Award Lectures of
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Healthy People, Healthy Animals: The Power of One Health in Tackling Public Health Threats

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OUTLINE

http://www.onehealthglobal.net/meetings/meetings-2013/2nd-grf-one-health-summit-2013/attachment/one-health-logo/

Background

5%

AMR in pets

90%

AMR in pet birds

30%

AMR in household cats

30%

AMR in dogs, cats, exotic pets

30%

Conclusions

5%

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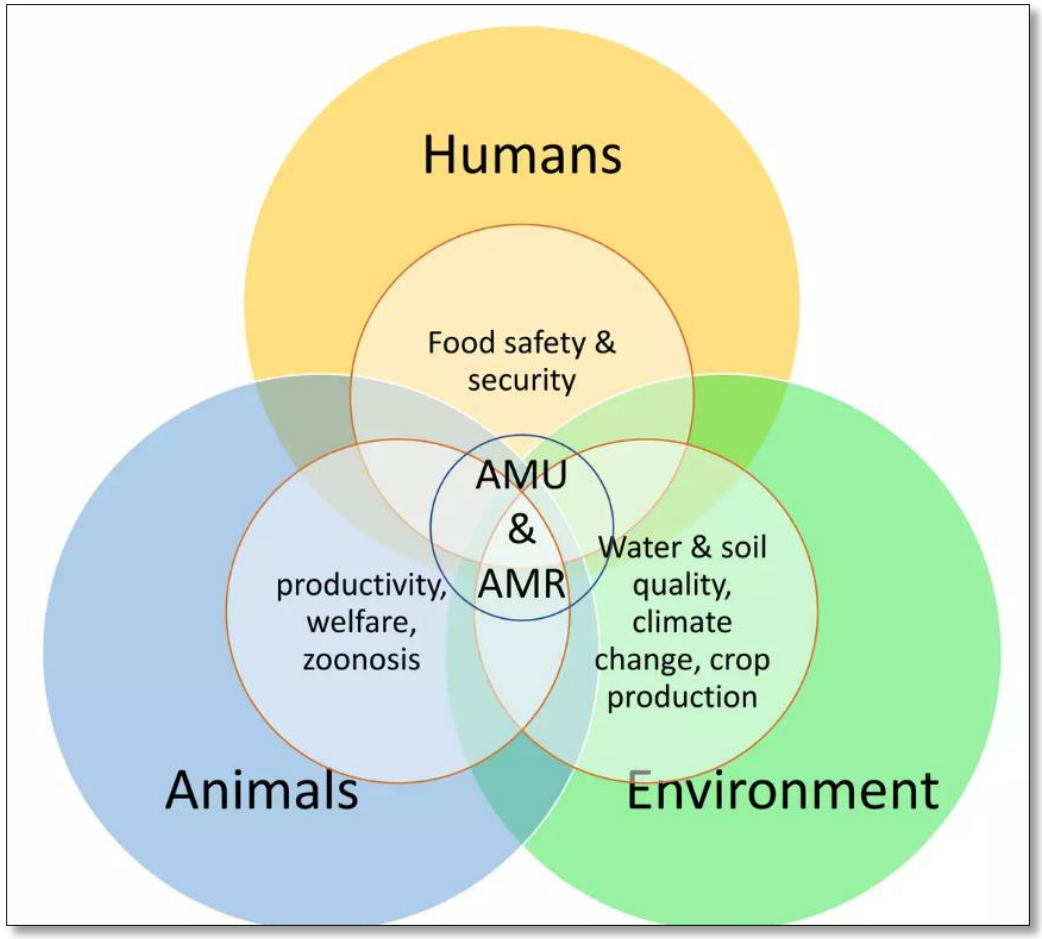
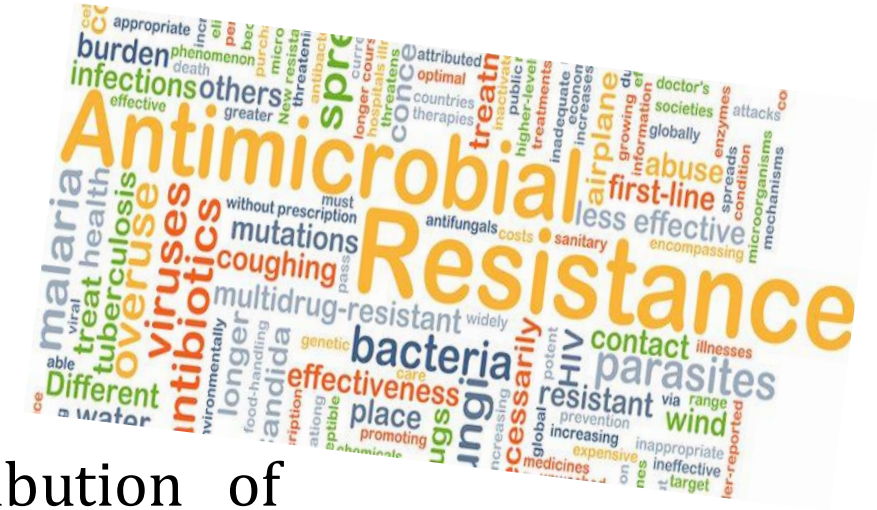
One Health

'One Health' is the collaborative efforts of multiple disciplines working locally, nationally and globally to attain optimal health for humans, animals and our environment.

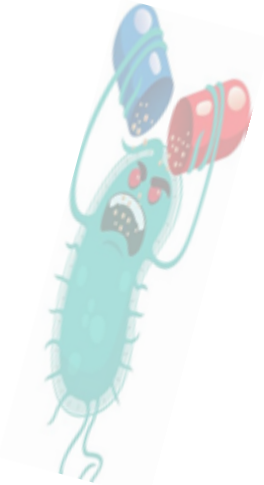
-American Veterinary Medical Association



Antimicrobial Resistance



- Antimicrobial Resistance (AMR) is globally rising public health threat.
- Lack of information on the trends and distribution of resistant pathogens especially in developing countries.
- South-East Asia and Middle East identified as two of the three major regions with the largest gaps in reporting (WHO Global Report on Surveillance, 2014).



Antimicrobial Resistance

Inappropriate Use of Antibiotics in Human Medicine

› Most commonly prescribed medications
› 80% of hospitalized patients receiving antibiotics
› Obtained without a physician prescription

Inappropriate Use of Antibiotics in Veterinary Medicine

› Antibiotics misuse in livestock and fish
› Therapeutic and prophylactic (growth promoter)

AMR Drivers

› Lack of water, sanitation, and hygiene (WASH) infrastructure

Lake of hygiene and infection prevention and control strategies

› Refugee and travelers

Political conflicts and human mobility

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Antimicrobial Resistance

Limitations

1. Number of sites recruited to compile the data (WHO, 2017).
2. Sites have access to human data only
3. AMR data from animal and environment are limited
4. Focus on farm animals

One Health Approach is needed to address AMR

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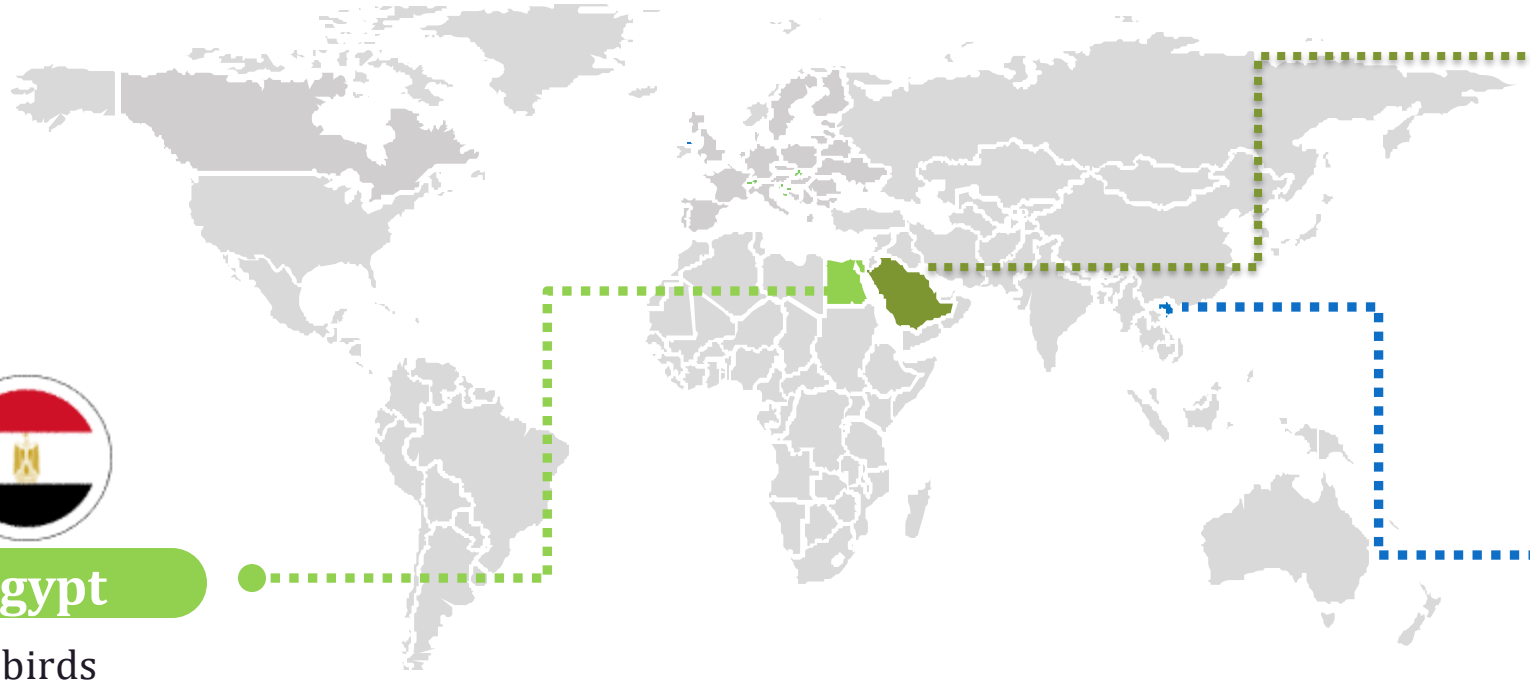
AMR in Pet Animals



Saudi Arabia

- Household cats

Egypt

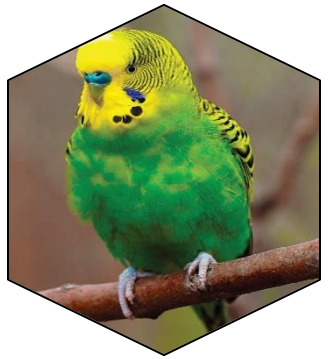
- Pet birds
- Pet shop worker

Hong Kong

- Dogs
- Cats
- Exotic pets (including turtles, snakes, frogs, lizards, pigeons, Chinchilla, guinea pigs, rabbits, pet fish)

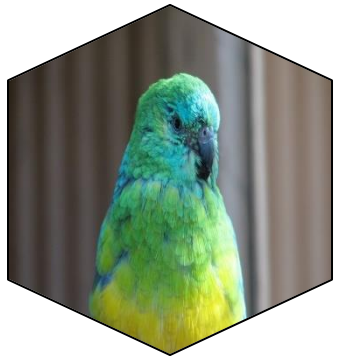
I - AMR in Pet Birds

- Are birds bred for ornamental use
- Zoonotic bacteria
- In Egypt, the practices of keeping birds as pet increased significantly



Budgerigar

Rosy-faced lovebird



Red-rumped parrot

Objectives:

- Prevalence of AMR zoonotic bacteria in pet birds and their human contacts.
- Genetic relatedness between isolates from birds and human sources.

Methodology:

- 125 cloacal and tracheal swabs
- 70 hand swabs
- 25 pet shops
- Bacterial isolation: Seven bacterial species
- Molecular identification, AMR testing, Virulotyping and Genotyping

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Main findings:

- Pet birds (38%) and human contacts (40%) were positive for at least one bacterium.
- ***Campylobacter*** and ***Chlamydia*** **spp.** were not identified in both birds and humans.
- ***S. typhimurium*** (4%) and ***P. multocida*** (0.8%) were detected only in birds.

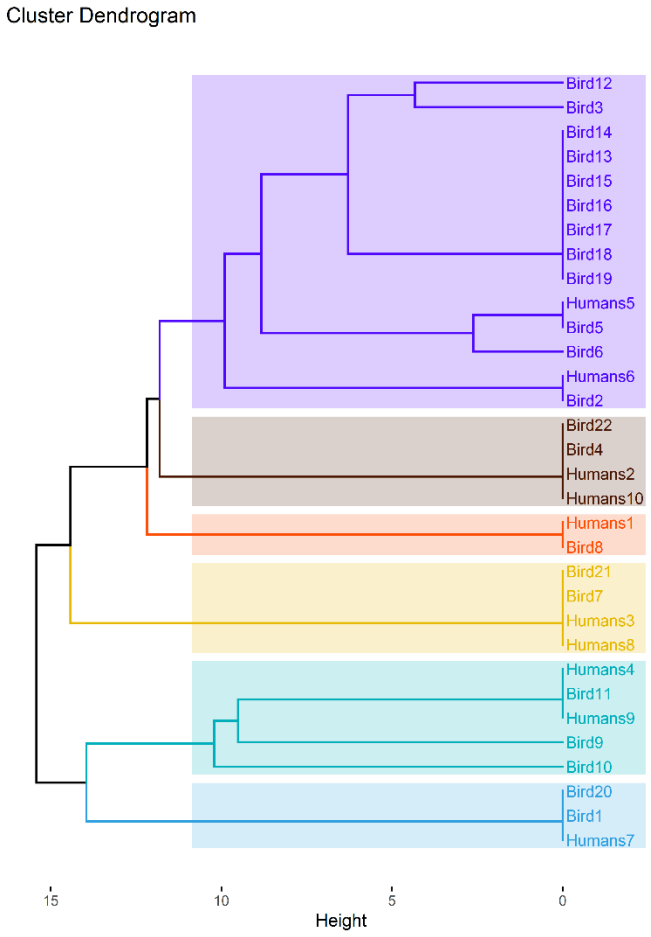
	No. examined	Number and species of bacteria (%)					Total
		Staph	***E. coli***	***Klebsiella***	***Salmonella***	***Pasteurella***	
Birds	125	19 (15.2)	22 (17.6)	22 (17.6)	5 (4.0)	1 (0.8)	**48 (38.4)**
Workers	70	17 (24.3)	10 (14.3)	9 (12.9)	0 (0.0)	0 (0.0)	**28 (40.0)**

E. coli

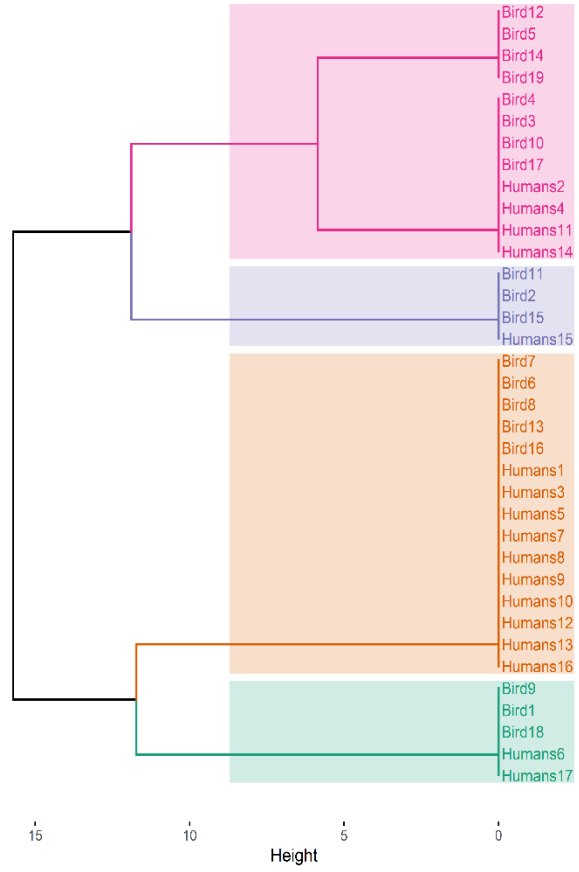
- 18% of birds and 14% humans
- Virulence genes (stx1, stx2, eaeA, hlyA): 60% and 27% of E. coli isolates recovered from birds and humans.
- MDR: 81% birds and 70% humans.

S. aureus

- 15% birds and 24% humans
- Virulence genes (PVL, sea, sed): 42% birds and 47% of humans.
- MRSA: 32% birds and 18% humans
- MDR: 61% of all isolates including MRSA.



Non-metric multidimensional scaling (nMDS) plot



II - AMR in Household Cats

- Share common environment with the owners
- Treated with antimicrobial agents commonly prescribed to humans
- Potential reservoirs for AMR zoonotic bacteria.

Objectives:

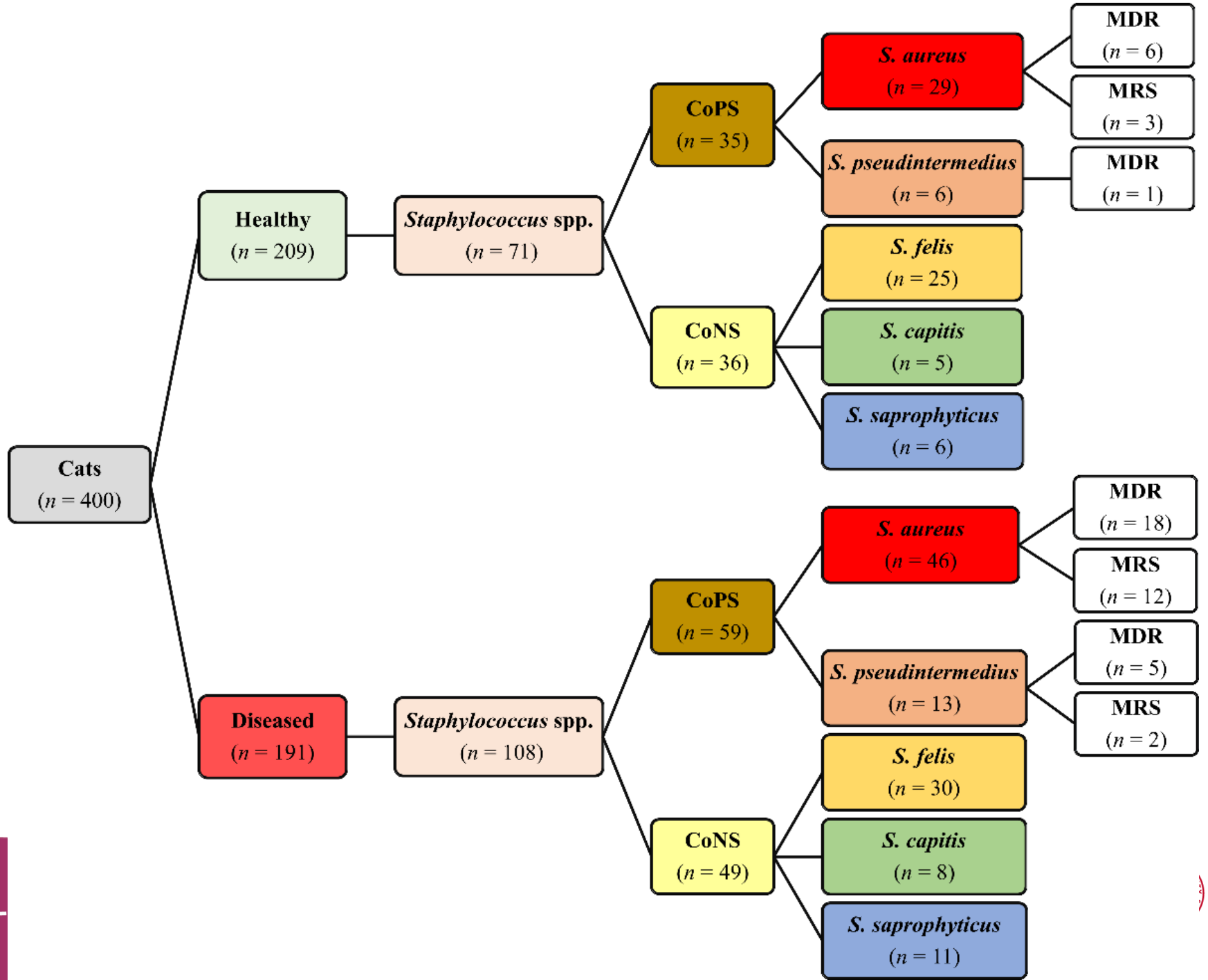
- Investigate the diversity in Staphylococcus spp. recovered from different anatomical locations in healthy and diseased cats
- Determine the occurrence of MDR and MRS spp. as well as possible risk factors associated with colonization in these cats.

Data:

- 2000 swabs
- 400 cats (209 Healthy and 191 Diseased)
- 5 swabs each cat (skin, anus, ear canal, conjunctival sac and nares).
- Questionnaire (demographics, health status, management, and antimicrobial usage)

Main findings:

Staphylococcus spp. isolated from healthy and diseased cats

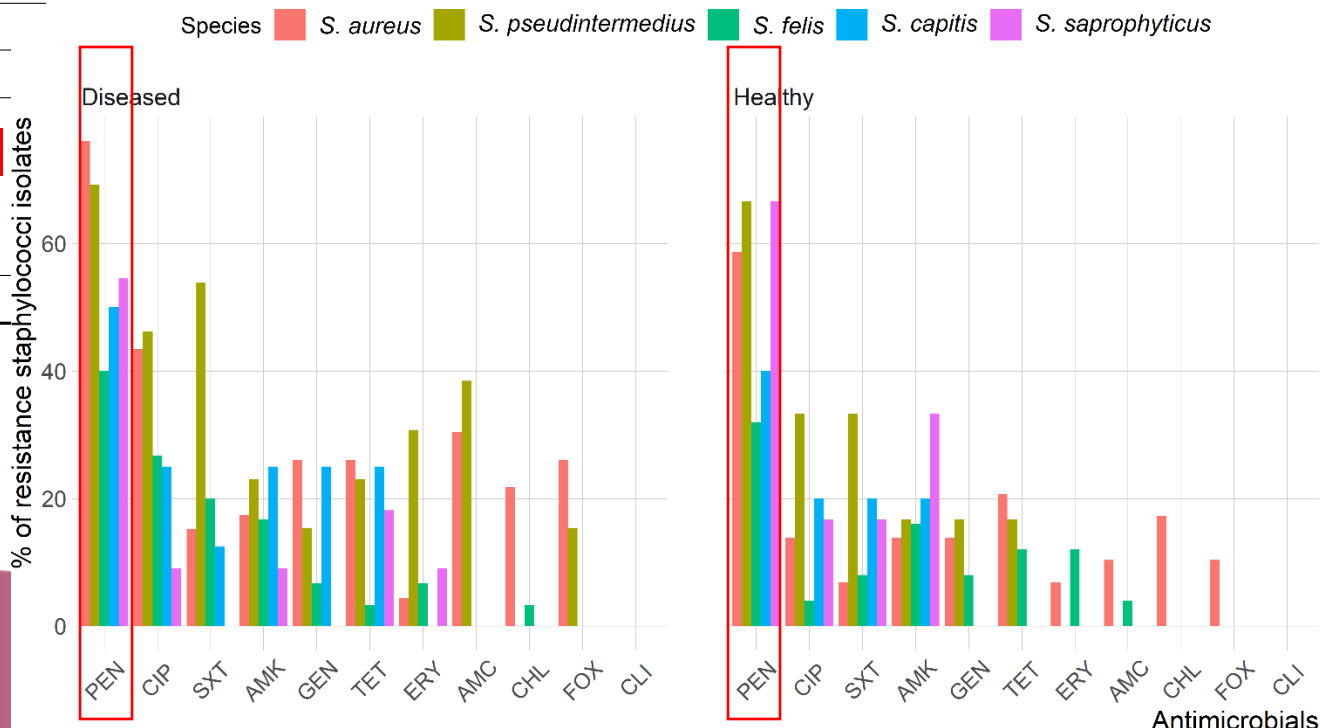


Main findings:

Distribution of *Staphylococcus* spp.

Anatomical Locations	No. of Isolates(%)	No. (%) of Coagulase-Positive Staphylococci		No. (%) of Coagulase-Negative Staphylococci		
		S. aureus	*S. pseudintermedius*	*S. felis*	*S. capitis*	*S. saprophyticus*
I—Healthy Cats (n = 209)						
Anus	7 (3.4)	2 (28.6)	0 (0.0)	1 (14.3)	1 (14.3)	3 (42.9)
Skin	28 (13.4)	10 (35.7)	2 (7.1)	13 (46.4)	2 (7.1)	1 (3.6)
Ear canal	15 (7.2)	5 (33.3)	2 (13.3)	4 (26.7)	2 (13.3)	2 (13.3)
Conjunctival sac	14 (6.7)	7 (50.0)	1 (7.1)	6 (42.9)	0 (0.0)	0 (0.0)
Nares	7 (3.4)	5 (71.4)	1 (14.3)	1 (14.3)	0 (0.0)	0 (0.0)
Total	71 (34.0)	29 (40.8)	6 (8.5)	25 (35.2)	5 (7.0)	6 (8.5)
II—Diseased Cats (n = 191)						
Anus	13 (6.8)	3 (23.1)	1 (7.7)	3 (23.1)	2 (15.4)	4 (30.8)
Skin	45 (23.6)	19 (42.2)	5 (11.1)	13 (28.9)	4 (8.9)	4 (8.9)
Ear canal	25 (13.1)	11 (44.0)	2 (8.0)	8 (32.0)	2 (8.0)	2 (8.0)
Conjunctival sac	14 (7.3)	6 (42.9)	3 (21.4)	4 (28.6)	0 (0.0)	1 (7.1)
Nares	11 (5.8)	7 (63.6)	2 (18.2)	2 (18.2)	0 (0.0)	0 (0.0)
Total	108 (56.5)	46 (42.6)	13 (12.0)	30 (27.8)	8 (7.4)	11 (10.2)

Antimicrobial Susceptibility of *Staph.* spp.



Risk factors associated with MDR and MRS

Factors	MDR		MRS	
	OR (95% CI) [1]	*p*-Value	OR (95% CI) [1]	*p*-Value
Family use antimicrobials				
No	1.00 (ref.)		1.00 (ref.)	
Yes	8.8 (3.47–22.30)	0.000	11.9 (2.48–57.46)	0.002
Family member with acne				
No	-	-	1.00 (ref.)	
Yes	-	-	15.9 (2.64–95.45)	0.003
Previous antimicrobial use for cat				
No	1.00 (ref.)		1.00 (ref.)	
Yes	6.1 (2.21–16.60)	0.000	12.4 (2.56–59.67)	0.034
Child at home				
No	1.00 (ref.)		1.00 (ref.)	
Yes	4.3 (1.63–11.54)	0.003	6.9 (1.46–32.43)	0.015
Cat living				
Indoors	1.00 (ref.)		1.00 (ref.)	
Indoors–outdoors	0.29 (0.12–0.69)	0.006	0.15 (0.04—0.65)	0.011
Reason being at clinic				
Vaccination and/or grooming	1.00 (ref.)		1.00 (ref.)	
Treatment	3.6 (1.34–9.61)	0.011	5.4 (1.14–25.88)	0.034
_cons	0.001 (0.000–0.010)	0.000	0.00 (0.000–0.000)	0.000

[1] OR: odds ratio; CI: confidence interval.

III- AMR in Pet animals in Hong Kong

- The number of pet animals kept in households is growing.
- In Hong Kong, the exact size of the exotic pet population is unknown.
- Between 2015 and 2019, at least 4 million exotic pets were imported from 84 countries.
- In 2016, exotic pets accounted for 25.1% of all pets in Hong Kong.

1

Retrospective study

- ✓ Electronic laboratory records
- ✓ Dogs, cats, and exotic pets clinical samples
- ✓ Microbiology and AST
- ✓ CityU Veterinary Diagnostic Laboratory

Objective

- ✓ Identify the most prevalent bacterial infections and AMR profiles among dogs, cats, exotic pets clinical samples in Hong Kong

2

Prospective study

- ✓ Samples from owned dogs and cats / Stray dogs and cats
- ✓ Samples from exotic pets (reptiles)
- ✓ Data collection (Risk factors)

Objectives

- ✓ To determine the prevalence of AMR-zoonotic bacteria
- ✓ Characterize the isolated phenotypically and genotypically
- ✓ Identify the potential risk factors

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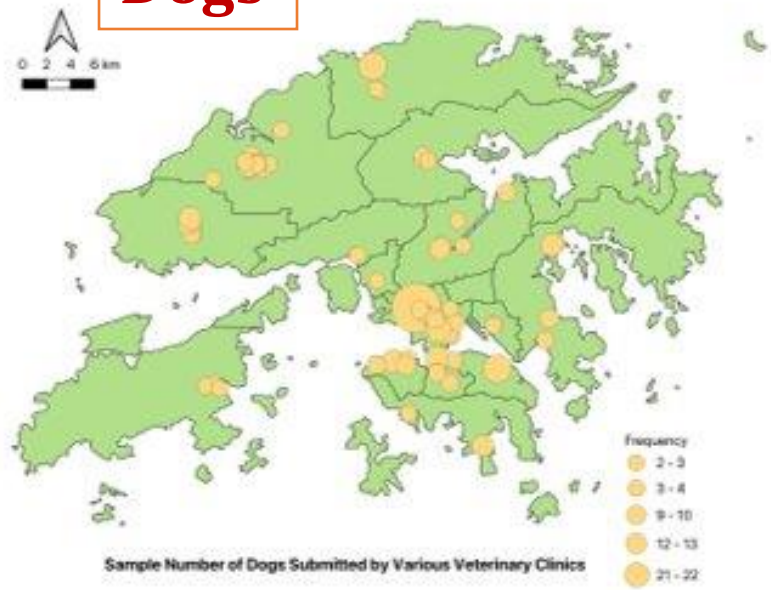
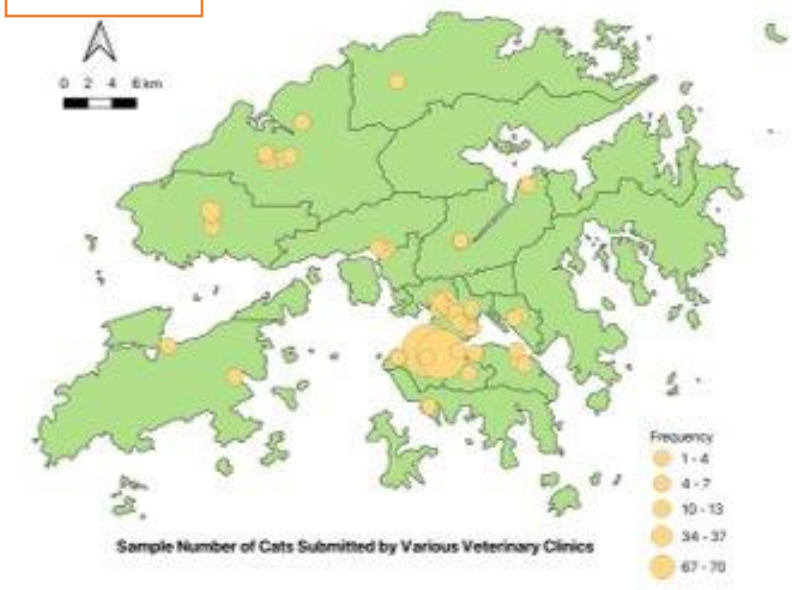
Main findings of dogs and cat's retrospective analysis:

Data from 2018 to 2022		
	Dogs	**Cats**
Number of clinical samples	520	728
Number of veterinary clinics	77	55
Bacterial growth	369	290
Total number of bacterial isolates	589	405
AST results	554	394

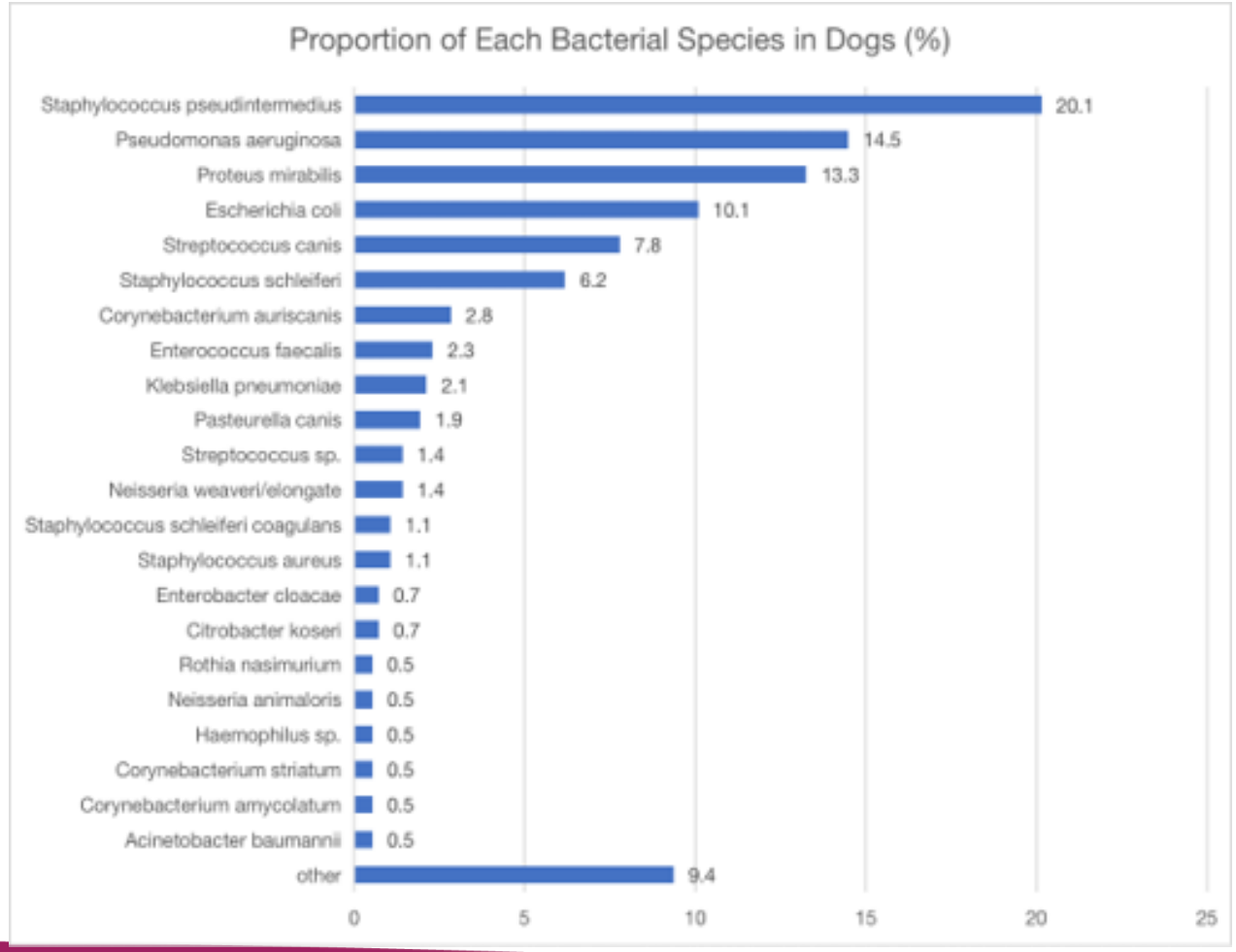
Dogs

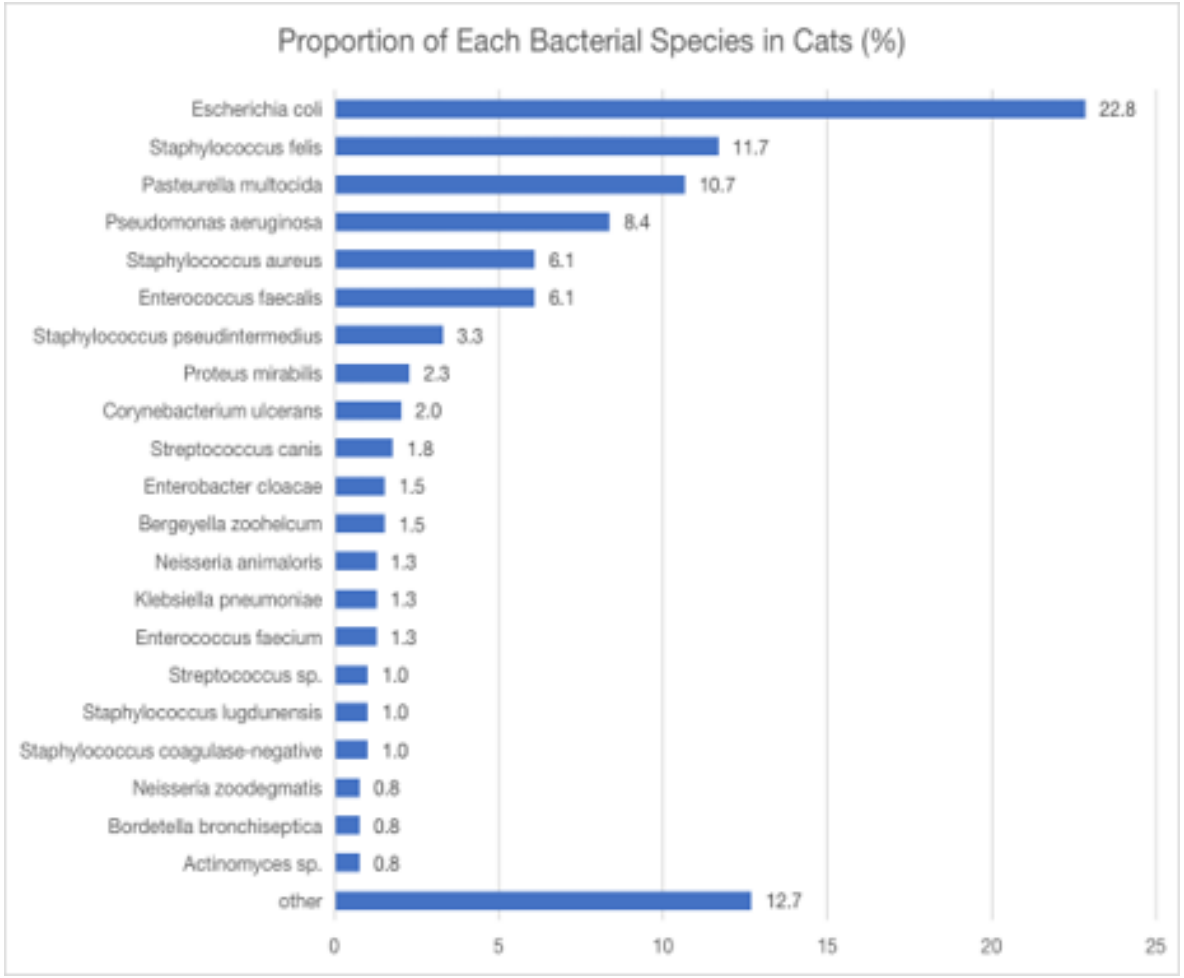


Cats



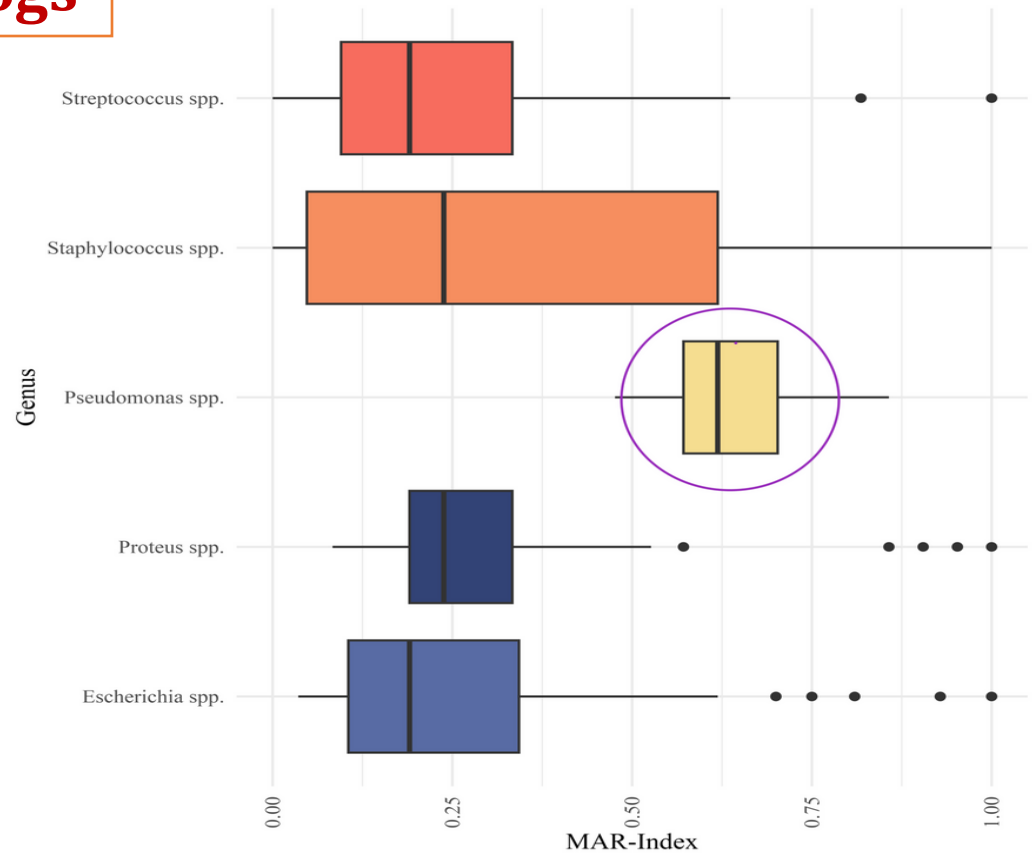
Proportion of most isolated bacterial species:



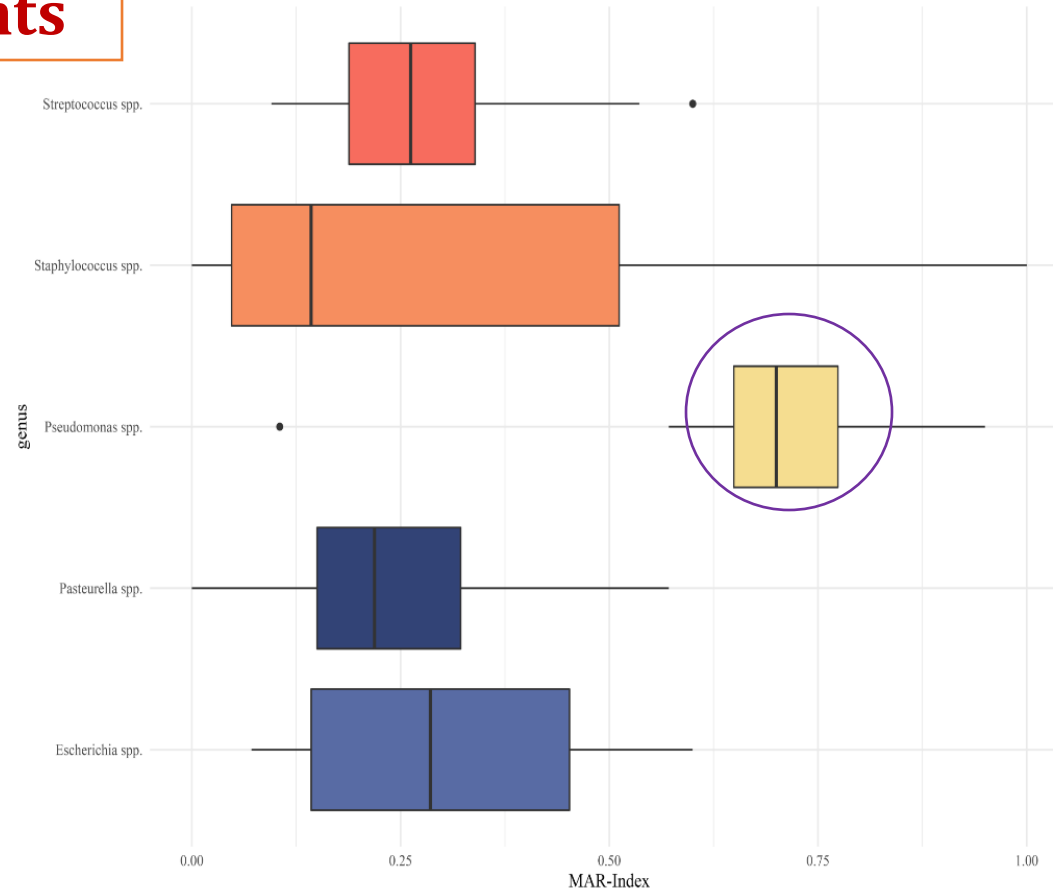


Multiple antibiotic resistance (MAR) index:

Dogs



Cats



Initial findings of exotic pets:

No. of clinical samples submitted between 2018 and 2022	
Hamster	524
Rabbits	301
Turtles and Tortoises	263
Pet birds	263
Guinea pigs	240
Chinchilla	182
Lizards	49
Frog	18
Pigeon	8
Snakes	3

Conclusions

- High levels of AMR and MDR resistance zoonotic bacteria were isolated from pet animals.
- Isolated bacteria were resistance to antimicrobials commonly prescribed in human medicine.
- ***Antimicrobial stewardship*** is need to address the potential threats of AMR in pet animals.

Contributors

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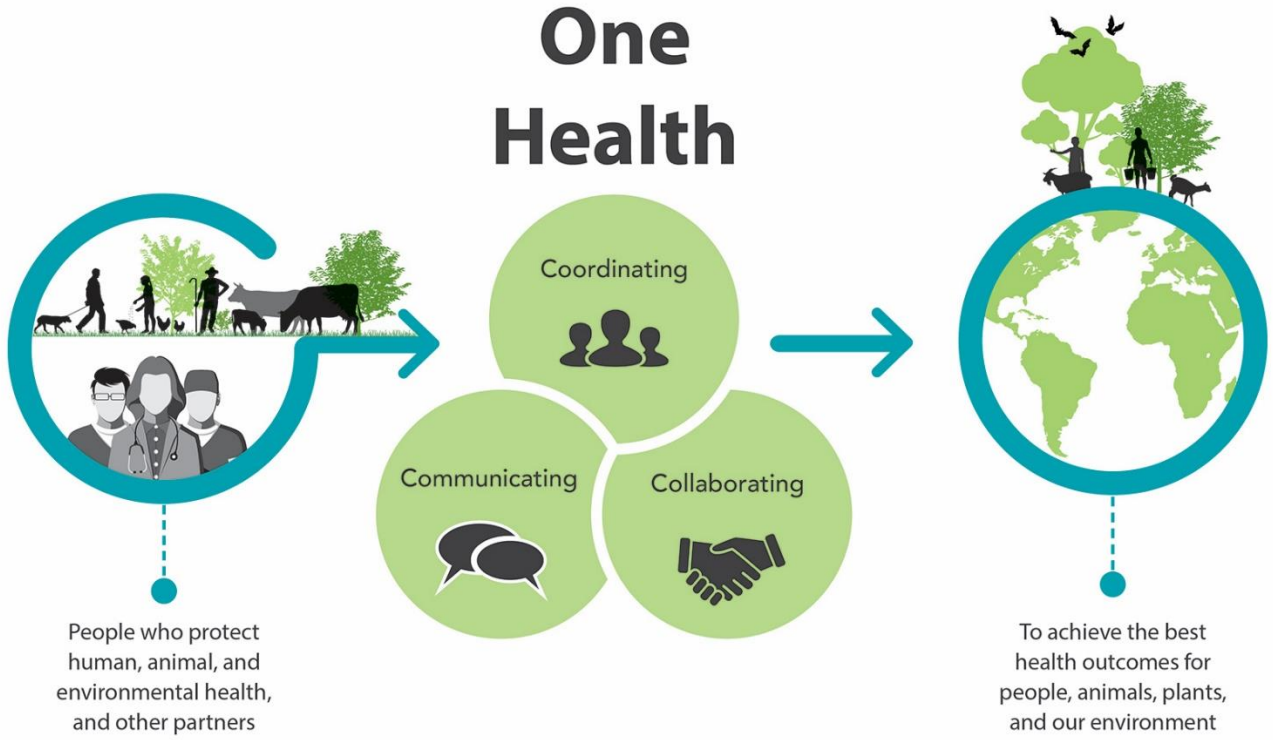
Thank You



https://www.cdc.gov/onehealth/images/multimedia/one-health-def.jpg

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