

Use of antimicrobials in companion animals from 133 German veterinary practices

Roswitha Merle, Leonie Feuer, Katharina Frenzer, Jan-Lukas Plenio, Astrid Bethe, Nunzio Sarnino, Antina Lübke-Becker, Wolfgang Bäumer

Gefördert durch



Bundesministerium
für Ernährung
und Landwirtschaft

aufgrund eines Beschlusses
des Deutschen Bundestages

Projektträger



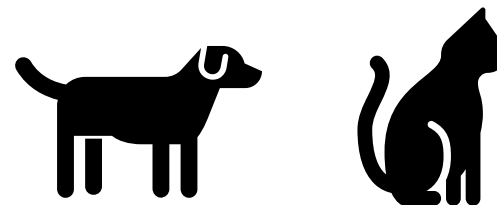
Bundesanstalt für
Landwirtschaft und Ernährung

Regulation (EU) 2019/6, Art. 57

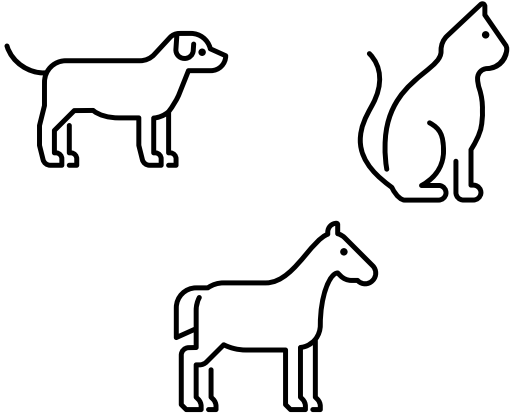
- Data collection on the use of antimicrobials in animals
 - From 2027 for all food-producing animals
 - From 2029 for all other animals that are kept or bred



→ Member states must report sales data and on the use of antimicrobials per animals species and per active substance



Use of antimicrobials in dogs, cats, and horses



HKP-Mon (2021 – 2024)

- Systematic data collection of antibiotic use in dogs, cats, and horses
- On behalf of the German Ministry of Agriculture, Food and Regional Identity

- Concept for recording antibiotic use
- Assessment strategy
- Partners
 - Institute of Pharmacology and Toxicology
 - Institute of Microbiology and Epizootics

Dataset debevet



- 2018 – 2023
- 133 practices
- Dogs and cats (at least 100)
- 718,842 consultations from 134,110 animals
 - dogs: 66.4 %
 - cats: 33.6%

Article

Use of Antibiotics in Companion Animals from 133 German Practices from 2018 to 2023

Roswitha Merle ^{1,*}, Leonie Feuer ², Katharina Frenzer ¹, Jan-Lukas Plenio ¹, Astrid Bethe ^{3,4}, Nunzio Sarnino ¹, Antina Lübke-Becker ³ and Wolfgang Bäumer ²

<https://doi.org/10.3390/antibiotics14010058>



115,911 consultations with antibiotic treatment

- 16.1% overall
 - 12.9 % in dogs
 - 22.5 % in cats

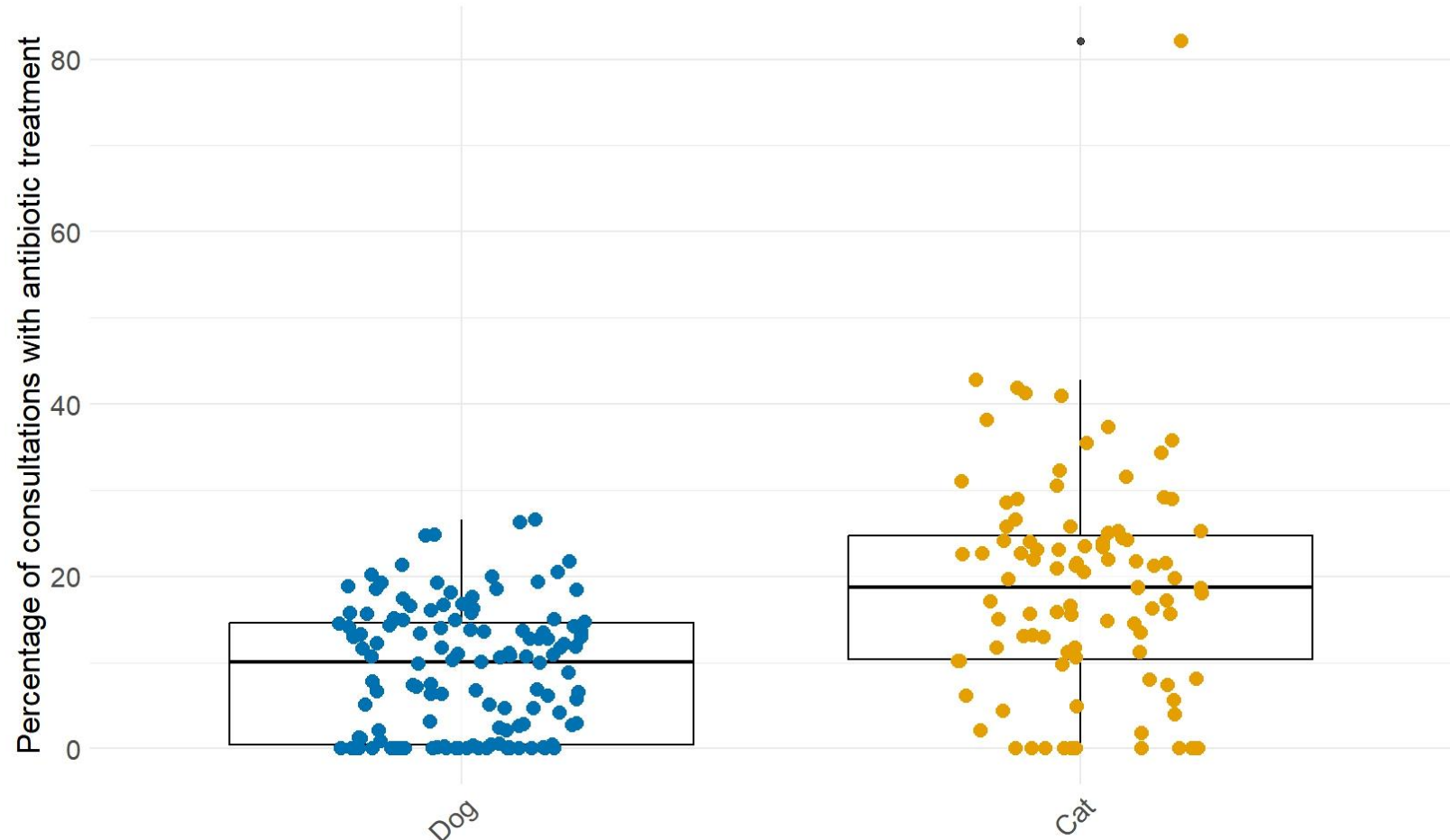


Figure 1. Percentage of consultations with antibiotic treatment per veterinary practice.
Merle et al., 2025, doi: 10.3390/antibiotics14010058

Follow-up consultations

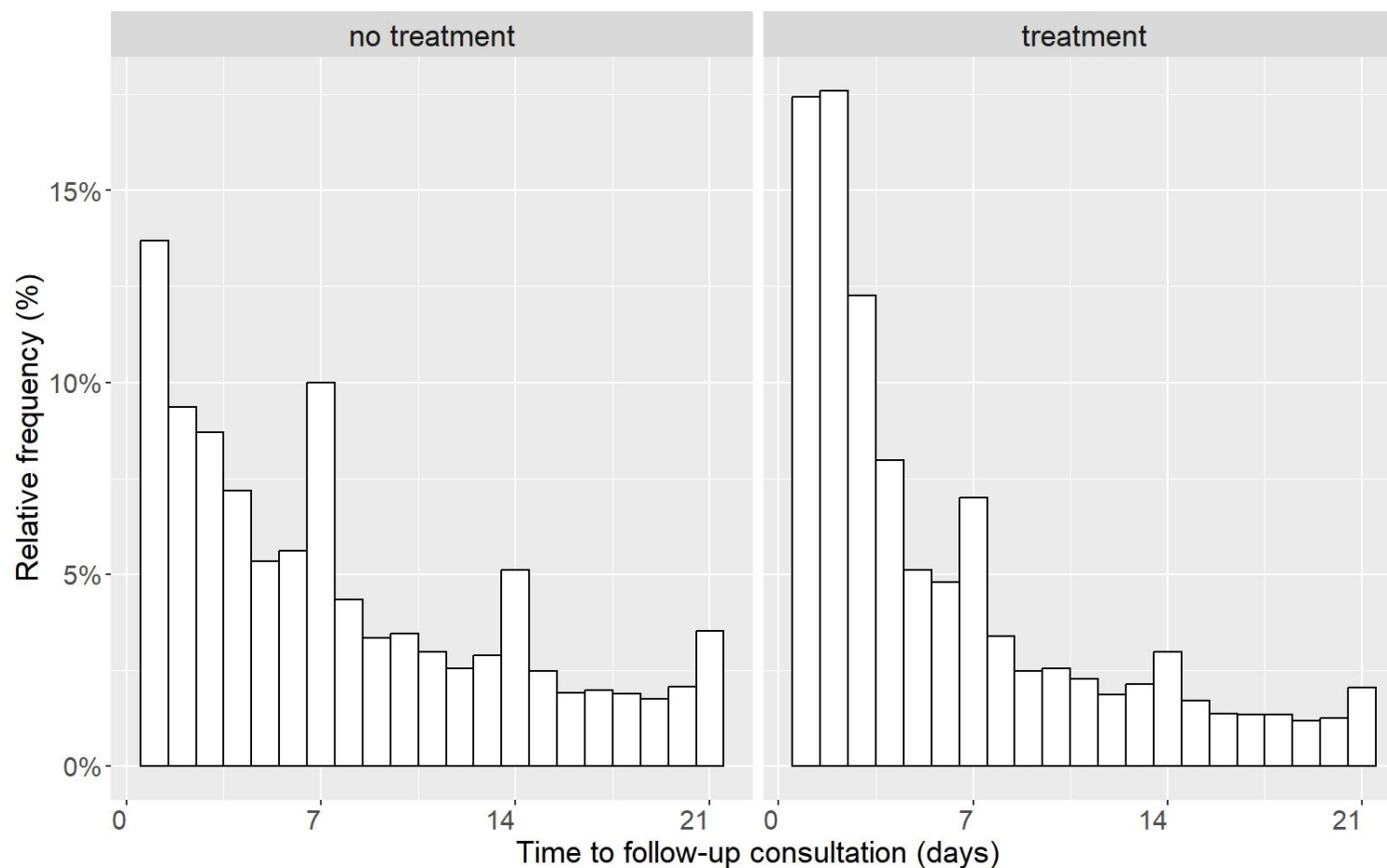


Figure 2. Histogram of time to follow-up consultations of dogs and cats, categorized by consultations with or without treatment with antibiotics.

Merle et al., 2025, doi: 10.3390/antibiotics14010058

- Distinguish between a follow-up and a new case
 - Gap >30 days = new case
- Future approaches using AI
 - According to the medication
 - According to the diagnosis recorded
 - Recognition of chronic diseases / long-term medication

Substance groups

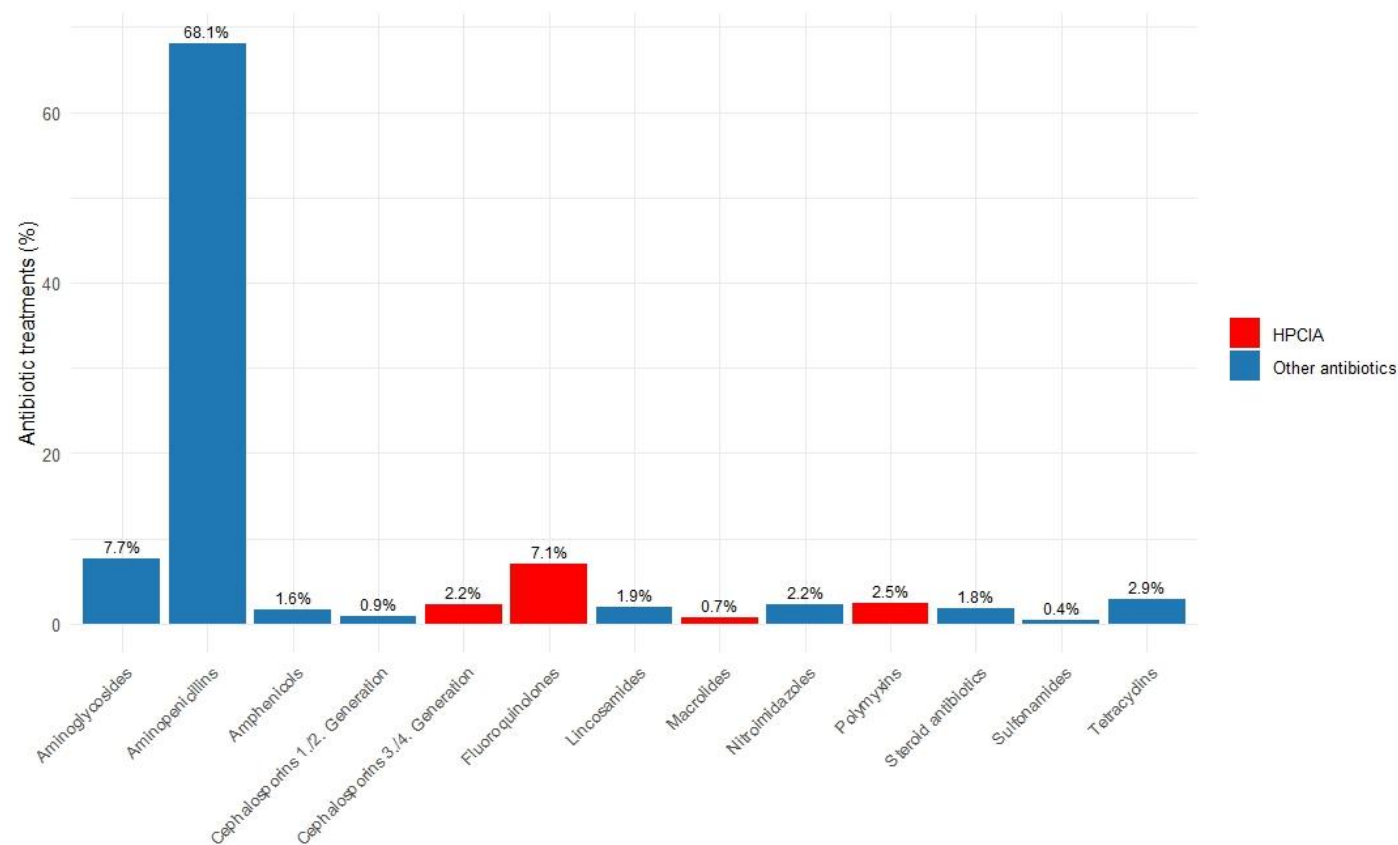


Figure 3: Percentage of consultations with antibiotic treatment per substance class in dogs and cats (145,846 applications or deliveries). Highlighted are substance groups that belong to the highest priority critically important antibiotics.

Merle et al., 2025, doi: 10.3390/antibiotics14010058

Challenges

- Antimicrobials recorded as free text
 - Identification of the medicinal product not always possible
 - Allocation of the active substance was always possible (14% of treatments)
 - A list of unique medicinal products necessary
- Different unit specifications
(1 bottle instead of 1 ml)
- Treatment duration was not available in the dataset!

Amox 250 mg			
Amox 250mg			
Amox 250mg			
Amox 50mg			
Amoxanil 200 F, 200 mg/g			
Amoxicillin 15%			
Amoxicillin 15% WDT, 150 mg / ml			
Amoxicillin 15% WDT, 150 mg/ml			
Amoxicillin 600 mg			
Synulox 250 mg (200 mg/50 mg)	200	mg/Tablette	TAB
Synulox 50 mg (40 mg/10 mg)	400	mg/Packung	PA
Synulox 50 mg (40 mg/10 mg)	40	mg/Tablette	TAB
Synulox 500 mg (400 mg/100 mg)	400	mg/Tablette	TAB
Synulox Pulver 40/10 mg/ml	648	mg/Flasche	FL
Synulox RTU (Ölige Suspension)	140	mg/ml	ML
Synulox RTU 140/35 mg/ml	7000	mg/Flasche	FL
Synulox RTU 140/35 mg/ml	140	mg/ml	ML
Synulox Pulver 40/10 mg/ml	40	mg/ml	ML

Allocation of consultations to diagnoses

- Free text entries in the fields “anamnesis” and “diagnosis” were allocated to indication categories
 - Python, Sklearn CountVectorizer
 - List with over 25,000 terms and abbreviations
 - Allocation to one out of 20 categories
 - Selection of the most common indication within an entry

Example of diagnosis allocation

Free text	Exophthalmos on the right, purulent nasal discharge on the left; suspected retrobulbar process from the nose
Extracted keywords	exophthalmos; Nasal discharge; Nose
Allocated indication categories	Ophthalmology; Respiratory system; Respiratory system
Decision	Respiratory System

Example 2

Free text	Proximal diaphyseal comminuted fracture of the right femur, pulmonary contusion, HCM (hypertrophic cardiomyopathy), Anemia
Extracted keywords	Diaphyseal; Fracture; Femur; Pulmonary; HCM; Anemia
Allocated indication categories	Orthopedics; Trauma; Orthopedics; Respiratory System; Cardiovascular System; Lab result
Decision	Orthopedics

Missclassifications

Diagnosis	Classification
Claw damaged	Respiratory disease
Dental scaling	Oncology

- Large variation between practices

Number of consultations per indication group

- An indication could be allocated to 43.3% of consultations.
- Often generic indications
 - Diagnostics/therapy
 - Emergency
 - Routine
 - Unclear

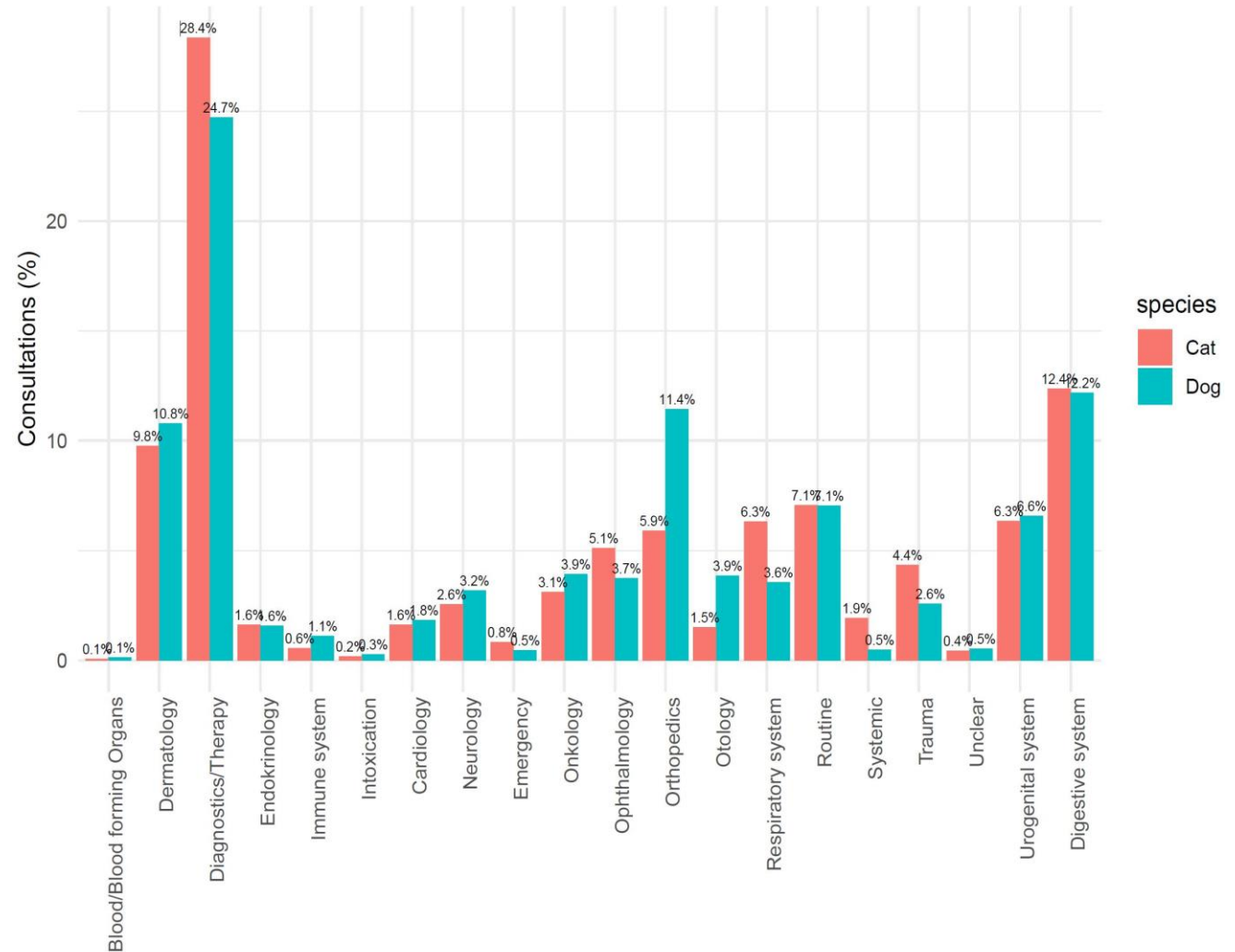


Figure 5. Percentage of consultations per indication group in cats and dogs.

Merle et al., 2025, doi: 10.3390/antibiotics14010058

Percentage of consultations with treatment per indication

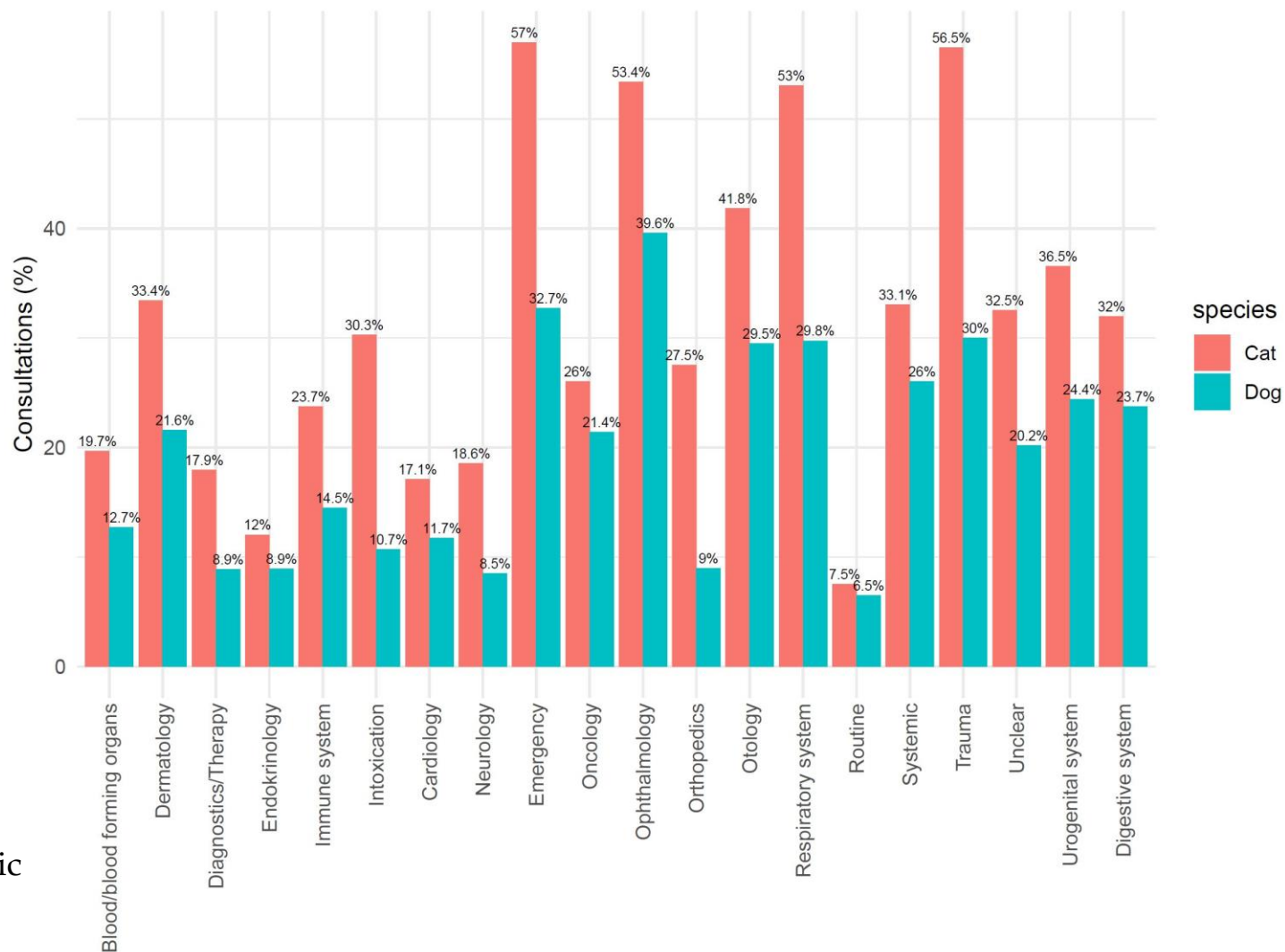


Figure 6. Percentage of consultations with antibiotic treatment per indication group in cats and dogs.
Merle et al., 2025, doi: 10.3390/antibiotics14010058

Future approaches using AI

- AI-supported transfer of voice recordings into the practice management software
 - Automatic assignment of content to the related fields
 - Notification if content is missing
 - Automated reporting to a national monitoring system
- Recording diagnoses
 - Better recognition and classification from free text
 - Several levels

The image shows a large number of three-dimensional wooden question marks scattered across the frame. The wood has a light, natural grain. The question marks are of various sizes and are piled together, creating a sense of abundance and depth. The lighting is soft and even, highlighting the texture of the wood. In the center of the image, the word "Questions?" is written in a clean, white, sans-serif font. The text is slightly larger than the individual wooden pieces, making it the focal point of the composition. The background is a continuous field of these wooden question marks, some in sharp focus and others blurred, suggesting a large quantity of them.

Questions?