Epidemiology of mast cell tumour in dogs

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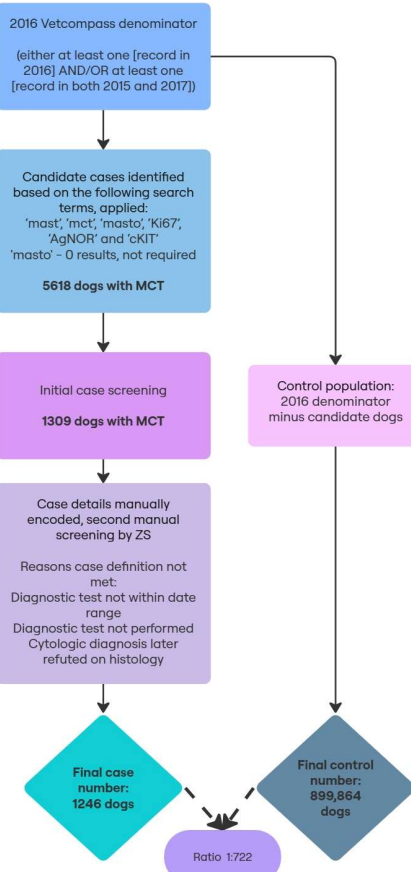
Background

- Mast cell tumour (MCT) is the most common malignant skin tumour in dogs - representing ~20% of sampled cutaneous neoplasms[1], (Figures 1,2)
- Understanding the epidemiology of MCT in dogs will help general practitioners identify at risk patients

Objectives

(1) **Evaluate frequency of MCT cases in 2016 VetCompass database**
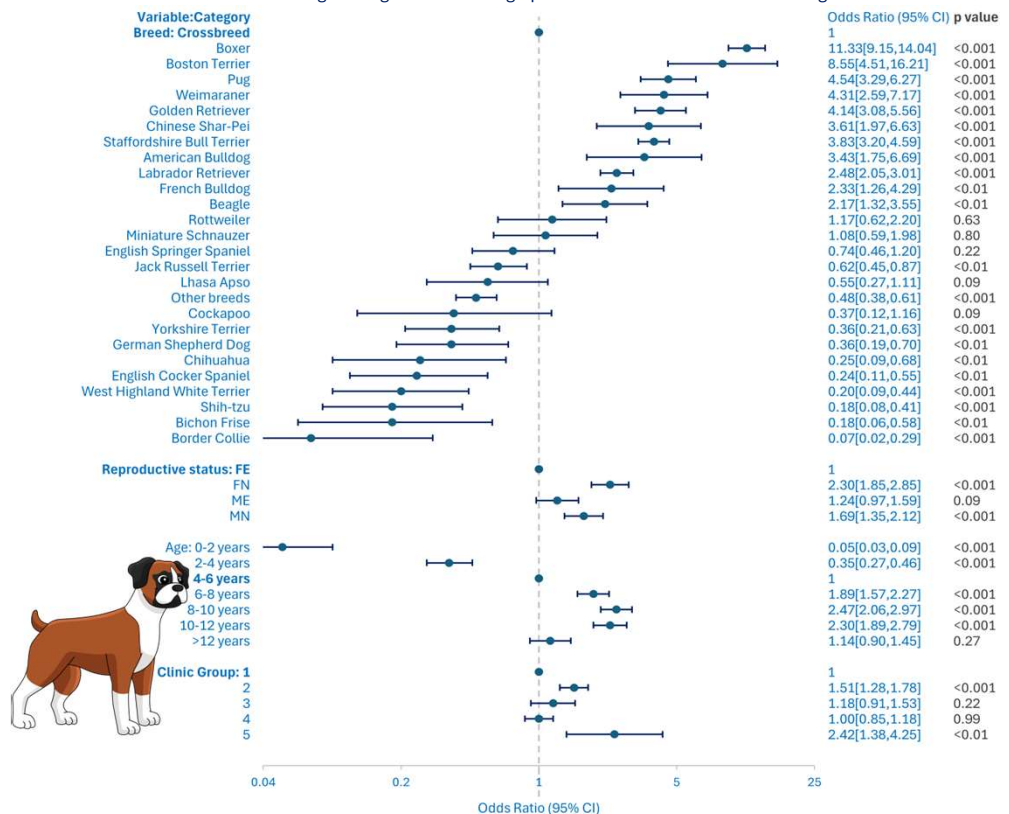(2) **Investigate demographic risk factors for diagnosis with MCT**

Figure 1: Cutaneous MCT in the dog © Aleksandra Kozačinski MRCVS

Figure 2: Cytology from a mast cell tumour © RVC Image Bank

Methods

VetCompass holds a database of de identified electronic health records from >1300 UK first opinion veterinary practices

2016 Vetcompass denominator

(either at least one [record in 2016] AND/OR at least one [record in both 2015 and 2017])

↓

Candidate cases identified based on the following search terms, applied:
'mast', 'mct', 'masto', 'Ki67', 'AgNOR' and 'cKIT'
'masto' - 0 results, not required

5618 dogs with MCT

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Initial case screening
1309 dogs with MCT

Control population: 2016 denominator minus candidate dogs

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Case details manually encoded, second manual screening by ZS

Reasons case definition not met:
Diagnostic test not within date range
Diagnostic test not performed
Cytologic diagnosis later refuted on histology

↓

Final case number: 1246 dogs

Final control number: 899,864 dogs

Ratio 1:722

Results

- **Incidence: 140 per 100,000 dogs per year** (0.14%, 95% confidence interval (CI): 0.13-0.15)
- Breed specific incidence within 5 most represented breeds: Boxer: 1.52% (95% CI: 1.28-1.79%), Golden Retriever: 0.58% (0.44-0.75%), Staffordshire Bull Terrier: 0.50% (0.44-0.57%), Labrador Retriever: 0.33% (0.29-0.38%), Pug: 0.28% (0.20-0.37%)
- Within dogs with MCT: 675 female (54%) of which 579 were neutered (86%) and 96 (14%) were entire; 571 male (45%) of which 393 (69%) were neutered and 178 (31%) were entire
- Median age at diagnosis: 8.12 years (interquartile range IQR: 6.18-10.10 years)
- Median weight of dogs diagnosed with MCT: 24.7kg (IQR: 17.03-31.64kg)
- **Breed, age, neuter status** and clinic group (to account for case clustering) were retained for final multivariable model

Multivariable logistic regression: Demographic risk factors associated with diagnosis with MCT

Variable:Category	Odds Ratio (95% CI)	p value
Breed: Crossbreed	1	
Boxer	11.33[9.15,14.04]	<0.001
Boston Terrier	8.55[4.51,16.21]	<0.001
Pug	4.54[3.29,6.27]	<0.001
Weimaraner	4.31[2.59,7.17]	<0.001
Golden Retriever	4.14[3.08,5.56]	<0.001
Chinese Shar-Pei	3.61[1.97,6.63]	<0.001
Staffordshire Bull Terrier	3.83[3.20,4.59]	<0.001
American Bulldog	3.43[1.75,6.69]	<0.001
Labrador Retriever	2.48[2.05,3.01]	<0.001
French Bulldog	2.33[1.26,4.29]	<0.01
Beagle	2.17[1.32,3.55]	<0.01
Rottweiler	1.17[0.62,2.20]	0.63
Miniature Schnauzer	1.08[0.59,1.98]	0.80
English Springer Spaniel	0.74[0.46,1.20]	0.22
Jack Russell Terrier	0.62[0.45,0.87]	<0.01
Lhasa Apso	0.55[0.27,1.11]	0.09
Other breeds	0.48[0.38,0.61]	<0.001
Cockapoo	0.37[0.12,1.16]	0.09
Yorkshire Terrier	0.36[0.21,0.63]	<0.001
German Shepherd Dog	0.36[0.19,0.70]	<0.01
Chihuahua	0.25[0.09,0.68]	<0.01
English Cocker Spaniel	0.24[0.11,0.55]	<0.01
West Highland White Terrier	0.20[0.09,0.44]	<0.001
Shih-tzu	0.18[0.08,0.41]	<0.001
Bichon Frise	0.18[0.06,0.58]	<0.01
Border Collie	0.07[0.02,0.29]	<0.001
Reproductive status: FE	1	
FN	2.30[1.85,2.85]	<0.001
ME	1.24[0.97,1.59]	0.09
MN	1.69[1.35,2.12]	<0.001
Age: 0-2 years	0.05[0.03,0.09]	<0.001
2-4 years	0.35[0.27,0.46]	<0.001
4-6 years	1	
6-8 years	1.89[1.57,2.27]	<0.001
8-10 years	2.47[2.06,2.97]	<0.001
10-12 years	2.30[1.89,2.79]	<0.001
>12 years	1.14[0.90,1.45]	0.27
Clinic Group: 1	1	
2	1.51[1.28,1.78]	<0.001
3	1.18[0.91,1.53]	0.22
4	1.00[0.85,1.18]	0.99
5	2.42[1.38,4.25]	<0.01

Odds Ratio (95% CI)

Conclusions

- Demographic features are associated with probability of diagnosis with mast cell tumour
- Predisposed breeds include Boxer, Boston Terrier, Pug, Weimaraner, Golden Retriever, suggesting a genetic component

Ongoing work

- Describe features of MCT cases: tumour location/size, histological features, staging performed, treatment modalities
- Design Cox Proportion Hazard model for survival. Unique eight-year follow-up within the dataset
- Perform similar analysis in Golden Retriever Lifetime Study (GRLS) cohort, in a breed which is predisposed to MCT

WOAH Collaborating Centre for
Risk Analysis & Modelling
A collaboration between the Animal and Plant Health Agency and the Royal Veterinary College