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ORIGINAL RESEARCH

SUPPLEMENTARY SURVEY:

Knowledge, attitudes, and practices of veterinarians on antibiotic use and resistance and its containment in South Africa

There are 44 questions in this survey

SECTION 1. SOCIO-DEMOGRAPHIC CHARACTERISTICS OF PARTICIPANTS

What is your gender?

Please choose **only one** of the following:

- ○ Female
- ○ Male

What age group do you fall under?

Please choose **only one** of the following:

- ○ 20–25 years
- ○ 26–30 years
- ○ 31–35 years
- ○ 36–40 years
- ○ 41–45 years
- ○ 46–50 years
- ○ 51–55 years
- ○ 56–60 years
- ○ More than 60 years

What is your profession?

Please choose **only one** of the following:

- ○ Veterinarian
- ○ Veterinary nurse
- ○ Animal health technician
- ○ Veterinary technologist
- ○ Laboratory animal technologist
- ○ Animal welfare assistant
- ○ Veterinary physiotherapist

What is your qualification?

Please write your answer here:

At which university/institution did you obtain the qualification?

Please choose **only one** of the following:

- ○ University of Pretoria
- ○ Medical University of Southern Africa (MEDUNSA)
- ○ University of South Africa (UNISA)
- ○ Tshwane University of Technology
- ○ North-West University
- ○ Tsolo Agricultural and Rural Development Institute (TARDI)
- ○ Other

Which of the following describes the period of your graduation from the university/institution mentioned above?

Please choose **only one** of the following:

- ○ Prior to 1950
- ○ 1951–1960
- ○ 1961–1970
- ○ 1971–1980
- ○ 1981–1990
- ○ 1991–2000
- ○ 2001–2010
- ○ 2011–2019

What best describes your current employment setting? *

Please choose **all** that apply:

- ☐ General small animal practice
- ☐ General mixed animal practice
- ☐ Emergency practice
- ☐ Specialty practice
- ☐ Animal welfare
- ☐ Feline only practice
- ☐ Mobile practice
- ☐ Academic teaching hospital

☐ Locum
☐ Wildlife
☐ Retired
☐ Unemployed
☐ Other (i.e., Government industry)

Are you registered with the South African Veterinary Council (SAVC) as a specialist?

Please choose **only one** of the following:

◯ Yes
◯ No

Do you have any field of specialisation?

Please choose **only one** of the following:

◯ No field of specialisation
◯ State/regulatory veterinary medicine
◯ General pathology practice
◯ Clinical pathology practice
◯ Ophthalmology
◯ Radiology and veterinary imaging
◯ Rehabilitation and physiotherapy
◯ Soft tissue surgery
◯ Orthopaedic surgery
◯ Avian, exotic and zoological medicine
◯ Neurology
◯ Internal medicine
◯ Emergency/critical care/ICU
◯ Dermatology
◯ Cardiology
◯ Anaesthesia
◯ Behavioural medicine
◯ Dentistry
◯ Laboratory diagnostic practice
◯ Rural practice – food animal
◯ Equine practice
◯ In-hospital food animal
◯ Theriogenology
◯ Other

How many years have you been in veterinary practice?

Please choose **only one** of the following:

◯ < 1 year
◯ 1–5 years
◯ 6–10 years
◯ 11–15 years
◯ 16–20 years
◯ 21–25 years
◯ 26–30 years
◯ > 30 years

What proportion of your total professional activity is dedicated to clinical practice?

Please choose **only one** of the following:

◯ Less than 20%
◯ 20–39%
◯ 40–59%
◯ 60–79%
◯ 80–100%

Where do you practice?

Please choose **only one** of the following:

◯ Urban
◯ Rural

In which Province do you practice?

Please choose **only one** of the following:

◯ Gauteng
◯ North West
◯ KwaZulu-Natal
◯ Eastern Cape
◯ Limpopo
◯ Free State
◯ Mpumalanga
◯ Northern Cape
◯ Western Cape

SECTION 2. KNOWLEDGE

How important are the following sources of antibiotic information in determining your choice of antibiotic for clinical use?

Please choose the appropriate response for each item:

	Not at all important	Slightly important	Moderately important	Very important	Extremely important	Not applicable
Pharmaceutical company representative	○	○	○	○	○	○
Label or package insert	○	○	○	○	○	○
Peer-reviewed scientific literature	○	○	○	○	○	○
Peers within my service	○	○	○	○	○	○
Peers outside of service (clinician or pharmacist)	○	○	○	○	○	○
Veterinary Information Network (VIN)	○	○	○	○	○	○
Veterinary formulary	○	○	○	○	○	○
Online resource e.g. blog, media post, or web search	○	○	○	○	○	○
Textbook or drug handbook	○	○	○	○	○	○
Applications on a smartphone or tablet	○	○	○	○	○	○

For each of the following antibiotics, please indicate if they are used as first, second or third line agents.

Please choose the appropriate response for each item:

	First line	Second line	Third line	I do not use it	Not applicable
Amoxicillin	○	○	○	○	○
Amoxicillin-clavulanate	○	○	○	○	○
Amikacin	○	○	○	○	○
Oxytetracycline	○	○	○	○	○
Metronidazole	○	○	○	○	○
Enrofloxacin	○	○	○	○	○
Procaine penicillin	○	○	○	○	○
Cefovecin	○	○	○	○	○
Trimethoprim sulphonamide	○	○	○	○	○
Gentamicin	○	○	○	○	○
Vancomycin	○	○	○	○	○
Clindamycin	○	○	○	○	○
Chloramphenicol	○	○	○	○	○
Cephalexin	○	○	○	○	○
Marbofloxacin	○	○	○	○	○
Rifampicin	○	○	○	○	○

Do the following conditions require antibiotic therapy?

Please choose the appropriate response for each item:

	Yes	No	Not applicable
Diarrhoea?	○	○	○
Fever?	○	○	○
Urinary tract infection?	○	○	○
Skin infection?	○	○	○
Respiratory infection?	○	○	○
Ectoparasite infestation?	○	○	○
Parasitic- gastroenteritis?	○	○	○

Which of these is true about antibiotic resistance?

Please choose the appropriate response for each item:

	True	False	Not applicable
There is an increasing rate of infections resistant to antibiotics in animals	○	○	○
Infections from antibiotic-resistant bacteria could be difficult to treat	○	○	○
Antibiotic resistance can greatly affect the animal population	○	○	○
Antibiotic resistance is not an issue in South Africa	○	○	○
Antibiotic-resistant bacteria can spread from animal to animal	○	○	○
Antibiotic resistance in animals can spread to humans	○	○	○
Infections from antibiotic-resistant bacteria can make surgical procedures dangerous	○	○	○
Antibiotics should not be stored for later use in animals	○	○	○
Appropriate antibiotic use can reduce the risk of antibiotic-resistant bacterial infections in animals	○	○	○
The antibiotic resistance problem can be reduced by good farm security	○	○	○
Antibiotics should only be administered to animals when prescribed by veterinarians	○	○	○
Antibiotic resistance is one of the biggest problems in livestock production	○	○	○
Veterinarians should only prescribe antibiotics when necessary	○	○	○

In your opinion, which of the following contributes to antibiotic-resistant infections in people?

Please choose **all** that apply:

☐ Antibiotic use in human medicine

☐ Antibiotic use in small animal veterinary medicine

☐ Antibiotic use in food animal veterinary medicine

☐ Environmental pressure

☐ Random genetic mutations

☐ Not applicable

☐ Other:

Select any of the following factors in veterinary medicine that you believe may play a role in antibiotic-resistant infections in people.

Please choose **all** that apply:

- ☐ Client non-compliance when giving antibiotics to their animals
- ☐ Clients' expectation of receiving antibiotics for their animals
- ☐ Over prescribing of antibiotics to animals
- ☐ Inadequate dose, frequency or duration of antibiotics prescribed to animals
- ☐ The use of medically important antibiotics (i.e., those used in human medicine) in veterinary medicine
- ☐ Antibiotic use in veterinary medicine does not contribute to antibiotic-resistant infections in people
- ☐ Not enough evidence to link antibiotic use in veterinary medicine and antibiotic resistance in people
- ☐ Not applicable
- ☐ Other:

Please indicate how strongly you agree with each of the following statements.

Please choose the appropriate response for each item:

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Not applicable
I understand what antibiotic stewardship is	○	○	○	○	○	○
I understand antibiotic resistance mechanisms	○	○	○	○	○	○
I have a good knowledge of the pharmacology of antibiotics	○	○	○	○	○	○
I know how to use antibiotics to minimise the risk of antibiotic resistance developing	○	○	○	○	○	○

To what extent did your veterinary training alone, adequately equip you with knowledge on rational use of antibiotics?

Please choose **only one** of the following:

- ○ Not at all
- ○ A little
- ○ Somewhat
- ○ Quite a bit
- ○ Very much
- ○ Not applicable

Would you be interested in obtaining continuing professional education (CPD) pertaining to antibiotic use/resistance or stewardship?

Please choose **only one** of the following:

- ○ Yes
- ○ No
- ○ Not sure
- ○ Not applicable

SECTION 3. ATTITUDES

Which one of the following best represents your opinion about antibiotic use at your clinic/practice/institute?

Please choose **only one** of the following:

- ○ Antibiotics are sometimes prescribed based on no documented evidence of infection
- ○ Antibiotics are sometimes prescribed for suspected (but not confirmed) infections
- ○ Antibiotics are prescribed based only on confirmed infection
- ○ Not sure
- ○ Not applicable

Which one of the following best represents your opinion about antibiotic prescription at your practice/clinic/institute?

Please choose **only one** of the following:

- ○ Antibiotics are under-prescribed
- ○ Antibiotics are optimally prescribed
- ○ Antibiotics are over-prescribed
- ○ Not applicable

How do you rate your degree of concern about antibiotic-resistant infections?

Please choose **only one** of the following:

- ○ Not concerned
- ○ Slightly concerned
- ○ Moderately concerned
- ○ Quite concerned
- ○ Very concerned
- ○ Not applicable

To what extent do you agree or disagree with the following statement? "Antibiotic classes commonly used in human medicine should not be used in veterinary medicine because their use in veterinary medicine selects for antibiotic resistance in bacteria that can cause infections in humans."

Please choose **only one** of the following:

- ○ Strongly disagree
- ○ Disagree
- ○ Neither disagree nor agree
- ○ Agree
- ○ Strongly agree
- ○ Not applicable

To what extent do you agree or disagree with the following statement? "Antibiotic drug use in veterinary practice may lead to antibiotic resistance in pathogens affecting humans."

Please choose **only one** of the following:

- ○ Strongly disagree
- ○ Disagree
- ○ Neither disagree nor agree
- ○ Agree
- ○ Strongly agree
- ○ Not applicable

Which of the following factors in veterinary medicine pose a challenge to implementing and using an antibiotic stewardship plan (i.e., a protocol for judicious antibiotic use)? (Select all that apply)

Please choose **all** that apply:

- ☐ Client expectations of receiving antibiotics
- ☐ Time required for adequate client education
- ☐ Practice culture
- ☐ Cost of diagnostics (i.e., bacterial culture/sensitivity)
- ☐ Time to results of diagnostics (i.e., bacterial culture/sensitivity)
- ☐ Current low rates of antibiotic prescribing
- ☐ Antibiotic stewardship plans are not needed in veterinary medicine
- ☐ There are no barriers to antibiotic stewardship plans in veterinary medicine
- ☐ Not applicable
- ☐ Other:

How often do you discuss antibiotic resistance with your clients?

Please choose **only one** of the following:

- ○ Never
- ○ Rarely
- ○ Sometimes
- ○ Often
- ○ Always
- ○ Not applicable

How do you rate the majority of your clients' concerns about antibiotic resistance?

Please choose **only one** of the following:

- ○ Not concerned
- ○ Slightly concerned
- ○ Moderately concerned
- ○ Quite concerned
- ○ Very concerned
- ○ Not applicable

SECTION 4. PRACTICES AND EXPERIENCES

What are the 3 most important factors that would influence your decision to submit samples for culture and sensitivity testing?

Please choose **all** that apply:

- ☐ Location of the infection
- ☐ Ease of obtaining a sample
- ☐ Persistent infection
- ☐ Severe infection
- ☐ Client finances

- ☐ Unusual infection
- ☐ Atypical cytology
- ☐ To confirm a diagnosis
- ☐ Herd problems
- ☐ Recurring infections
- ☐ Not applicable
- ☐ Other:

How important are the following factors in determining your choice of antibiotic for clinical use?

Please choose the appropriate response for each item:

	Not at all important	Slightly important	Moderately important	Very important	Extremely important	Not applicable
Clinical signs	○	○	○	○	○	○
History of previous antibiotic use on the animal	○	○	○	○	○	○
Pressure from clients/producers	○	○	○	○	○	○
Peer or colleague recommendations	○	○	○	○	○	○
Cost implications	○	○	○	○	○	○
Results of cytological evaluation	○	○	○	○	○	○
Results of bacteriological culture and antibiotic susceptibility testing	○	○	○	○	○	○
Route of administration	○	○	○	○	○	○
Frequency of administration	○	○	○	○	○	○
Medication size or volume	○	○	○	○	○	○
Clinical/practice/institute guidelines	○	○	○	○	○	○
Potential for adverse reactions	○	○	○	○	○	○
Availability of antibiotic agent(s)	○	○	○	○	○	○
Concerns about antibiotic resistance issues in animals	○	○	○	○	○	○
Concerns about antibiotic resistance issues in humans	○	○	○	○	○	○
Fear of litigation by the client/ producer in the event of an undesirable clinical outcome	○	○	○	○	○	○
Concerns about animal welfare	○	○	○	○	○	○
Prudent use guidelines	○	○	○	○	○	○
Drug withdrawal periods	○	○	○	○	○	○
Compliance by the client/ producer to the prescription	○	○	○	○	○	○

How frequently do you read veterinary guidelines for judicious use of antibiotics?

Please choose **only one** of the following:

- ○ Never
- ○ Rarely
- ○ Sometimes
- ○ Very often
- ○ Always
- ○ Not applicable

How often do you prescribe antibiotics for therapeutic treatment of infectious diseases in your clinical setting?

Please choose **only one** of the following:

- ○ Never
- ○ Once a day
- ○ 2 times a day
- ○ 3–5 times a day
- ○ > 5 times a day
- ○ Not applicable

How often do you prescribe antibiotics for metaphylaxis?

Please choose **only one** of the following:

- ○ Never
- ○ Once a day
- ○ 2 times a day
- ○ 3–5 times a day
- ○ > 5 times a day
- ○ Not applicable

How often do you prescribe antibiotics for preoperative prophylaxis of infections?

Please choose **only one** of the following:

- ○ Never
- ○ 1–2 cases out of every 10 surgical patients
- ○ 3–5 cases out of every 10 surgical patients
- ○ 6–8 cases out of every 10 surgical patients
- ○ > 8 cases out of every 10 surgical patients
- ○ Not applicable

How often do you prescribe antibiotics for prophylaxis of infectious diseases?

Please choose **only one** of the following:

- ○ Never
- ○ Once a day
- ○ 2 times a day
- ○ 3–5 times a day
- ○ > 5 times a day
- ○ Not applicable

How often do you prescribe antibiotics to prevent postoperative infections?

Please choose **only one** of the following:

- ○ Never
- ○ 1–2 cases out of every 10 surgical patients
- ○ 3–5 cases out of every 10 surgical patients
- ○ 6–8 cases out of every 10 surgical patients
- ○ > 8 cases out of every 10 surgical patients
- ○ Not applicable

How often do you prescribe the following classes of antibiotics?

Please choose the appropriate response for each item:

	Never	Rarely	Sometimes	Very often	Always	Not applicable
Aminoglycosides	○	○	○	○	○	○
Cephalosporins	○	○	○	○	○	○
Fluoroquinolones	○	○	○	○	○	○
Lincosamides	○	○	○	○	○	○
Macrolides	○	○	○	○	○	○
Penicillins	○	○	○	○	○	○
Sulfas	○	○	○	○	○	○
Tetracyclines	○	○	○	○	○	○

Have you ever prescribed or administered any of the following antibiotics (Select all that apply)?

Please choose **all** that apply:

- ☐ Imipenem
- ☐ Linezolid
- ☐ Polymyxin B (Terra-cortril® and or Surolan®)
- ☐ Vancomycin
- ☐ No, I have not prescribed or administered any of these antibiotics
- ☐ Unsure
- ☐ Not applicable

What are the 5 antibiotic drugs that you commonly prescribe? (Rank from the most to the least.)

(*If the question doesn't apply, please indicate with "Not applicable".*)

Please write your answer here:

For each of the following scenarios please indicate the level of biosecurity you would take for examination and performing procedures.

Please choose the appropriate response for each item:

	None	Handwash after contact	Gloves only	Apron only	Gloves and apron	Not applicable
Routine examination of a dog or cat	○	○	○	○	○	○
Routine examination of a horse	○	○	○	○	○	○
Routine examination of a cow	○	○	○	○	○	○
Horse with fever of unknown origin and neurological signs	○	○	○	○	○	○
Horse with acute watery diarrhoea	○	○	○	○	○	○
Cow with acute watery diarrhoea	○	○	○	○	○	○
Respiratory signs of 4 days duration in an otherwise healthy cat	○	○	○	○	○	○
Postmortem examination of a cow	○	○	○	○	○	○
Postmortem examination of a horse	○	○	○	○	○	○
Aborted foetal material from a horse	○	○	○	○	○	○
Routine dental prophylaxis in a dog	○	○	○	○	○	○
Cow with dystocia	○	○	○	○	○	○
Goats with poor conception rates	○	○	○	○	○	○
Mare with dystocia	○	○	○	○	○	○
Methicillin-resistant *Staphylococcus pseudintermedius dermatitis*	○	○	○	○	○	○
An animal with a multi-drug resistant urinary tract infection	○	○	○	○	○	○
When entering a pig farm	○	○	○	○	○	○

Antibiotic stewardship programmes are coordinated interventions designed to improve and measure the appropriate use of antibiotics by promoting the selection of optimal antibiotic regimens, dose, and duration of therapy and route of administration. Does your practice/clinic/institute have an antibiotic stewardship programme?

Please choose **only one** of the following:

○ No

○ Not sure

○ Yes

○ Not applicable

If your answer was no above, do you think that your practice should develop and implement an antibiotic stewardship programme?

Please choose **only one** of the following:

○ Yes

○ No

○ Not sure

○ Not applicable

Thank you for your participation.

Submit your survey.
Thank you for completing this survey.

Supplementary Data

Table SI: Socio-demographic characteristics of the veterinary participants

Variable	Number (%) of respondents
Gender	
Female	49 (48)
Male	53 (52)
Years in veterinary practice	
0–10 years	34 (33.3)
11–20 years	18 (17.6)
+ 20 years	50 (49)
Age group	
20–40 years	32 (31.4)
+ 40 years	70 (68.6)
Qualification	
BVSc only	68 (66.7)
BVSc and other	28 (27.5)
Other	6 (5.9)
University attended	
University of Pretoria	93 (91.2)
Other	9 (8.8)
Current employment setting	
General small animal practice	56 (54.9)
General mixed animal practice	20 (19.6)
Emergency practice	4 (3.9)
Specialty practice	11 (10.8)
Animal welfare	6 (5.9)
Feline only practice	0 (0)
Mobile practice	7 (6.9)
Academic teaching hospital	6 (5.9)
Locum	10 (9.8)
Wildlife	7 (6.9)
Retired	0 (0)
Unemployed	1 (1)
Other i.e., Government industry	14 (13.7)
Registered as specialists	38 (37.3)
Proportion of total professional activity dedicated to clinical practice	
Less than 20%	9 (8.8)
20–39%	8 (7.8)
40–59%	9 (8.8)
60–79%	8 (7.8)
80–100%	68 (66.7)
Place of practice	
Rural	38 (37.3)
Urban	64 (62.7)
Province of practice	
Gauteng	42 (41.2)
Free state	5 (4.9)
North West	6 (5.9)
Mpumalanga	3 (2.9)
KwaZulu-Natal	15 (14.7)
Northern Cape	3 (2.9)
Eastern Cape	3 (2.9)
Western Cape	24 (23.5)
Limpopo	1 (1.0)

Table SII: Opinion on conditions requiring antibiotic therapy

Condition	Number (%) of respondents
Diarrhoea	31 (30.4)
Fever	32 (31.4)
Urinary tract infection	89 (87.3)
Skin infection	80 (78.4)
Respiratory infection	98 (96.1)
Ectoparasite infestation	99 (97.1)
Parasitic gastroenteritis	6 (5.9)

Table SIIIA: Association between socio-demographic factors and selected knowledge variables

Factor	Knowledge of antibiotic resistance		Opinion on contributors to antibiotic-resistant infections in people		Selection of factors in veterinary medicine playing a role in antibiotic-resistant infections in people	
	Mean (+/- SD)	Independent t-test/ANOVA *p*-value	Mean (+/- SD)	Independent t-test/ANOVA *p*-value	Mean (+/- SD)	Independent t-test/ ANOVA *p*-value
Gender						
Female	11.67 (1.42)	[I]0.447	1.94 (1.25)	[I]0.661	3.78 (1.33)	[I]0.147
Male	11.47 (1.25)		2.04 (1.02)		4.11 (0.99)	
Age						
20–40 years	11.81 (1.00)	[I]0.213	1.75 (1.08)	[I]0.148	3.97 (1.20)	[I]0.918
+ 40 years	11.46 (1.45)		2.10 (1.14)		3.94 (1.17)	
Veterinary experience						
0–10 years	11.82 (1.00)	[A]0.235	1.74 (1.05)	[A]0.206	3.94 (1.18)	[A]0.157
11–20 years	11.17 (1.69)		1.94 (1.30)		3.50 (1.25)	
+ 20 years	11.54 (1.37)		2.18 (1.10)		4.12 (1.12)	
Place of practice						
Rural	11.08 (1.67)	[I]**0.004***	2.13 (1.12)	[I]0.333	3.76 (1.28)	[I]0.21
Urban	11.86 (1.00)		1.91 (1.14)		4.06 (1.10)	

Table SIIIB: Association between socio-demographic factors and selected knowledge variables

Factor	Importance of sources of antibiotic information in determining choice of antibiotic for clinical use		Knowledge of antibiotic stewardship, antibiotic resistance mechanisms, and pharmacology	
	Mean (+/- SD)	Independent t-test/ANOVA *p*-value	Mean (+/- SD)	Independent t-test/ANOVA *p*-value
Gender				
Female	5.37 (2.21)	[I]0.524	3.27 (0.93)	[I]0.478
Male	5.62 (1.81)		3.40 (0.93)	
Age				
20–40	5.44 (2.11)	[I]0.833	3.13 (1.10)	[I]0.125
+ 40	5.53 (1.98)		3.43 (0.83)	
Veterinary experience				
0–10 years	5.47 (2.06)	[A]0.112	3.15 (1.08)	[A]0.136
11–20 years	4.67 (2.25)		3.17 (1.10)	
+ 20 years	5.82 (1.83)		3.52 (0.71)	
Place of practice				
Rural	5.45 (1.97)	[I]0.804	3.24 (1.00)	[I]0.420
Urban	5.53 (2.05)		3.39 (0.88)	

Table SIIIC: Association between socio-demographic factors and selected knowledge variables

Variables	The extent to which veterinary training alone adequately equipped veterinarians with knowledge on the rational use of antibiotics						Chi-square *p*-value
	Not at all/a little		Somewhat		Quite a bit/very much		
	n	%	*n*	%	*n*	%	
Gender							
Female	2	5.9	8	23.5	24	70.6	0.103
Male	1	2.5	3	7.5	36	90	
Age							
20–40	0	0	2	11.1	16	88.9	0.504
+ 40	3	5.4	9	16.1	44	78.6	
Veterinary experience							
0–10 years	0	0	2	11.1	16	88.9	0.498
11–20 years	0	0	2	12.5	14	87.5	
+ 20 years	3	7.5	7	17.5	30	75	
Place of practice							
Rural	0	0	3	12.5	21	87.5	0.416
Urban	3	6	8	16.0	39	78	

Table SIV: Association between socio-demographic factors and selected attitude variables

Variables	Opinion about antibiotic use at the clinic/practice/institute						Chi-square *p*-value
	Antibiotics are sometimes prescribed for suspected but not confirmed infections		Antibiotics are prescribed based only on confirmed infection		Antibiotics are sometimes prescribed based on no documented evidence of infection		
	n	%	*n*	%	*n*	%	
Gender							
Female	37	75.5	8	16.3	4	8.2	0.553
Male	44	83	7	13.2	2	3.8	
Age							
20–40	27	84.4	4	12.5	1	3.1	0.637
+ 40	54	77.1	11	15.7	5	7.1	
Veterinary experience							
0–10 years	29	85.3	4	11.8	1	2.9	0.682
11–20 years	14	77.8	2	11.1	2	11.1	
+ 20 years	38	76	9	18	3	6	
Place of practice							
Rural	29	76.3	8	21.1	1	2.6	0.244
Urban	52	81.3	7	10.9	5	7.8	
	Opinion about antibiotic prescription at clinic/practice/institute						
	Antibiotics are over-prescribed		**Antibiotics are under-prescribed**		**Antibiotics are optimally prescribed**		
	n	%	*n*	%	*n*	%	
Gender							
Female	24	49	1	2	24	49	0.335
Male	21	39.6	0	0	32	60.4	
Age							
20–40	15	46.9	0	0	17	53.1	0.754
+ 40	30	42.9	1	1.4	39	55.7	
Veterinary experience							
0–10 years	15	44.1	0	0	19	55.9	0.312
11–20 years	8	44.4	1	5.6	9	50	
+ 20 years	22	44	0	0	28	56	
Place of practice							
Rural	14	36.8	1	2.6	23	60.5	0.252
Urban	31	48.4	0	0	33	51.6	
	The extent of agreeing on antibiotic use in veterinary practice leading to antibiotic resistance in pathogens affecting humans						
	Strongly disagree/ Disagree		**Neither agree nor disagree**		**Agree/Strongly agree**		
	n	%	*n*	%	*n*	%	
Gender							
Female	6	12.2	7	14.3	36	73.5	0.901
Male	8	15.1	8	15.1	37	69.8	
Age							
20–40	3	9.4	5	15.6	24	75	0.688
+ 40	11	15.7	10	14.3	49	70	
Place of practice							
Rural	6	15.8	5	13.2	27	71.1	0.865
Urban	8	12.5	10	15.6	46	71.9	

	Rating the degree of concern about antibiotic-resistant infections						
	Not concerned/Slightly concerned		Moderately concerned		Quite concerned/Very concerned		
Gender							
Female	1	4.2	3	12.5	20	83.3	0.563
Male	0	0	4	17.4	19	82.6	
Age							
20–40	0	0	1	6.7	14	93.3	0.416
+ 40	1	3.1	6	18.8	25	78.1	
Veterinary experience							
0–10 years	0	0	1	6.3	15	93.8	0.053
11–20	0	0	5	38.5	8	61.5	
+ 20 years	1	5.6	1	5.6	16	88.9	
Place of practice							
Rural	1	5.9	2	11.8	14	82.4	0.379
Urban	0	0	5	16.7	25	83.3	
	Rating client concerns on antibiotic resistance						
	Not concerned/Slightly concerned		**Moderately concerned**		**Quite concerned/Very concerned**		
	n	%	*n*	%	*n*	%	
Veterinary experience							
0–10 years	18	54.5	10	30.3	5	15.2	0.332
11–20 years	8	47.1	6	35.3	3	17.6	
+ 20 years	15	31.3	22	45.8	11	22.9	
Age							
20–40	16	51.6	10	32.3	5	16.1	0.410
+ 40	25	37.3	28	41.8	14	20.9	
Place of practice							
Rural	17	45.9	12	32.4	8	21.6	0.604
Urban	24	39.3	26	42.6	11	18	
	The extent of agreeing on the statement "Antibiotic classes commonly used in human medicine should not be used in veterinary medicine because veterinary use selects for antibiotic resistance in bacteria".						
	Strongly disagree/ Disagree		**Neither disagree nor agree**		**Strongly agree/Agree**		
Gender							
Female	8	26.7	13	43.3	9	30	0.509
Male	9	25.7	11	31.4	15	42.9	
Age							
20–40	3	13.6	10	45.5	9	40.9	0.248
+ 40	14	32.6	14	32.6	15	34.9	
Veterinary experience							
0–10 years	4	16.7	11	45.8	9	37.5	0.078
11–20 years	3	37	5	62.5	0	0	
+ 20 years	10	30.3	8	24.2	15	45.5	
Place of practice							
Rural	7	25	9	32.1	12	42.9	0.671
Urban	10	27	15	40.5	12	32.4	

Table SVA: Association between socio-demographic factors and selected practice variables

Factor	Frequency of prescribing classes of antibiotics		Frequency of prescribing antibiotics for therapeutic treatment of infectious diseases in the clinical setting		Importance of factors in determining choice of antibiotic for clinical use	
	Mean (+/- SD)	Independent t-test/ ANOVA *p*-value	Mean (+/- SD)	Independent t-test/ ANOVA *p*-value	Mean (+/- SD)	Independent t-test/ ANOVA *p*-value
Gender						
Female	2.51 (1.17)	[I]0.487	2.63 (1.02)	[I]0.838	10.33 (4.13)	[I]0.610
Male	2.68 (1.27)		2.58 (1.05)		9.92 (3.81)	
Age						
20–40	2.56 (1.01)	[I]0.844	2.62 (0.98)	[I]0.919	9.88 (3.89)	[I]0.677
+ 40	2.61 (1.31)		2.60 (1.06)		10.23 (4.00)	
Veterinary experience						
0–10 years	5.47 (2.06)	[A]0.112	2.65 (0.99)	[A]0.707	9.74 (3.91)	[A]0.315
11–20 years	4.67 (2.25)		2.40 (0.99)		9.22 (4.76)	
+ 20 years	5.82 (1.83)		2.64 (1.09)		10.70 (3.64)	
Place of practice						
Rural	2.68 (1.25)	[I]0.585	2.42 (1.15)	[I]0.211	10.11 (3.28)	[I]0.981
Urban	2.55 (1.21)		2.71 (0.96)		10.13 (4.32)	

Table SVB: Association between socio-demographic factors and selected practice variables

Variables	Frequency of reading veterinary guidelines for appropriate use of antibiotics						Chi-square *p*-value
	Never/Rarely		Sometimes		Very often/Always		
Gender							
Female	9	18.8	23	47.9	16	33.3	0.104
Male	4	7.5	22	41.5	27	50.9	
Age							
20–40	6	18.8	16	50	10	31.3	0.225
+ 40	7	10.1	29	42	33	47.8	
Veterinary experience							
0–10 years	6	17.6	16	47.1	12	35.3	0.252
11–20 years	2	11.1	11	61.1	5	27.8	
+ 20 years	5	10.2	18	36.7	26	53.1	
Place of practice							
Rural	5	13.2	17	44.7	16	42.1	0.996
Urban	8	12.7	28	44.4	27	42.9	
	Frequency of discussing antibiotic resistance with clients						
	Never/Rarely		Sometimes		Often/Always		
Gender							
Female	8	16.7	15	31.3	25	52.1	0.378
Male	4	7.7	19	36.5	29	55.8	
Age							
20–40	4	12.5	9	28.1	19	59.4	0.691
+ 40	8	11.8	25	36.8	35	51.5	
Veterinary experience							
0–10 years	4	11.8	10	29.4	20	58.8	0.555
11–20 years	4	22.2	10	55.6	4	22.2	
+ 20 years	4	8.3	14	29.2	30	62.5	

	Client finances as an influence on the decision to submit samples for culture and sensitivity				
	No		Yes		
	n	%	*n*	%	
Place of practice					
Rural	19	50	19	50	0.647
Urban	35	54.7	29	45.3	
	Recurring infections as an influence on the decision to submit samples for culture and sensitivity				
	No		**Yes**		
Gender					
Female	13	26.5	36	73.5	0.682
Male	16	30.2	37	69.8	
Age					
20–40	5	15.6	27	84.4	0.053
+ 40	24	34.3	46	65.7	
Veterinary experience					
0–10 years	5	14.7	29	85.3	0.057
11–20 years	8	44.4	10	55.6	
+ 20 years	16	32	34	68	
Place of practice					
Rural	9	23.7	29	76.3	0.413
Urban	20	31.3	44	68.8	
	Persistent infection as an influence on the decision to submit samples for culture and sensitivity				
	No		**Yes**		
Gender					
Female	5	10.2	44	89.8	0.459
Male	8	15.1	45	84.9	
Age					
20–40	4	12.5	28	87.5	0.960
+ 40	9	12.9	61	87.1	
Veterinary experience					
0–10 years	4	11.8	30	88.2	0.511
11–20 years	1	5.6	17	94.4	
+ 20 years	8	16	42	84	
Place of practice					
Rural	8	21.1	30	78.9	0.053
Urban	5	7.8	59	92.2	

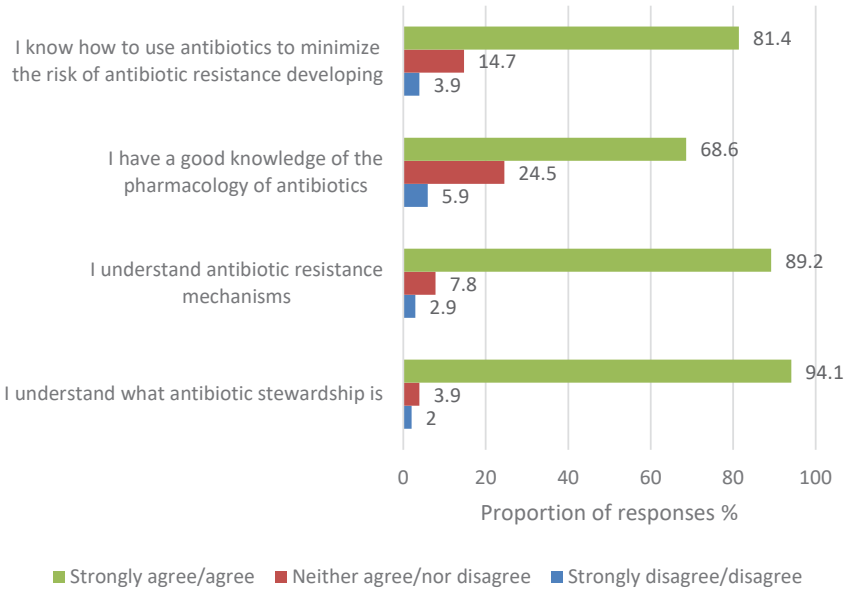

Figure S1: Knowledge on pharmacology, antibiotic resistance and antibiotic stewardship

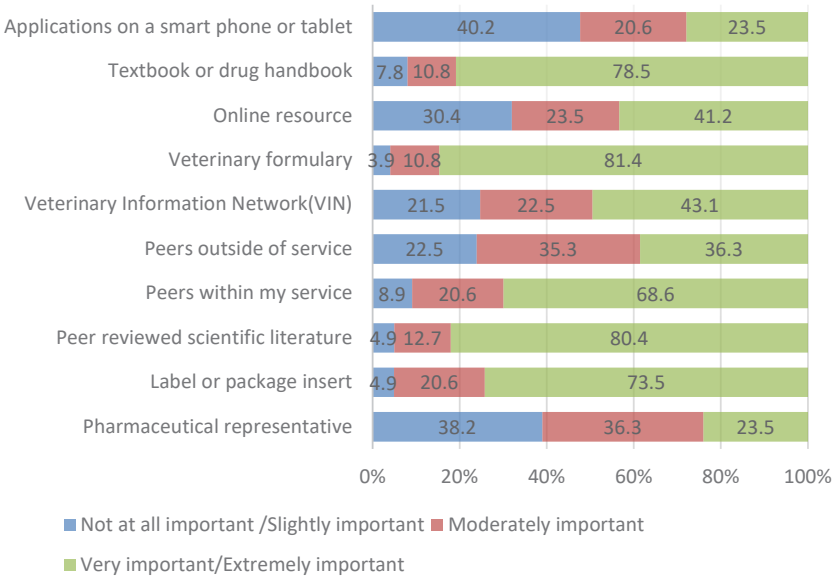

Figure S2: Sources of information on choice of antibiotic

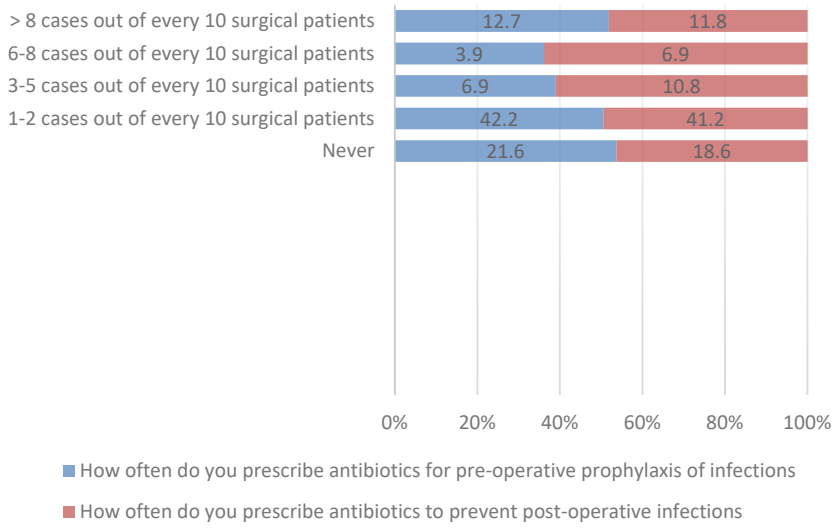

Figure S3: Frequency of prescribing antibiotics for surgical patients