ) and roof-collected rainwater samples ( $\bullet$ ) with ellipses indicating the respective 95% confidence intervals.....	47
<b>FIGURE 3.1</b> Blood lead concentration (ug/dL) of kaka nestlings sampled at 3-4 weeks and 7-8 weeks in season 2014/2015.....	69
<b>FIGURE 3.2</b> Intra- and inter-clutch variability in lead exposure in kaka nestlings in Zealandia Sanctuary that is located within urban Wellington. Individual nests are represented on the x-axis with the size of the symbol indicative of the number of chicks.....	70

## List of tables

<b>TABLE 2.1</b> Lead 206/207 isotope ratios of ammunition from North America (Church et al., 2006; Tsuji et al., 2008) and Europe (Binkowski, Meissner, Trzeciak, Izevbekhai, & Barker, 2016).....	53
<b>TABLE 3.1</b> Total numbers of nests and chicks, average clutch size, fledging success and blood lead concentrations of lead exposed chicks in season 1 and season 2.....	68
<b>TABLE 3.2</b> Blood lead concentrations in nestling birds inhabiting polluted and non-polluted sites.....	73

