PUBLIC HEALTH ASPECTS OF *YERSINIA PSEUDOTUBERCULOSIS* IN DEER AND VENISON

A THESIS PRESENTED IN PARTIAL FULFILMENT (75%) OF THE
REQUIREMENTS FOR THE DEGREE OF MASTER OF PHILOSOPHY
IN VETERINARY PUBLIC HEALTH
AT MASSEY UNIVERSITY

EDWIN BOSI

September, 1992

DEDICATED TO

MY PARENTS (MR. RICHARD BOSI AND MRS. VICTORIA CHUAN)

MY WIFE (EVELYN DEL ROZARIO)

AND MY CHILDREN (AMELIA, DON AND JACQUELINE)

Abstract

A study was conducted to determine the possible carriage of Yersinia pseudotuberculosis and related species from faeces of farmed Red deer presented for slaughter and the contamination of deer carcase meat and venison products with these organisms. Experiments were conducted to study the growth patterns of Y.pseudotuberculosis in vacuum-packed venison stored at chilling and freezing temperatures.

The serological status of slaughtered deer in regards to Y.pseudotuberculosis serogroups 1, 2 and 3 was assessed by Microplate Agglutination Tests. Forty sera were examined comprising 19 from positive and 20 from negative intestinal carriers. Included in this study was one serum from an animal that yielded carcase meat from which Y.pseudotuberculosis was isolated.

Caecal contents were collected from 360 animals, and cold-enriched for 3 weeks before being subjected to bacteriological examination for Yersinia spp.

A total of 345 and 321 carcases surface samples for bacteriological examination for Yersiniae were collected at the Deer Slaughter Premises (DSP) and meat Packing House respectively.

A total of 70 venison sausages were purchased from local supermarkets. Direct plating and plating after 21 days cold-enrichment were carried out to examine for Yersiniae.

Venison samples were obtained from the DSP and seeded with a known approximate number of Y.pseudotuberculosis organisms. The samples were vacuum-packed and stored at temperatures of +10 ℃, +4 ℃, -1 ℃, -10 ℃, -13 ± 2 ℃, and -20 ℃; recovery and enumeration of the test organism was made at predetermined times.

The results of the Microplate Agglutination Tests showed that deer presented for slaughter at this DSP had low (1:10) or undetectable antibody titres to Y.pseudotuberculosis. The prevalence of Yersinia spp. in faeces was 5.3% (19/360) of Y.pseudotuberculosis, 2.6% (9/360) of Y.enterocolitica, 3.6% (13/360) of Y.kristensenii, 20.5% (74/360) of Y.frederiksenii, 0.6% (2/360) of Y.intermedia and 0.6% (2/360) of Y.rohdei. Five of nine strains of Y.enterocolitica isolated were found to be potentially pathogenic by means of the virulence marker tests. Two of them were identified as biotype 3 serovar O:5,27.

There was only one isolation (0.3%) of Y.pseudotuberculosis from 321 carcases sampled at the Packing House.

The prevalence of Yersinia spp. in venison sausages was 11.4% (8/70) Y.enterocolitica, 1.4% (1/70) Y.kristensenii and 5.7% (4/70) Y.intermedia.

Y.pseudotuberculosis grew very well in vacuum-packed venison stored at chilling temperature although a long lag phase was observed at -1 ℃. When frozen, the organisms remained viable for a long period of time and recovered and multiplied rapidly when transferred to chill temperature.

The study showed that there was no serological evidence of yersiniosis in deer presented for slaughter during the study period despite the fact that 5.3% of the animals were carrying Y.pseudotuberculosis in their faeces. While there was a low prevalence of Y.pseudotuberculosis on carcase meat their presence could be a source of cross contamination of other carcases especially during deboning. The finding of Yersiniae in venison sausages showed that there was contamination during their preparation. The multiplication of the bacteria in vacuum-packed venison and their long survival in frozen venison are of public health concern while its presence may affect export markets.

ACKNOWLEDGMENT

I would like to extend my gratitude to the Government of Sabah, Malaysia for sponsoring my study and the Director of Veterinary Services and Animal Industry, Sabah for his kind approval.

I am grateful to my chief supervisor Mr. Per Madie for his outstanding role in guiding me throughout the study period and is directly responsible for the early completion of my course.

I am also thankful to my second supervisor Professor Colin Wilks for his support, encouragement and guidance. His brilliant supervision has contributed immensely to the early completion of my course.

I would also like to say thank you to my other supervisors Assoc. Professor Roger Marshall and Mr. Stan Fenwick for their support and guidance.

I would like to express my appreciation to the following :-

Professor Bill Manktelow for his confidence in me to undertake the M.Phil Course and for his "subtle" supervision of my progress.

Professor Bob Jolly for providing me a "roof" for the first two days of my life in New Zealand and for his kind concern on my progress.

Mr. Peter Wildbore, Ms. Jan Schramar and all the other technicians for their friendly assistance during my study.

Mr. Tom Law for taking the photographs.

Mrs. Bev Royd and Mrs. Sherryl Crawford for their secretarial assistance.

Dr. Robert Sanson for assisting me with the statistical analysis.

Dr. John Brooks of the Department of Food Technology, Massey University for his advise, the supply of some bacterial cultures and the use of the vacuum-packaging machine.

Drs. Eamonn Gormley and Ariane Van de Moer for their assistance in the production of the graphs.

Professor Tom Barry, Dr. Peter Wilson and members of the Massey Deer Group for their valuable knowledge they have imparted to me. I am also thankful for their support and friendship.

The officers and staffs of the Training and Career Division, Chief Minister's Department, Kota Kinabalu, Sabah for their assistance in terms of administration and finance.

The New Zealand Venison Company Limited, Feilding and Hastings for their kind permission to collect samples from their plants, and supply of the plastic bags for the experimental work.

The Ministry of Agriculture and Fisheries Veterinarians at Feilding and Hastings for their kind permission and support during my study.

Mr. Per Madie, Professor Colin Wilks, Mr. Terry Bissett, Ms. Andrea Hurrell and Dr. Claude De Allie for their kind assistance in the collection of samples.

To my wife and children for their unlimited support and understanding during the period of my study and of which this thesis is dedicated.

Finally to my brothers, sisters and in-laws in Sabah, and all my friends in New Zealand who have made our stay a pleasant and memorable one. The friendships cultivated shall always be treasured and remembered dearly.

TABLE OF CONTENTS

List of Figures

List of Tables

List of Graphs