

L'AMR colonise la faune sauvage d'Amérique Latine: les prochains défis

Antimicrobial resistance colonization of Latin American wildlife: next challenges

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Latin America is a hotspot of

Latin America is a hotspot of

Music



<https://www.reddit.com/r/Infographics/>

Football



<https://www.foot01.com/equipe/paris/>



<https://news365.fr/>

Volcanoes/earthquakes

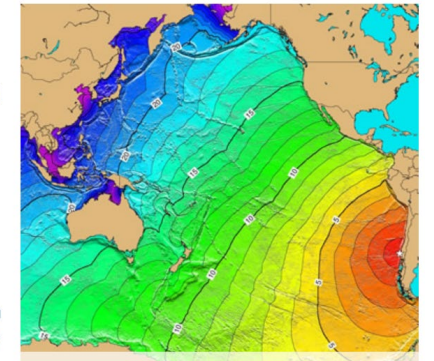
World's Largest Recorded Earthquake

9.5 Magnitude - May 22, 1960 near Valdivia, Chile

"The Great Chilean Earthquake"

The world's largest [earthquake](#) with an instrumentally documented magnitude occurred on May 22, 1960 near Valdivia, in southern [Chile](#). It was assigned a magnitude of 9.5 by the United States Geological Survey. It is referred to as the "Great Chilean Earthquake" and the "1960 Valdivia Earthquake."

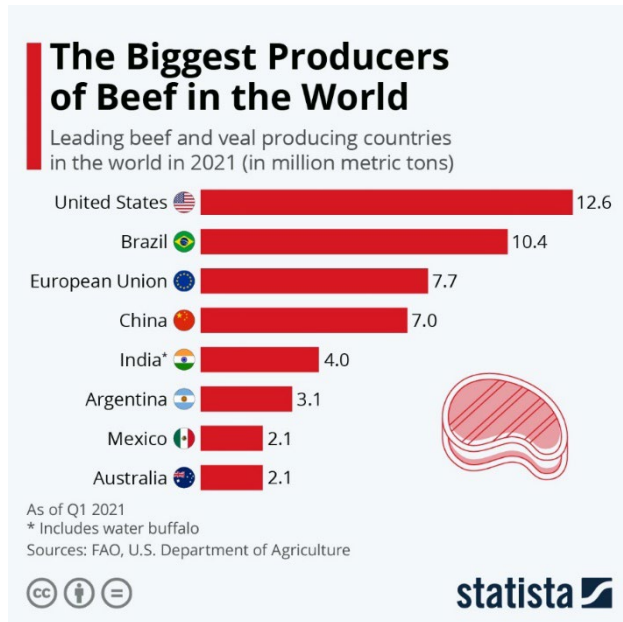
The United States Geological Survey reports this event as the "largest earthquake of the 20th Century." Other earthquakes in recorded history



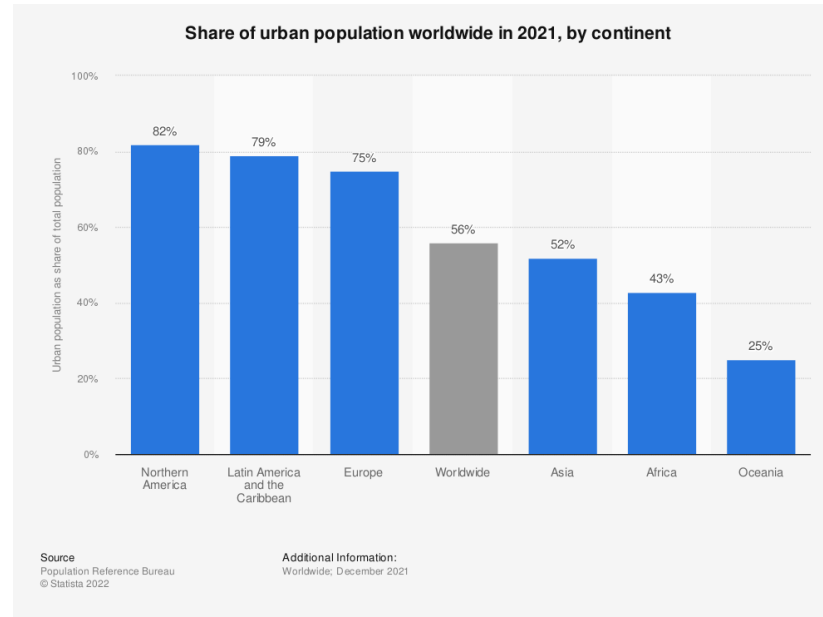
Chili: ~100 active volcanoes
(10% of the world)

Latin America is a hotspot of

Agriculture



Urbanization



Biodiversity



Fig. from Manes & Vale, 2022, Regional Environmental Change

Latin America is a hotspot of

Agriculture

The Biggest Producers of Beef in the World

Leading beef and veal producing countries in the world in 2021 (in million metric tons)



April 2022
* includes water buffalo
Source: FAO, U.S. Department of Agriculture

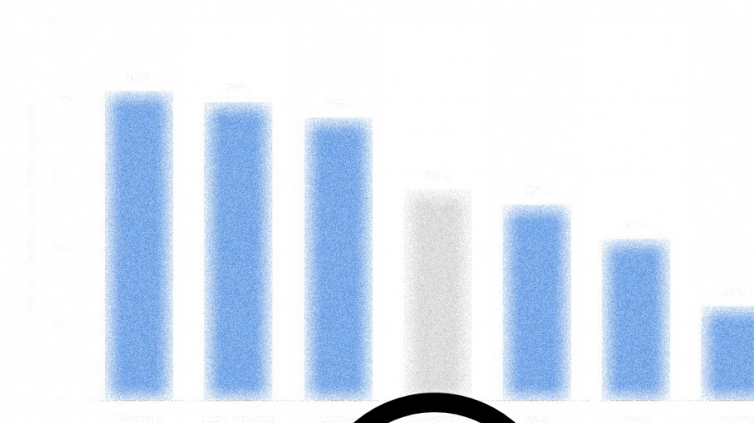


statista



Urbanization

Share of urban population worldwide in 2021, by continent



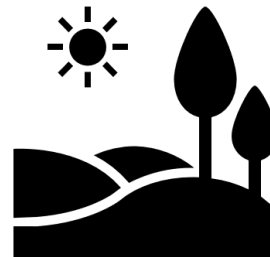
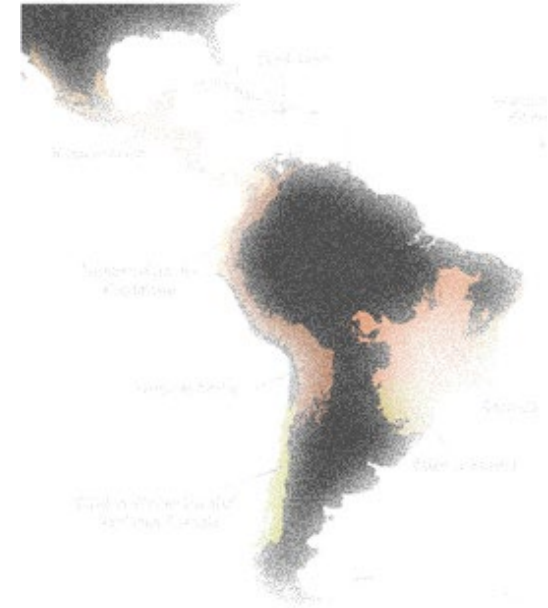
Source: World Urbanization Prospects 2018, United Nations



**Antimicrobial
Resistance**

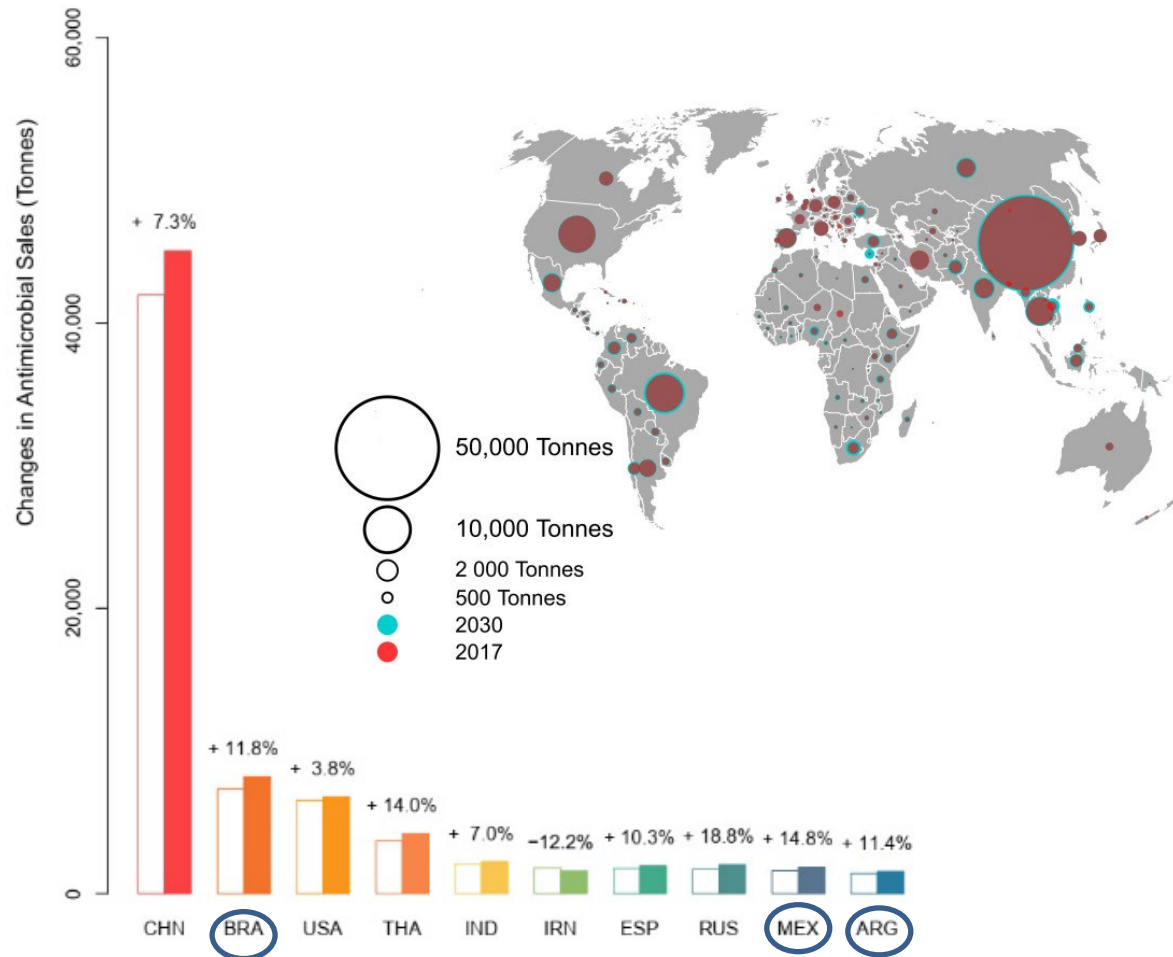


Biodiversity



Latin America is a hotspot of Antimicrobial Resistance (AMR)

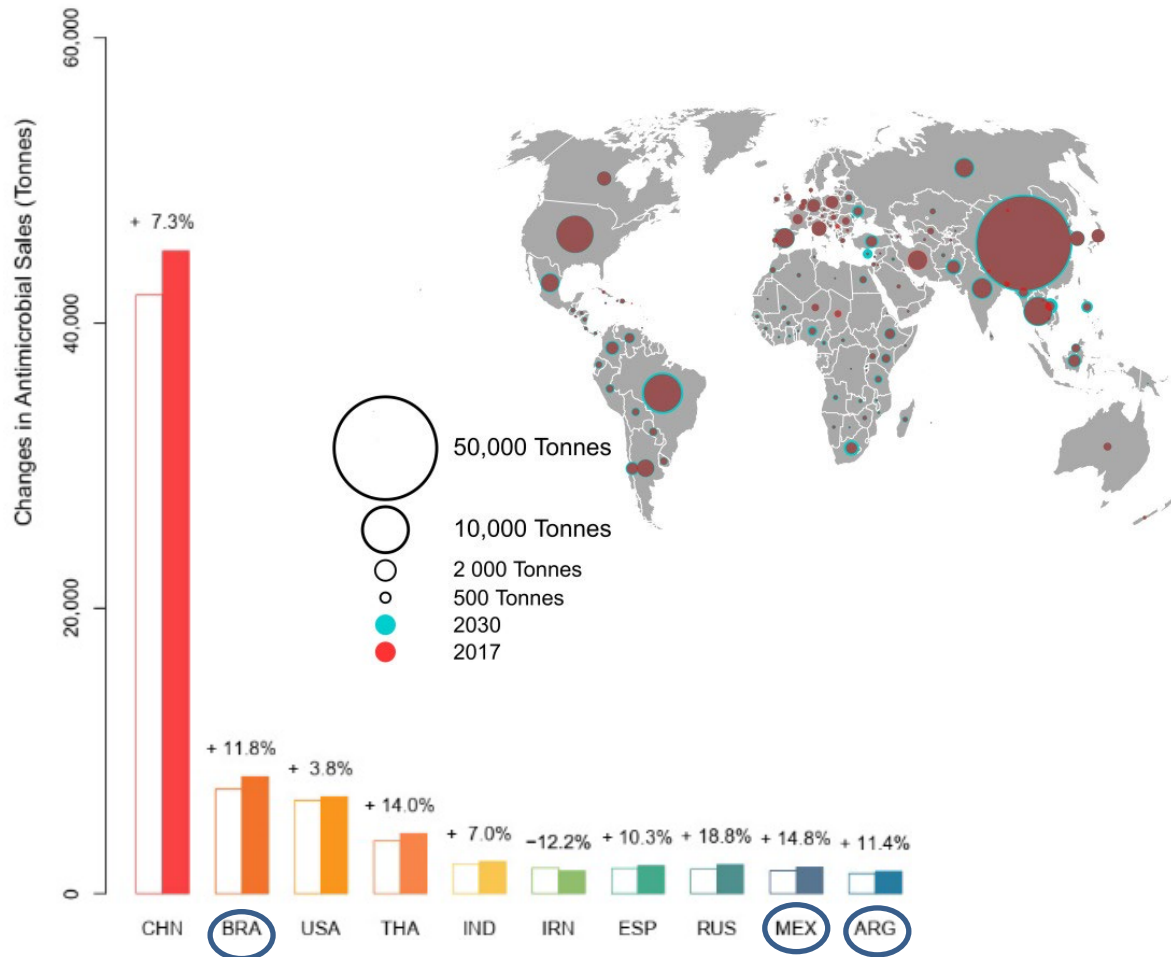
Global use antibiotics in livestock



Figures 1 & 2 from *Tiseo et al. Antibiotics 2020*. The top 10 consumers of veterinary antimicrobials by country in 2017 (open bars) and their projected consumption for 2030

Latin America is a hotspot of Antimicrobial Resistance (AMR)

Global use antibiotics in livestock



Figures 1 & 2 from *Tiseo et al. Antibiotics 2020*. The top 10 consumers of veterinary antimicrobials by country in 2017 (open bars) and their projected consumption for 2030

AMR burden by region

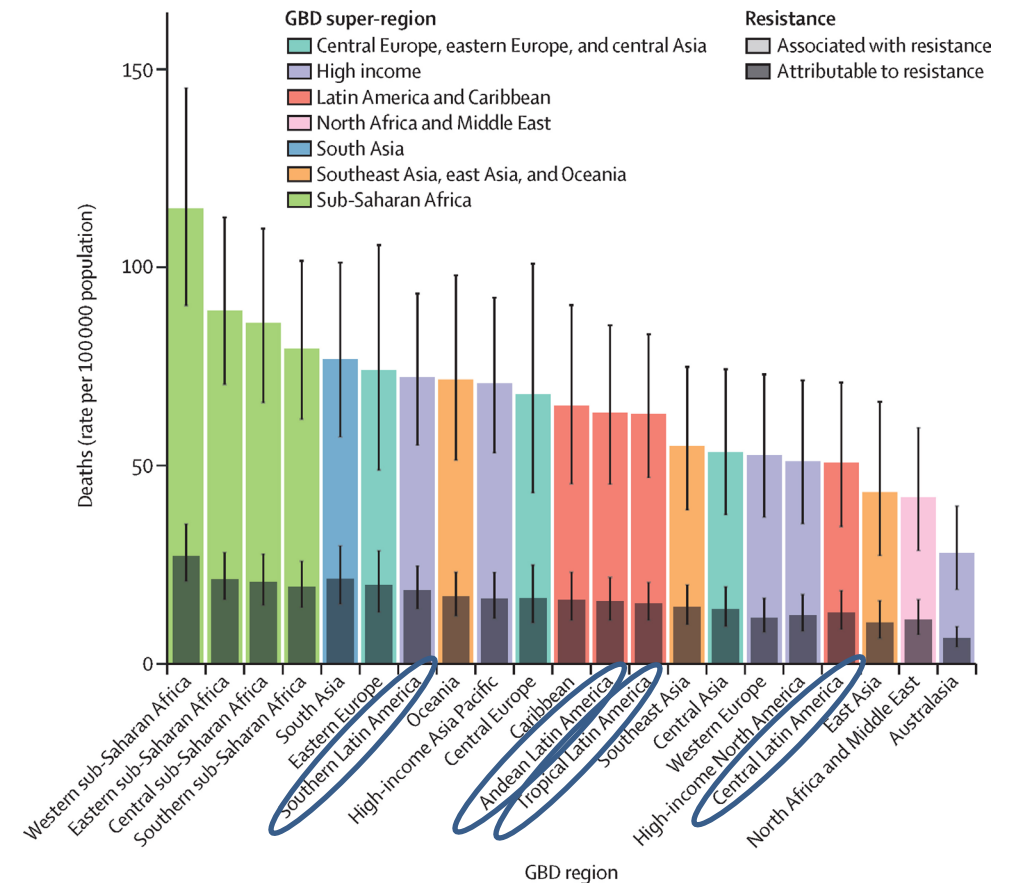


Figure 2. from *Murray et al. 2022. The Lancet*

Detection of AMR among wildlife in Latin America

Zoonoses AND PUBLIC HEALTH

ORIGINAL ARTICLE | Full Access

Antimicrobial resistance genes present in the faecal microbiota of free-living Galapagos tortoises (*Chelonoidis porteri*)

Ainoa Nieto-Claudin, Fernando Esperón, Stephen Blake, Sharon L. Deem

First published: 24 August 2019 | <https://doi.org/10.1111/zph.12639> | Citations: 9



Zoonoses AND PUBLIC HEALTH

SHORT COMMUNICATION | Open Access | CC BY

Extended-spectrum beta-lactamase-producing *Escherichia coli* in common vampire bats *Desmodus rotundus* and livestock in Peru

J. A. Benavides, C. Shiva, M. Virhuez, C. Tello, A. Appelgren, J. Vendrell, J. Solassol, S. Godreuil, D. G. Streicker

First published: 25 March 2018 | <https://doi.org/10.1111/zph.12456> | Citations: 17



Vector-Borne and Zoonotic Diseases > Vol. 13, No. 12 > Short Communications

Identification of diverse *Salmonella* Serotypes, Virulotypes, and Antimicrobial Resistance Phenotypes in Waterfowl From Chile

Marcela Fresno, Violeta Barrera, Vanessa Gormall, Pilar Lillo, Natalia Paredes, Pedro Abalos, Alda Fernández, and Patricio Retamal

Published Online: 5 Dec 2013 | <https://doi.org/10.1089/vbz.2013.1408>



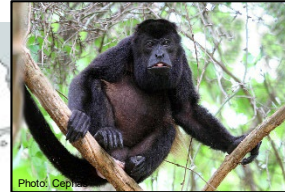
MOLECULAR ECOLOGY

ORIGINAL ARTICLE | Full Access

Genomic data reveal international lineages of critical priority *Escherichia coli* harbouring wide resistome in Andean condors (*Vultur gryphus* Linnaeus, 1758)

Danny Fuentes-Castillo, Fernanda Esposito, Brenda Cardoso, Gisela Dalazen, Quézia Moura, Bruna Fuga, Harrison Fontana, Louise Cardiera, Milena Droga, Jürgen Rottmann, Daniel González-Acuña, José L. Catão-Dias, Nilton Lincopan ... See fewer authors

First published: 26 April 2020 | <https://doi.org/10.1111/mec.15455> | Citations: 14



PLOS ONE

OPEN ACCESS | PEER-REVIEWED

RESEARCH ARTICLE

Resistance to Antibiotics of Clinical Relevance in the Fecal Microbiota of Mexican Wildlife

Jurgi Cristóbal-Azkarate, Jacob C. Dunn, Jennifer M. W. Day, Carlos F. Amabile-Cuevas

Published: September 18, 2014 | <https://doi.org/10.1371/journal.pone.0107719>



Marine Pollution Bulletin
Volume 105, Issue 1, 15 April 2016, Pages 51-57



Resistance to antimicrobial agents among enterococci isolated from fecal samples of wild marine species in the southern coast of Brazil

Janira Prichula, Rebeca Inhoque Pereira, Guilherme Raffo Wachholz, Leonardo Almanso Cardoso, Neidimar Cezar Correa Tolfo, Naiara Aguiar Santestevan, Aline Weber Medeiros, Maurício Tavares, Jeverson Frazzon, Pedro Alves d'Azevedo, Ana Paula Guedes Frazzon



MICROBIOLOGY - An. Acad. Bras. Ciênc. 93 (3) - 2021 - <https://doi.org/10.1590/0001-376520210191577> COPY

Gulls as carriers of antimicrobial resistance genes in different biogeographical areas of South America

ELIANA LORENTI | FABIANA MOREDO | JAVIER ORIGLIA | JULIA I. DIAZ | FLORENCIA CREMONTE

GABRIELA GIACOBONI | ABOUT THE AUTHORS

AMR in wildlife of Latin America: remaining questions

- Understand AMR transmission dynamics among wildlife
- Circulation between wildlife, domestic animals and humans:
Wildlife as reservoirs of AMR?
- Identify sources of AMR
- Molecular mechanisms and co-selection favoring AMR?



Circulation between wild and domestic animals

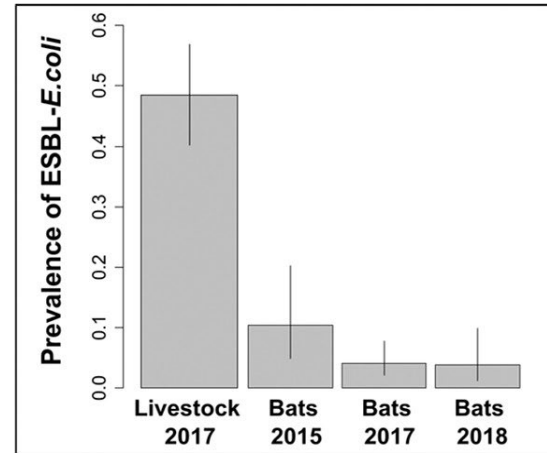


Photo: Jaime Castillo

Common vampire bat (*Desmodus rotundus*) and Livestock in Peru



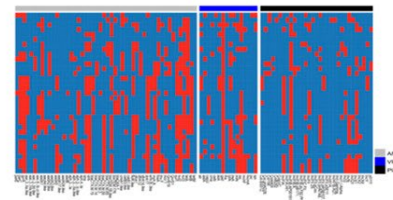
Fecal sampling
Bacteria isolation



ESBL- *Escherichia coli*



Whole Genome Sequencing



23 *E. coli* STs
46 AR genes
16 Virulence genes
31 plasmids replicon types

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journal homepage: www.elsevier.com/locate/scitotenv



Long-term maintenance of multidrug-resistant *Escherichia coli* carried by vampire bats and shared with livestock in Peru



Julio A. Benavides^{a,b,c,h,*}, Sylvain Godreuil^{d,e,f}, Andrés Opazo-Capurro^{g,h}, Oumar O. Mahamat^{e,f,i}, Nestor Falcon^j, Katarina Oravcova^b, Daniel G. Streicker^{b,k}, Carlos Shivaⁱ

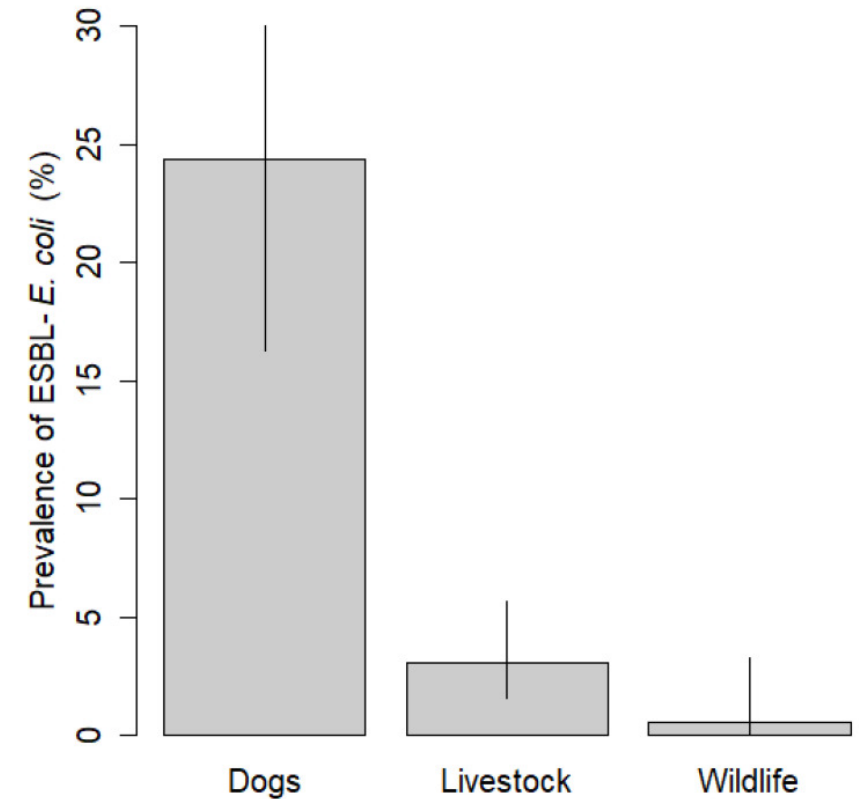
Circulation between wild and domestic animals



> [Antibiotics \(Basel\)](#). 2021 Apr 30;10(5):510. doi: 10.3390/antibiotics10050510.

ESBL-Producing *Escherichia coli* Carrying CTX-M Genes Circulating among Livestock, Dogs, and Wild Mammals in Small-Scale Farms of Central Chile

Julio A Benavides ^{1 2 3}, Marfía Salgado-Caxito ^{3 4}, Andrés Opazo-Capurro ^{3 5},
Paulina González Muñoz ^{3 5 6}, Ana Piñeiro ⁷, Macarena Otto Medina ¹, Lina Rivas ^{3 8},
Jose Munita ^{3 8}, Javier Millán ^{1 9 10}



***E. coli* ST2973**
Bla_{CTM-X-55}

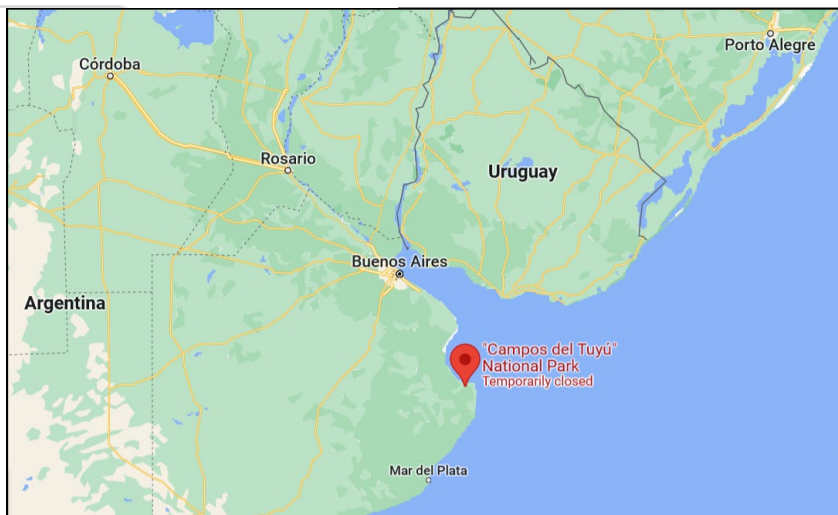
Circulation between wild and domestic animals



Phd student Ezequiel Condori

Main Supervisors:

Silvia Estein, UNICEN, and Marcela Uhart, UC Davis



Urban bats as reservoirs of AMR for humans?



Photo: Jaime Castillo



Phd student Zulma Rojas

Co-Supervisor: Daniel Streicker, Univ. of Glasgow

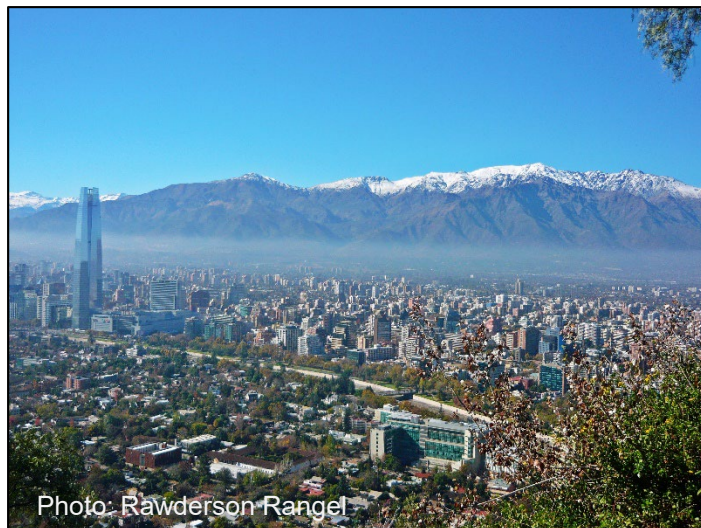
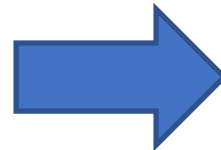


Photo: Rawderson Rangel



- More than 300 dead bats sampled in Chile from the Rabies Surveillance Program
- No ESBL/CARBA *E. coli*
- Only ESBL-resistant *Rahnella aquatilis*

Understand AMR circulation dynamics among gulls



Understand AMR circulation dynamics among gulls



Understand AMR circulation dynamics among gulls



Photo: Julio Benavides

Understand AMR circulation dynamics among gulls



Phd student Tania Suarez
Co-Supervisor: Carmen Torres, Univ. La Rioja

**Longitudinal Sampling
(Winter/Summer)
2020-2022**

**Different seabird species
(Pelican, resident and
migratory gulls)**

**Dogs and waste
water**

***Multidrug-resistant
E. coli***

Larus dominicanus



Understand to propose sustainable solutions ?

- No Program on Surveillance or Control of AMR in wildlife in Latin America
- Can we limit risky-contacts with sympatric wildlife (gulls, bats, rodents) ?
- Reduce sources of contamination (e.g. landfills) and human waste into the environment (e.g. water treatment)
- Only monitor? (quantify impact first)



Merci



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Partners:



Funders



Photo: Julio Benavides