What do we know about multi-drug resistant bacteria in New Zealand's pet animals?

Eve Pleydell

Animal and Marine Biosecurity Response Team, Ministry for Primary Industries

Formerly: Institute of Veterinary, Animal and Biomedical Sciences, Massey University

mEpiLab.massey.ac.nz

Team at Massey involved in this work

MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

- Kate Hill, Veterinary Teaching Hospital, IVABS
- Jackie Benschop & Nigel French, *m*EpiLab, IVABS
- Alex Grinberg, Infectious Disease Group, IVABS
- Students:
  - Esther Gwae Kimaro, Master's 2009
  - Souphavanh Keovilay, Master's 2009
  - Claire McMeekin, Master's 2014
  - Ali Karkaba, PhD 2015

BBC | News | Sport | Weather | Capital | Future | Sho

NEWS HEALTH

Home | World | Asia | India | China | UK | Business | Health | Science/Environment | Technology | Entertainm

30 April 2014 Last updated at 12:05

Share

Antibiotic resistance now 'global threat', WHO warns

By Pippa Stephens
Health reporter, BBC News

WHO called for more preventative measures against infection

MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

The New Zealand Herald

Search keywords...

National | Video | Opinion | Election 14 | Business | Tech | World | Sport | Ent

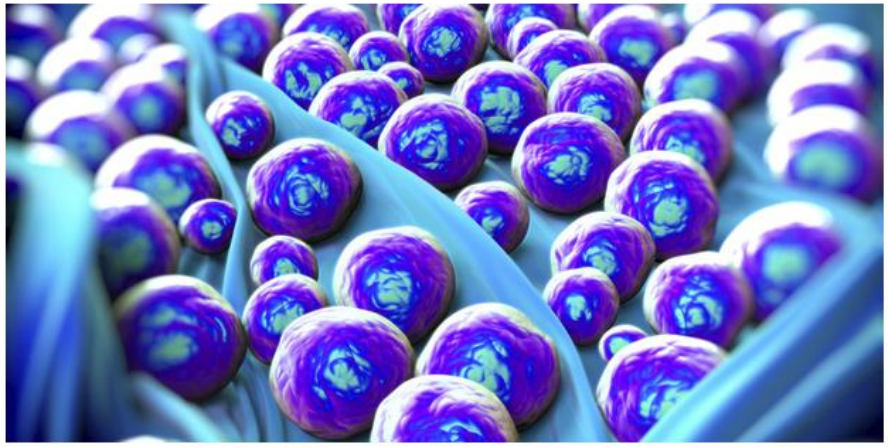
Rebecca Quilliam
Rebecca Quilliam is senior reporter at the APNZ News Service office in Wellington.

Antibiotic resistance on the rise

11:34 AM Saturday May 24, 2014

Health & Wellbeing | Medicine

41 | 20 | 2 | 0



MRSA bacteria or superbug. Photo / Thinkstock

ivabs

IDReC
Infectious Disease Research Centre

mEpiLab

mEpiLab.massey.ac.nz

Question 1: What are the prescribing habits of NZ's companion animal vets?

THE TIMES
Health News

News | Opinion | Business | Money | Sport | Life | Arts | Puzzles | Papers

Antibiotic misuse by vets is fuelling rise of superbugs

Hannah Devlin Science Editor
Published at 12:01AM, January 26 2013

Dogs and other household pets are fuelling the rise of so-called superbugs by acting as a "reservoir" of drug-resistant bacteria, a leading scientist has warned.

Dr Tim Nuttall, a veterinary dermatologist at the University of Liverpool, has shown that 40 per cent of healthy pet dogs carry multi-drug-resistant strains of bacteria, a higher proportion than seen in people, highlighting pets as a potentially important source of antibiotic-resistant germs.

Pet owners kissing and being licked by their animals contribute to the spread of bacteria
Gandee Vasan/Getty

Print
Email
Share
Like 10

Patterns of use of antimicrobials (AMs) in companion animals by vets

- Postal survey of vets, 2008
  - Souphavanh Keovilay, Master's Veterinary Science
- 393 responses
- 1,984 cases of suspected bacterial infection
  - Skin, ear and urinary tract infections
  - Culture & susceptibility tests used in 376 (19%) cases
  - Antimicrobials prescribed in 1,799 (91%) cases

Selection of antimicrobial drugs

- Commonly prescribed systemic drugs
  - Beta-lactams
    - Amoxicillin-clavulanic acid: 864 cases, 48%
    - Cephalexin: 558 cases, 31%
  - Fluoroquinolones: 198 cases, 11%
- Mostly in agreement with international guidelines
  - Potentially higher use of fluoroquinolones
  - Second line drugs frequently used as first line treatments without C&S
  - Shorter median treatment durations for skin infections than recommended

New drug launched late 2008

Visit MyPetItches.com » itches

convenia® cefovecin sodium

Clinical Experience | Pet Owner Experience | Video Testimonials

14 days of treatment in a single injection.*

First-Time Resolution.† 100% Compliance.

A single injection of CONVENIA® (cefovecin sodium) provides up to 14 days of antibiotic therapy* and gives pet owners peace of mind because their pets are assured a full course of therapy. CONVENIA helps you quickly and effectively treat common bacterial skin infections in dogs (secondary superficial pyoderma, abscesses and wounds) and cats (wounds and abscesses).[2,3]

Prescribing Information »

FOR YOUR CLIENTS
92% pet owner satisfaction[1] »

FOR YOU
93% veterinarian satisfaction[1] »

FOR YOUR PATIENTS
More than 90% clinical success[2,3]

EXCELLENCE IN DERMATOLOGY™ For resources, clinical information and education materials, visit ExcellenceinDermatology.com. »

Question 2: Are drug-resistant bacteria being isolated from clinical infections in NZ's cats and dogs?

- Occurrence of antimicrobial resistant bacteria in diagnostic samples from dogs and cats
  - Data from 7 commercial diagnostic laboratories
  - Esther Kimaro, Master's Veterinary Science
- 3 month study of laboratory results
  - Spring 2008

Results of 2008 pilot study

- Most common samples submitted
  - Ear swabs (38%)
  - Urine (37%)
- Laboratory differences
  - Standard profiles required
  - MRSA screening not routine in 2008
- Majority of isolates were susceptible to majority of drugs
- Some regional differences
  - Ampicillin & cephalothin resistance in *E. coli*
    - 23% across New Zealand
      - 43% Auckland laboratory
      - 3–7% Palmerston North laboratory

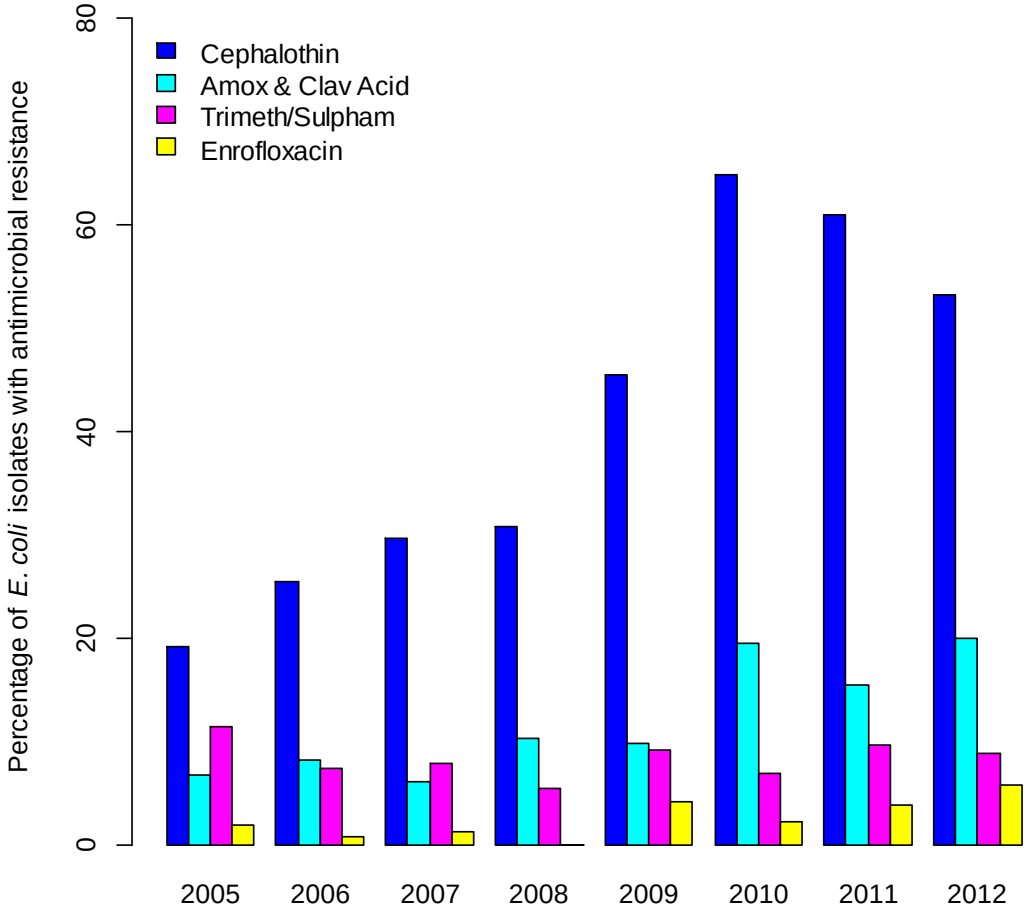
MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

Question 3: Are bacteria causing urinary tract infections in cats & dogs becoming more resistant to drug therapy?

Frequency and antimicrobial resistance patterns of bacteria isolated from canine urinary cultures submitted to a New Zealand Veterinary diagnostic laboratory 2005 – 2012

Claire McMeekin, Master's Veterinary Medicine

E. Coli resistance over time

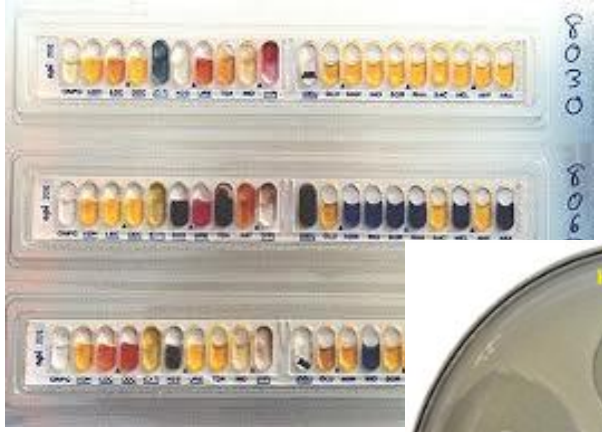


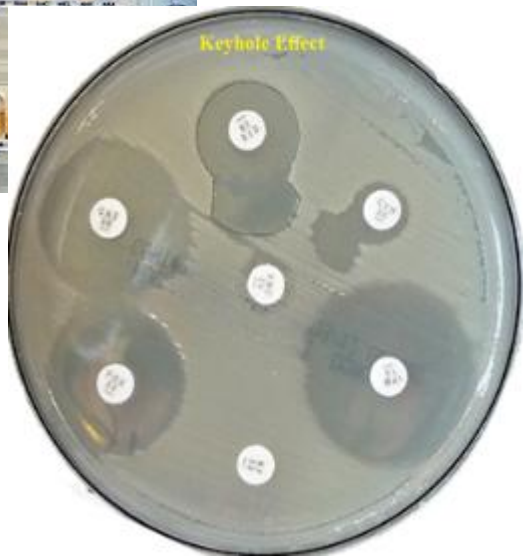
Q4: Are bacteria producing extended-spectrum beta-lactamases (ESBLs) being isolated from clinical infections in NZ's cats & dogs?

- Occurrence and distribution of multidrug resistant *Escherichia coli* and *Staphylococcus aureus* in animals in New Zealand
  - Ali Karkaba, PhD
  - 2012–2015

Methods

- 7 veterinary laboratories, 12 months
  - *Enterobacteriaceae* isolates resistant to 2+ drugs
- Confirmation of identity
  - Biochemical
  - MALDI-TOF (Middlemore)
- Disc diffusion antibiograms
- PCR detection
  - Extended-spectrum beta-lactamase
  - AmpC beta-lactamase
- MLST
  - ESBL & ampC producing *E. coli*



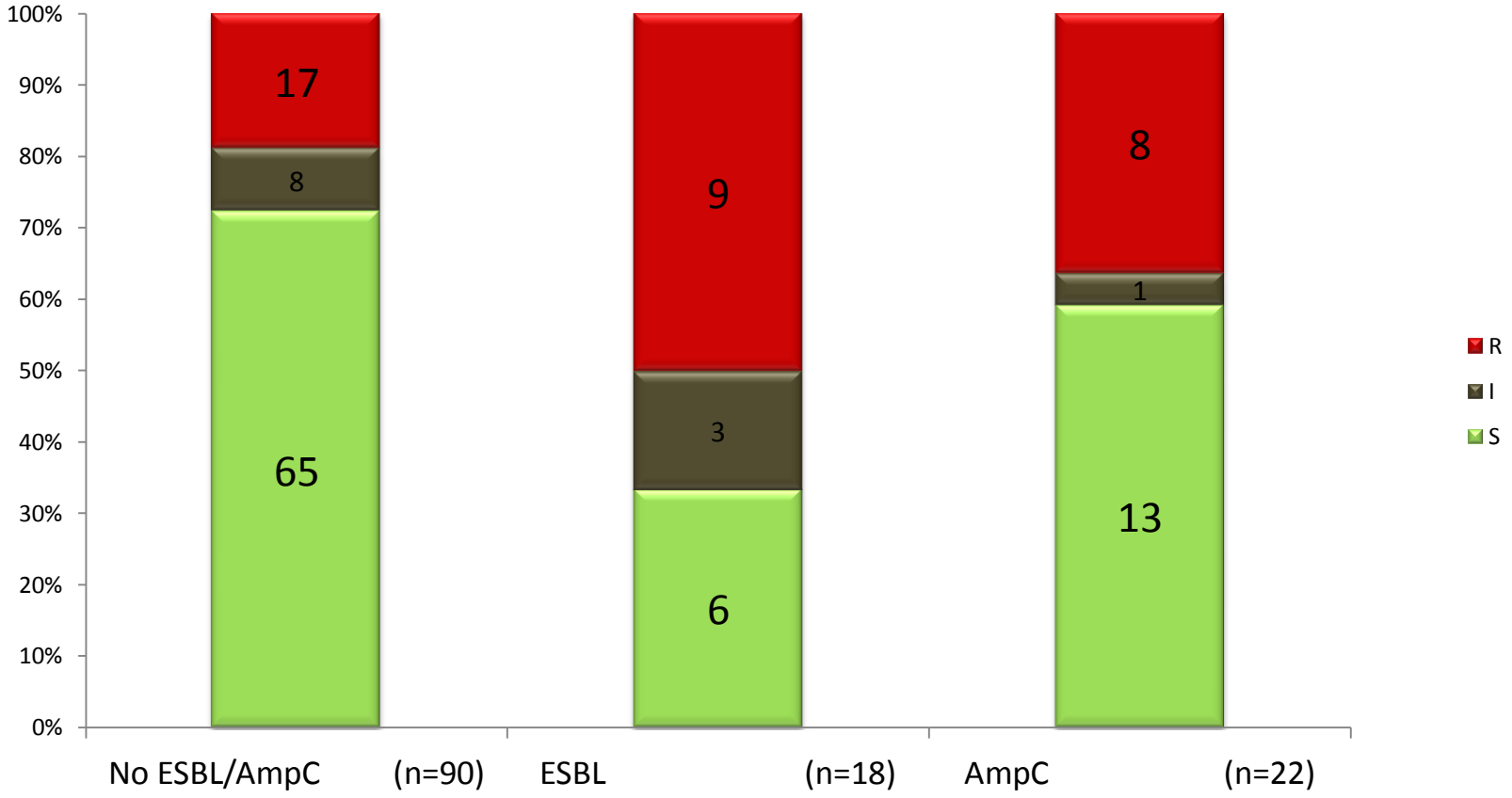


Extended spectrum beta-lactamase producers

- 130 isolates
  - Resistant to =>2 drugs
  - 96 *E. coli*
  - 4 *K. pneumoniae*
- 18 ESBL-*Enterobacteriaceae*
  - 14% (9–21%)
  - 14 *E. coli*
- 17 plasmid-mediated AmpC-*E. coli (pAmpC)*
  - 13% (8–20%)

Source	Total	ESBL	pAmpC
Urine	72	12	10
Wound	9	1	2
Abscess	9	0	1
Blood	2	0	1
Other	38	5	3
Total	*130*	*18*	*17*

Enrofloxacin susceptibility



MLST & PCR results

MLST ST	ESBL CTXM-14	ESBL CTXM-15	ESBL CTXM-27	pAmpC blaCMY2	First isolated	Year	Country
648	3			1	Human	2000	Canada
744	3			1	Human	2006	France
131	1	1	1		Avian	1992	USA
12	2				Human	1984	Germany
155	1			1	Human	1995	Nigeria
4200	1				Cat	2012	NZ
156				3	Human	1996	Ghana
46				2	Human	1995	Nigeria
457				2	Human	?	UK
23				1	Human	1995	Nigeria
90				1	Pig	1975	USA
101				1	Pig	1992	Spain
205				1	Human	1997	Ghana
372				1	Chicken	1985	Germany
1485				1	Human	2009	France
4166				1	Dog	2012	NZ
Grand Total	11	1	1	17			

Q5: Are cats and dogs without bacterial infections carrying multidrug-resistant bacteria?

MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

- Preliminary work
  - Massey University Veterinary Teaching Hospital
    - 10 animals
  - Palmerston North community
    - 34 animals
- Main study
  - Auckland veterinary practices
    - 580 animals

Characterisation of ESBL/AmpC producers

Source	Species	Antimicrobial profile	ESBL/ampC genes	MLST ST
Hospital	Canine	CepAmcCtxCvnGenEnrSxtTetAtm	CTXM-14; TEM-1	744
Hospital	Feline	CepAmcCtxCvnGenEnrSxtTetAtm	CTXM-14; TEM-1	744
Hospital	Feline	CepAmcCtxCvnGenEnrSxtTetAtm	CTXM-14; TEM-1	744
Hospital	Canine	CepAmcFoxCtxCazCvnAtm	AmpC gene mutation	2175
Community	Canine	CepAmcFoxCtxCazCvnSxt	CMY-2; TEM-1	4394 (New ST)
Community	Canine	CepAmcFoxCtxCazCvnTet	CMY-2	155
Community	Feline	CepAmcCtxCvnGenSxtTetAtm	CTXM-14; TEM-1	48
Community	Feline	CepAmcCtxCvnGenSxtTetAtm	CTXM-14; TEM-1	155
Community	Canine	CepAmcCtxCvnGenSxtTetAtm	CTXM-14; TEM-1	155
Community	Canine	CepAmcCtxCvnGenSxtTetAtm	CTXM-14; TEM-1	744

Auckland carriage study

- Auckland veterinarians recruited
  - Each sampled 30 animals over 3 weeks
    - Rectal swab – *Enterobacteriaceae*
    - Nasal / perianal swab – *Staphylococcus aureus*
  - Owners completed a short questionnaire

Species	Count of samples processed
Canine	419
Feline	161
Grand Total	580

Results from Auckland

Species	Count of multidrug-resistant isolates (=>3 drug families)
Canine	13
	13/580 = 2.2%

	Count of AmpC producers	Count of ESBL producers
Canine	27	3
Feline	10	0
Total	(34 CMY-2) 37	(2 CTXM-14; 1 CTXM-27) 3

Risk factors for carriage of ESBL & AmpC *E.coli*

MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

- Multilevel logistic regression model
  - Within the previous 6-months
    - Animal had been prescribed AMs
    - Animal had been hospitalised
    - Owner had travelled abroad
  - Owner worked in human or veterinary medicine

Summary – drug, resistance & NZ pets

MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

- Beta-lactam and fluoroquinolone drugs commonly prescribed
- Regional differences in resistance expressed
- Increasing beta-lactam and fluoroquinolone resistance in *E. coli* isolated from canine UTIs
- 25% of multidrug-resistant *Enterobacteriaceae* isolated from clinical infections are producing ESBLs or pAmpC beta-lactamases
  - Many of these isolates are concurrently resistant to fluoroquinolones too
- The majority of pet-associated *E. coli* producing ESBL and pAmpC are same strains (STs) that cause infections in humans
- The risk factors identified for animal carriage equate to risk factors identified for human carriage

Acknowledgements

- Laboratory staff, IVABS
  - Jing Jing Xu, Mary Gaddam
- NZVP (Isobel Gibson, Ian Bruce)
- Gribbles veterinary laboratories (Tara Gowland)

Funding bodies

- The New Zealand Companion Animal Trust (NZCAC)
- Zoetis
- Companion Animal Society, NZVA
- IVABS PG scholarship
- The McGeorge Research Fund, Massey University

Another reason why you shouldn't kiss your dog: Pets could pass antibiotic resistant infections to humans, scientists warn

- **Use of antibiotics in animals could be contributing to antibiotic resistance**
- **Resistant infections found in most pets and bacteria can spread to humans**
- **People should not allow dogs to lick them to avoid this problem**

By EMMA INNES

PUBLISHED: 15:13 GMT, 11 June 2014 | **UPDATED:** 16:01 GMT, 11 June 2014

Many besottted pet owners think nothing of giving their beloved cat or dog a kiss.

And while many aren't deterred by hygiene issues, there's now another off-putting reason to avoid a smooch.

Scientists are to investigate whether pets can transmit antibiotic resistant infections to humans.

Puppy love - but at a price: Pets could transmit antibiotic resistant infections to humans, researchers believe

The research will be led by Professor Nigel French at Massey University, in New Zealand, who believes the increasing use of antibiotics in animals may be contributing to the global issue of antimicrobial resistance.

Professor Massey said: 'We will be looking at the risks pets may pose in the transmission of these bacterial diseases that have been identified by the World Health Organisation as a huge and growing public issue.'