

**EPIZOOTOLOGICAL STUDIES AND DIAGNOSTIC
APPROACHES TOWARDS CATTLE BRUCELLOSIS IN
THE SMALLHOLDER DAIRY SECTOR OF ZIMBABWE**

A thesis presented by

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DECLARATION

1. BY THE CANDIDATE

The work presented in this thesis is to the best of my knowledge and belief, original, and does not contain any material published elsewhere, except where reference is made.

This material has not been submitted, either in part or whole, for degree or diploma at this or any other university.

Gift Matope

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ABSTRACT

A cross-sectional study was conducted to study the epizootology and diagnostic approaches of cattle brucellosis in six smallholder cattle farming areas of Zimbabwe. Specifically, the seroprevalence and risk factors for brucellosis were investigated. Serological diagnostic tests were evaluated and bacteriological investigations of herds and characterisation of *Brucella* spp. were carried out.

The overall mean individual animal and herd-level seroprevalences were 5.6% (95% CI: 4.4%, 6.8%) (81/1440) and 25.0% (95% CI: 18.1%, 31.9%), (52/203) respectively. The seroprevalence differed significantly ($P < 0.05$) among the study areas. Young animals (2-4 years) were found to be 5 times (OR=5.0, 95% CI: 1.4, 16.7) more likely to be positive compared to old animals (>7 years). Animals in the age group 5.5-7 years were found to be approximately 5 times (OR=4.9, 95% CI: 2.0, 11.6) more likely to have aborted compared to those of the age group 2-4 years, but the risk subsequently decreased with increasing age. Keeping mixed cattle breeds was associated with increased risk of brucellosis (OR= 8.5; 95% CI: 2.7, 26.5). Seropositivity (OR = 3.0, 95% CI: 1.4, 6.6) and mixed breed herds (OR = 2.3, 95% CI: 1.1, 4.9) were respectively found to be associated with increased risk of abortions. The kappa statistic test indicated good agreement among the c-ELISA, RBT and the FPA. The FPA had a higher specificity compared to RBT. The biochemical profiles of the *B. abortus* biovar 1 (11 isolates) and biovar 2 (2 isolates) typed in this study were typical of those of the genus. In conclusion, brucellosis was present in all study areas. The age of cattle and the mixing cattle breeds are important risk factors for brucellosis. The FPA could be used as a confirmatory test for bovine especially in the field. It is likely that *B. abortus* biovar 1 is the predominant cause of brucellosis in smallholder cattle. Further tests are required to study molecular biology and the epizootology of *B. abortus*.

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DEDICATION

This work is dedicated to my first principal supervisor, the late Professor Krishna Mohan. Having taught me the sequential primary and secondary tests used to identify the genus *Brucella*, he coined the phrase “*pure honey drop-like*”, as a perfect description of the colonies of *Brucella abortus* on Mueller-Hinton agar. After we had gone through all the identification procedures, he said to me; “if you master your subject, you will never be caught wanting”.

TABLE OF CONTENTS

TITLE.....	i
DECLARATION.....	ii
ABSTRACT.....	iv
ACKNOWLEDGMENTS.....	v
DEDICATION.....	vii
TABLE OF CONTENTS.....	viii
INDEX OF TABLES.....	xiii
INDEX OF FIGURES.....	xv
LIST OF ABBREVIATIONS.....	xvi
CHAPTER I.....	1
GENERAL INTRODUCTION.....	1
1.1 Introduction and background.....	1
1.2 Hypothesis.....	5
1.3 Aims and objectives.....	6
CHAPTER II.....	7
REVIEW OF LITERATURE.....	7
2.1 General.....	7
2.2 Taxonomy and evolution of the family <i>Brucellaceae</i>	8
2.3 Pathogenicity of <i>Brucella</i> spp.....	10
2.4 Identification of <i>Brucella</i> spp.....	12
2.4.1 Isolation.....	12
2.4.2 Growth Characteristics.....	14
2.4.3 Microscopic appearance.....	16
2.4.4 Biochemical reactions.....	16
2.4.5 Biotyping.....	16
2.4.6 Molecular typing.....	20
2.5 Domestic Animal Brucellosis.....	21
2.5.1 Introduction.....	21
2.5.2 Aetiology.....	22
2.5.2.1 Bovine brucellosis (Bang's Disease).....	22
2.5.2.2 Caprine and ovine brucellosis.....	23
2.5.2.3 Ovine brucellosis (Ovine epididymitis).....	23
2.5.2.4 Porcine brucellosis.....	23
2.5.2.5 Canine brucellosis.....	24
2.5.2.6 Equine brucellosis.....	24
2.5.3 Epizootology.....	24
2.5.3.1 Bovine brucellosis.....	24
2.5.3.2 Caprine and ovine brucellosis.....	28
2.5.3.3 Ovine brucellosis (ovine epididymitis).....	29
2.5.3.4 Porcine brucellosis.....	30
2.5.3.5 Canine brucellosis.....	31
2.5.3.6 Equine brucellosis.....	31
2.5.4 Transmission.....	31
2.5.4.1 Bovine brucellosis.....	31
2.5.4.2 Caprine and ovine brucellosis.....	32
2.5.4.3 Ovine brucellosis (ovine epididymitis).....	33

2.5.4.4	Porcine brucellosis.....	33
2.5.4.5	Canine brucellosis.....	34
2.5.4.6	Equine brucellosis.....	34
2.5.5	Pathogenesis.....	35
2.5.5.1	Bovine brucellosis.....	35
2.5.5.1.1	Intracellular survival.....	36
2.5.5.2	Caprine and ovine brucellosis.....	38
2.5.5.3	Ovine brucellosis (ovine epididymitis).....	38
2.5.5.4	Porcine brucellosis.....	39
2.5.5.5	Canine brucellosis.....	40
2.5.5.6	Equine brucellosis.....	40
2.5.6	Clinical signs.....	40
2.5.6.1	Bovine brucellosis.....	40
2.5.6.1.1	Latency.....	42
2.5.6.1.2	Immunity.....	43
2.5.6.1.2.1	Humoral immunity.....	43
2.5.6.1.2.2	Cell-mediated immunity.....	44
2.5.6.2	Caprine and ovine brucellosis.....	44
2.5.6.3	Ovine brucellosis (ovine epididymitis).....	45
2.5.6.4	Porcine brucellosis.....	46
2.5.6.5	Canine brucellosis.....	46
2.5.6.6	Equine brucellosis.....	47
2.5.7	Diagnosis.....	48
2.5.7.1	Bovine brucellosis.....	48
2.5.7.1.1	Clinical diagnosis.....	48
2.5.7.1.2	Laboratory Diagnosis.....	48
2.5.7.1.2.1	Culture and isolation.....	48
2.5.7.1.3	Serology.....	49
2.5.7.1.4	Milk Ring Test (MRT).....	55
2.5.7.2	Caprine and ovine brucellosis.....	56
2.5.7.3	Ovine brucellosis (ovine epididymitis).....	57
2.5.7.4	Porcine brucellosis.....	58
2.5.7.5	Canine brucellosis.....	59
2.5.7.6	Equine brucellosis.....	59
2.5.8	Treatment.....	60
2.5.8.1	Bovine brucellosis.....	60
2.5.8.2	Caprine and ovine brucellosis.....	61
2.5.8.3	Ovine brucellosis (ovine epididymitis).....	61
2.5.8.4	Porcine brucellosis.....	61
2.5.8.5	Canine brucellosis.....	62
2.5.8.6	Equine brucellosis.....	62
2.5.9	Control.....	62
2.5.9.1	Bovine brucellosis.....	62
2.5.9.1.1	Control by vaccination.....	63
2.5.9.1.2	Control programme on a herd basis.....	65
2.5.9.1.3	Control of bovine brucellosis in Zimbabwe.....	66
2.5.9.2	Caprine and ovine brucellosis.....	67
2.5.9.3	Ovine brucellosis (ovine epididymitis).....	67
2.5.9.4	Porcine brucellosis.....	68
2.5.9.5	Canine brucellosis.....	68
2.5.9.6	Equine brucellosis.....	69

2.6	Human brucellosis.....	69
2.6.1	Introduction.....	69
2.6.2	Aetiology.....	69
2.6.3	Epidemiology.....	70
2.6.4	Pathogenesis.....	72
2.6.5	Immunity.....	72
2.6.6	Clinical signs.....	73
2.6.7	Diagnosis.....	73
2.6.8	Treatment and control.....	74
2.7	Brucellosis of Wildlife and Marine mammals.....	75
2.7.1	Aetiology.....	75
2.7.1.1	Wildlife brucellosis.....	75
2.7.1.2	Brucellosis of marine mammals.....	76
2.7.2	Epizootology.....	76
2.7.2.1	Wildlife brucellosis.....	76
2.7.2.2	Brucellosis of marine mammals.....	77
2.7.3	Pathogenesis and clinical signs.....	78
2.7.3.1	Wildlife brucellosis.....	78
2.7.3.2	Brucellosis of marine mammals.....	78
2.7.4	Diagnosis.....	79
2.7.4.1	Wildlife brucellosis.....	79
2.7.4.2	Brucellosis of marine mammals.....	79
2.7.5	Control.....	80
2.7.5.1	Wildlife brucellosis.....	80
2.7.5.2	Brucellosis of marine mammals.....	80
CHAPTER III.....	81	
MATERIALS AND METHODS.....	81	
3.1	Prevalence of antibodies to <i>Brucella</i> species in individual dairy cattle and herds from smallholder farms in Zimbabwe.....	81
3.1.1	The study population.....	81
3.1.2	The study areas.....	82
3.1.3	The study design.....	85
3.2.4	Selection of herds and animals.....	85
3.1.5	Data collection.....	87
3.1.6	Laboratory Tests.....	87
3.1.6.1	Rose Bengal test (RBT).....	87
3.1.6.2	The competitive ELISA (c-ELISA).....	88
3.1.7	Statistical analysis.....	89
3.2	The risk factors for infection with <i>Brucella</i> spp. in individual cattle and herds from smallholder farms in Zimbabwe.....	90
3.2.1	Selection of herds and animals.....	90
3.2.3	Epidemiological data collection.....	90
3.2.4	Serological testing.....	91
3.2.5	Statistical analysis.....	91
3.2.5.1	The logistic regression analysis.....	91
3.3	Prevalence and risk factors for abortions in cows from smallholder farms naturally infected with <i>Brucella</i> species.....	94
3.3.1	Study areas.....	94
3.3.2	Epidemiological data collection.....	94
3.3.3	Serological tests.....	94

3.3.4	Data analysis.....	94
3.3.4.1	Logistic regression analyses.....	95
3.4	Comparison of the Fluorescence polarisation assay with the Rose Bengal test and the competitive ELISA for the serological diagnosis of bovine brucellosis in smallholder cattle farms in Zimbabwe.....	96
3.4.1	Sera and whole blood.....	96
3.4.2	Serological tests.....	96
3.4.2.1	Rose Bengal plate test (RBT).....	96
3.4.2.2	The competitive ELISA (c-ELISA).....	96
3.4.2.3	The Fluorescence polarisation assay (FPA).....	96
3.4.3	Data analysis.....	97
3.5	Bacteriological investigations of individual cattle by culture and isolation, and characterization of some <i>Brucella</i> spp. from Zimbabwe by biochemical profiling and AMOS PCR.....	98
3.5.1	Culture and isolation of <i>Brucella</i> spp. from clinical specimens.....	98
3.5.2	<i>Brucella</i> isolates for characterisation using biochemical profiles and AMOS-PCR.....	98
3.5.3	Biochemical profiles.....	100
3.5.4	Characterisation by AMOS-PCR.....	100
3.5.4.1	Extraction of <i>Brucella</i> DNA.....	100
3.5.4.2	The AMOS-PCR.....	101
	CHAPTER IV.....	103
	RESULTS.....	103
4.1	Prevalence of antibodies to <i>Brucella</i> species in individual cattle and herds from smallholder farms in Zimbabwe.....	103
4.1.1	Individual animal descriptive results.....	103
4.1.2	Herd-level descriptive results.....	106
4.2	The risk factors for infection with <i>Brucella</i> spp. in individual cattle and herds from smallholder farms in Zimbabwe.....	107
4.2.1	Individual animal risk factors.....	107
4.2.2	Herd-level risk factors.....	111
4.2.2.1	Multivariable regression analysis.....	113
4.3	Prevalence and risk factors for abortions in cows from smallholder farms naturally infected with <i>Brucella</i> species.....	115
4.3.1	Descriptive statistics.....	115
4.3.2	Logistic regression analyses.....	118
4.4	Comparison of the Fluorescence polarisation assay with the Rose Bengal test and the competitive ELISA for the serological diagnosis of bovine brucellosis in smallholder cattle farms in Zimbabwe.....	121
4.5	Bacteriological investigations of individual cattle by culture and isolation, and characterization of some <i>Brucella</i> spp. from Zimbabwe by biochemical profiling and AMOS PCR.....	126
4.5.1	Culture and isolation of <i>Brucella</i> spp. from clinical specimens.....	126
4.5.2	Characterisation of <i>Brucella</i> isolates using biochemical profiles and AMOS-PCR.....	127
	CHAPTER V.....	131
	DISCUSSION.....	131
5.1	Prevalence of antibodies to <i>Brucella</i> species in individual cattle and herds from smallholder farms in Zimbabwe.....	131
5.2	The risk factors for infection with <i>Brucella</i> spp. in individual cattle and herds from smallholder farms in Zimbabwe.....	134

5.3	Prevalence and risk factors for abortions in cows from smallholder farms naturally infected with <i>Brucella</i> species.....	140
5.4	Comparison of the Fluorescence polarization assay with the Rose Bengal test and the competitive ELISA for the serological diagnosis of bovine brucellosis in smallholder cattle farms in Zimbabwe.....	144
5.5	Bacteriological investigations of individual cattle by culture and isolation, and characterization of some <i>Brucella</i> spp. from Zimbabwe by biochemical profiling and AMOS PCR.....	147
CHAPTER VI.....		151
CONCLUSIONS AND RECOMMENDATIONS.....		151
6.1	Conclusions.....	151
6.1.1	Prevalence of antibodies to <i>Brucella</i> spp. in individual cattle and herds from smallholder farms in Zimbabwe.....	151
6.1.2	The risk factors for infection with <i>Brucella</i> spp. in individual cattle and herds from smallholder farms in Zimbabwe.....	152
6.1.3	Prevalence and risk factors for abortions in cows from smallholder farms naturally infected with <i>Brucella</i> species.....	153
6.1.4	Comparison of the Fluorescence polarisation assay with the Rose Bengal test and the competitive ELISA for the serological diagnosis of bovine brucellosis in smallholder cattle farms in Zimbabwe.....	153
6.1.5	Bacteriological investigations of individual cattle by culture and isolation, and characterization of some <i>Brucella</i> spp. from Zimbabwe by biochemical profiling and AMOS PCR.....	154
6.2	Recommendations.....	155
6.2.1	Diagnosis of bovine brucellosis.....	155
6.2.2	Control of bovine brucellosis in smallholder diary farming areas.....	155
REFERENCES.....		157
APPENDIX.....		177
1.1	The structured questionnaire used to collect <i>Brucella</i> epizootological data....	177

INDEX OF TABLES

Table 2.1	Hosts, diseases and distribution of <i>Brucella</i> spp.....	11
Table 2.2	Differential characteristics of <i>Brucella</i> spp. from some other Gram-negative bacteria.....	17
Table 2.3	Differentiation of the species and biovars of the genus <i>Brucella</i>	18
Table 2.4	Differentiation of the species of the genus <i>Brucella</i>	19
Table 2.5	Distribution of bovine brucellosis prevalence by country and production system.....	26
Table 2.6	Summary of the serological tests for bovine brucellosis.....	50
Table 3.1	Cattle population of Zimbabwe by farming sector from 1991 to 2001...	81
Table 3.2	Details of geographical locations and climatic conditions of study areas.....	84
Table 3.5.1.	<i>Brucella</i> isolates used in the study collected from different regions of Zimbabwe.....	99
Table 3.5.2	Sequences of the oligonucleotide primers for the AMOS-PCR.....	102
Table 4.1.1	The distribution of herds, individual cattle sampled, detailing their categories and age groups.....	104
Table 4.1.2	Distribution of <i>Brucella</i> sero-positive reactor cattle ($n = 1440$) by study area, age group and sex, among Zimbabwean traditional cattle, with prevalence adjusted for primary sampling units and weights(2004-2005).....	105
Table 4.1.3.	The sampling weight-adjusted seroprevalence of antibodies to <i>Brucella</i> spp. of cattle from smallholder farms in the respective study districts of Zimbabwe (2004-2005).....	106
Table 4.2.1	Distribution of <i>Brucella</i> seropositive reactor smallholder dairy cattle ($n = 1440$) by age group, sex and origin (purchased or locally raised) with prevalence adjusted for primary sampling unit and weights (2004-2005).....	108
Table 4.2.2	Results of the logistic regression analysis for identification of individual animal risk factors in traditional cattle ($n = 1440$) from smallholder farms in Zimbabwe (2004-2005).....	109
Table 4.2.3	The effect of herd size, farm size and stocking density on the distribution of <i>Brucella</i> sero-positive cattle herds ($n=203$) from smallholder farms in Zimbabwe (2004-2005).....	111
Table 4.2.4	Potential risk factors for the occurrence of antibodies to <i>Brucella</i> spp. in cattle herds ($n=203$) from smallholder farms in Zimbabwe (2004-2005).....	112
Table 4.2.5	Final multiple logistic regression model showing the effects of herd level risk factors on <i>Brucella</i> sero-positivity in cattle herds ($n=203$) from smallholder farms in Zimbabwe (2004-2005).....	113
Table 4.2.6	Final multiple negative binomial regression model showing the effects of individual animal level risk factors on <i>Brucella</i> sero-positive cattle herds ($n=203$) from smallholder farms in Zimbabwe (2004-2005).....	114
Table 4.3.1	The sampling weight-adjusted distribution of abortions in cattle herds ($n = 203$) from smallholder farms in Zimbabwe (2004-2005).....	116

Table 4.3.2	The SAT antibody titres of RBT/c-ELISA positive cows ($n=32$) from Gokwe, Nharira and Rusitu smallholder farming areas.....	117
Table 4.3.3	A multiple logistic regression model showing the effect of individual animal risk factors on abortions in cattle ($n = 1291$) from smallholder farms ($n = 203$) in Zimbabwe (2004-2005).....	118
Table 4.3.4	A crude description of the potential risk factors for the occurrence of abortions in cattle herds ($n = 203$) from smallholder farms in Zimbabwe (2004-2005).....	119
Table 4.3.5	A multiple logistic regression model showing the effect of herd level risk factors on abortions in cattle herds ($n = 203$) from smallholder farms in Zimbabwe(2004-2005).....	120
Table 4.4.1	Sensitivity and specificity of the Rose Bengal plate test (RBPT) ($n=789$) and the fluorescence polarization using serum (FPASRM) ($n= 776$) or whole blood (FPABLD) ($n=351$) relative to the c-ELISA which was used as gold standard.....	123
Table 4.4.2	Test agreement for the RBT, c-ELISA and the FPA serum (FPASRM) or whole blood (FPABLD).....	125
Table 4.5.1	Details of the culture and isolation of <i>Brucella</i> spp. from milk and other specimens.....	126
Table 4.5.2	Basic biochemical and metabolic profiles of field <i>Brucella</i> spp. from Zimbabwe.....	128
Table 4.5.3	Biochemical and metabolic profiles of selected reference strains of <i>Brucella</i> spp.....	128
Table 4.5.4	Summary of the growth characteristics, agglutination with monospecific antisera and sensitivity to phages of the field <i>Brucella</i> spp. from Zimbabwe.....	129

INDEX OF FIGURES

Figure 2.1	Phylogenetic tree of the <i>Brucella</i> spp.....	9
Figure 2.2	Characteristic properties of an early vacuole and the replicative niche of <i>Brucella</i> spp.....	37
Figure 2.3	Unilateral <i>Brucella abortus</i> -induced hygroma in a cow.....	42
Figure 3.1	The location of study areas in relation to the agro-ecological regions of Zimbabwe.....	84
Figure 3.2	Formulae used to calculate sample sizes of cattle herds and individual animals for estimation of mean prevalence of brucellosis.....	85
Fig. 4.2.1	Fig. 4.2.1. Lowess smoother graph and scatter plots showing the relationship between <i>Brucella</i> seroprevalence and age.....	110
Figure 4.3.1	Relative distribution of <i>Brucella</i> sero-positive and aborted animals by age group.....	117
Figure 4.4.1	Receiver operating characteristic (ROC) curve for the fluorescence polarization test for the detection of antibodies to <i>Brucella</i> spp. in cattle from smallholder farming areas in Zimbabwe (2004-2005).....	122
Figure 4.4.2	Frequency distribution of the data obtained with the fluorescence polarisation assay for the detection of antibodies to <i>Brucella</i> spp. using sera from cattle from smallholder farms from Zimbabwe (2004-2005).....	124
Figure 4.5.1	AMOS-PCR results of the field <i>Brucella</i> strains from Zimbabwe.....	130
Figure 4.5.2	AMOS-PCR agarose gel photograph of reference <i>Brucella</i> spp.....	130

LIST OF ABBREVIATIONS

AGID = Agar gel immunodiffusion test
AMOS-PCR = *Brucella abortus*, *Brucella melitensis*, *Brucella ovis*, *Brucella suis*,
polymerase chain reaction
ARDA = Agricultural Rural Development Authority
AUC = Area under a curve
c-ELISA = Competitive enzyme-linked immunosorbent assay
CFT = Complement fixation test
CI = Confidence interval
DNA = Dextroribonucleic acid
FPA = Fluorescence polarisation assay
HIV/AIDS = Human immunodeficiency virus/Acquired immunodeficiency syndrome
i-ELISA = indirect enzyme-linked immunosorbent assay
IR = Incidence rate ratio
IU = International units
LPS = Lipopolysaccharides
METAT = 2-Mercaptoethanol tube agglutination test
mP = millipolarisation units
MRT = Milk ring test
OPS = O-polysaccharides
OR = Odds ratio
PCR = Polymerase chain reaction
PI = Percent inhibition
RBT = Rose Bengal plate test
RLPS = Rough Lipopolysaccharides
RNA = Ribonucleic acid
ROC = Receiver operator characteristic curves
SAT = Serum agglutination test
SE = Standard error
TSB = Tryptone Soya broth
VNTR = Variable number of tandem repeat analysis