

KITP 2011

The bases of convergence
in microbial evolution

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INSERM U722/ University Paris7

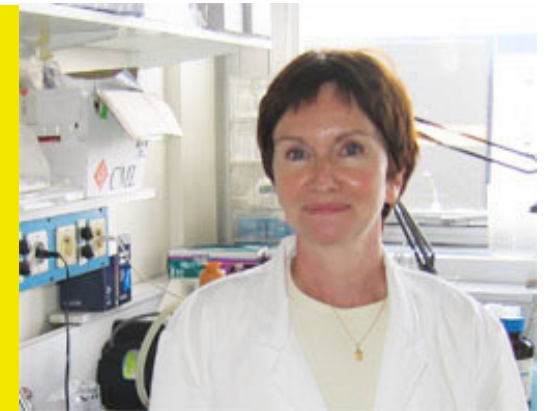
University of California Irvine



Erick Denamur



Olivier Clermont



Odile Bouvet

Within host evolution



Catherine Branger



Oana Zamfir

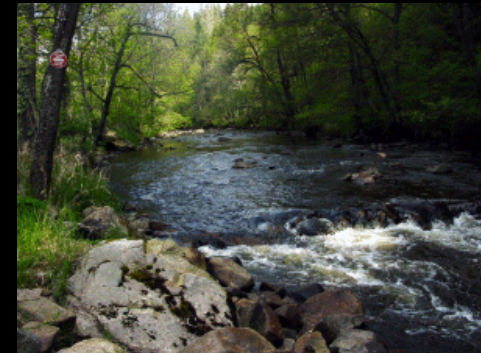
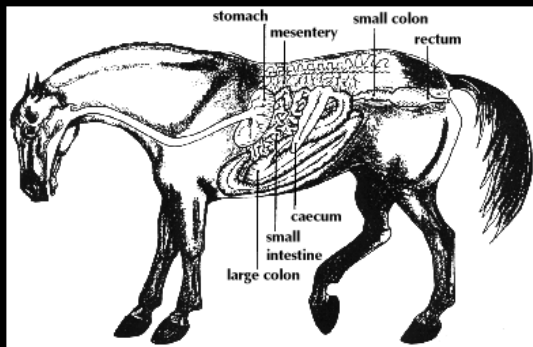
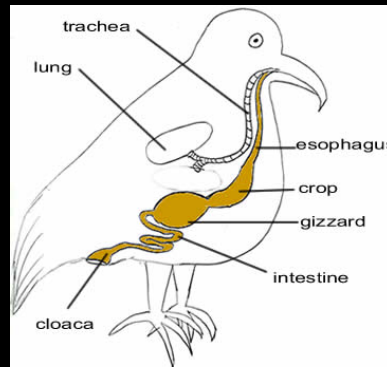
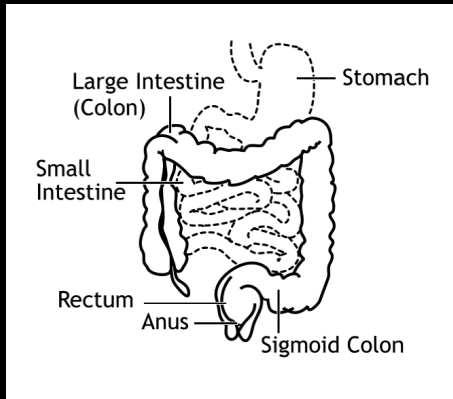


Maxim Levert

Levert *et al.*, *PLoS Pathogens*, 2010

A commensal of vertebrates

Digestive tract



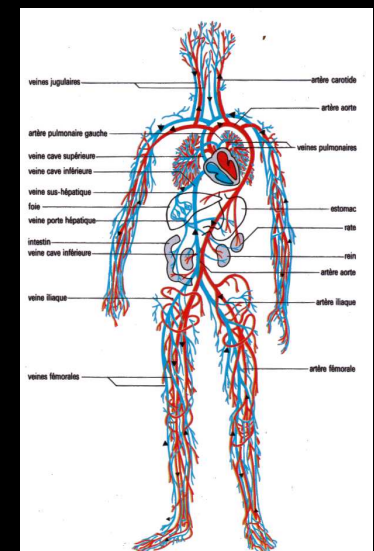
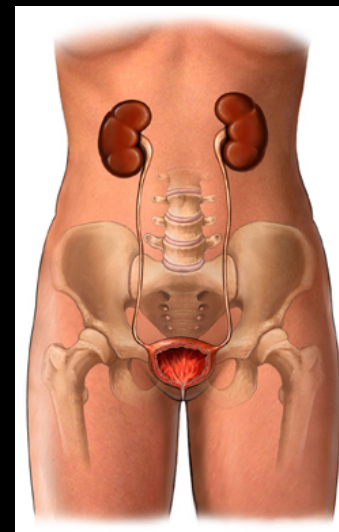
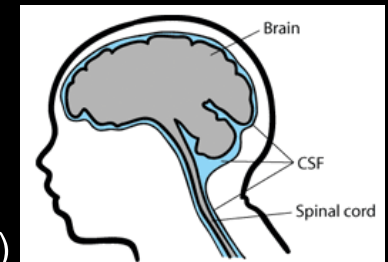
Water and sediment

A versatile pathogen

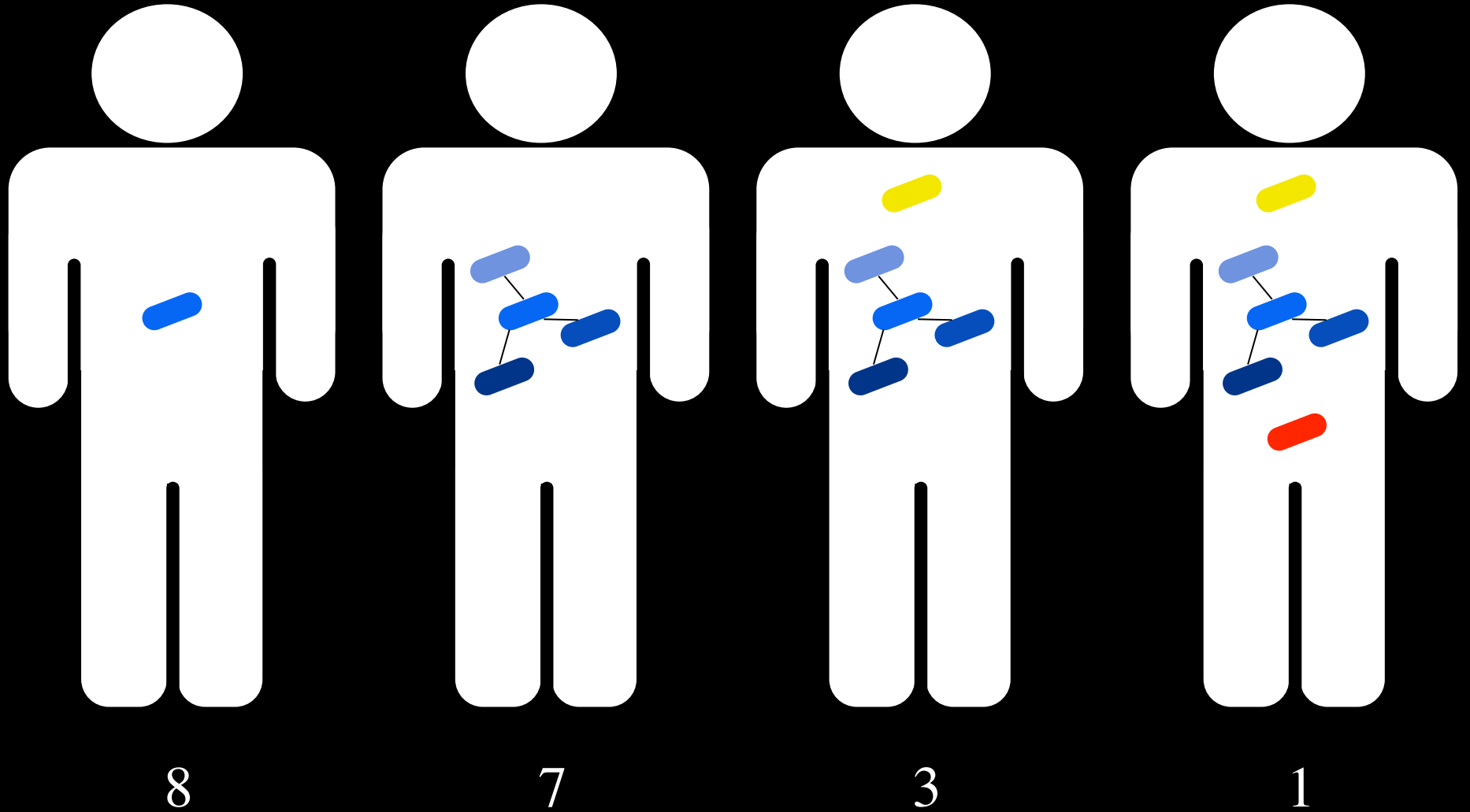


commensal
and
pathogenic

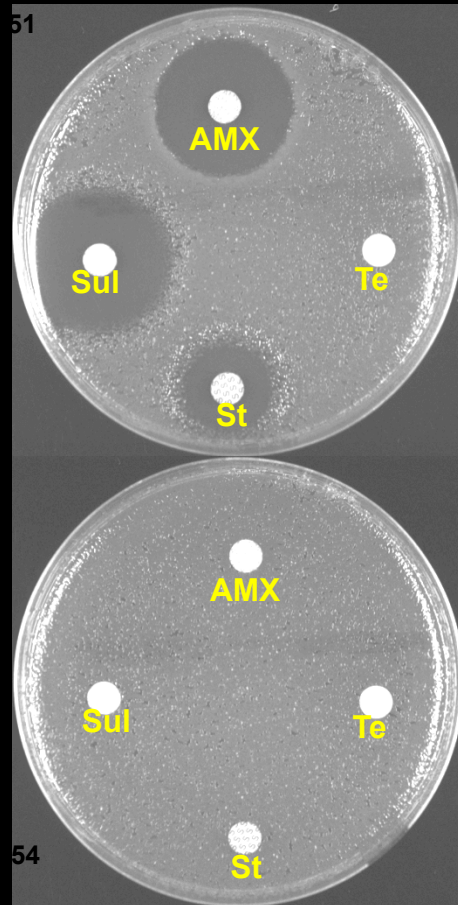
(2 Million deaths a year)



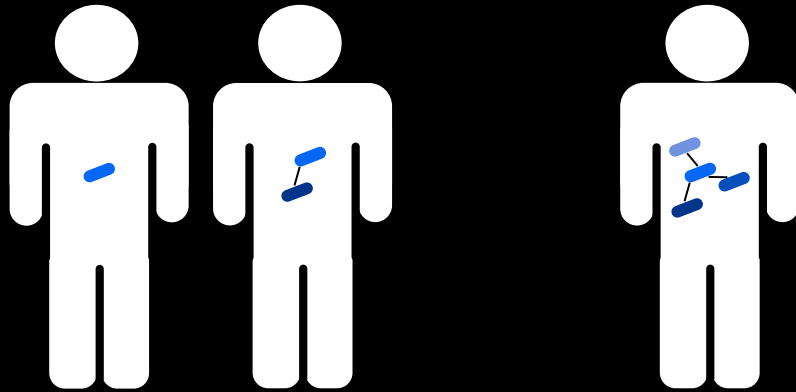
What diversity in *E. coli* extraintestinal evolution



Antibiotic resistance diversity



Antibiotic resistance evolution



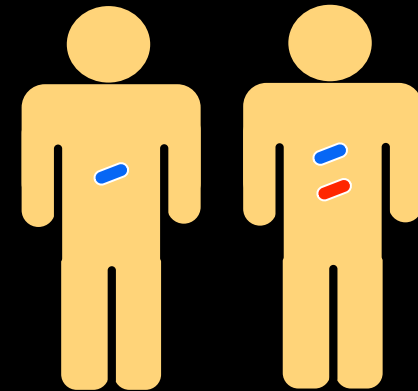
10

7

2

infected

healthy



14

1

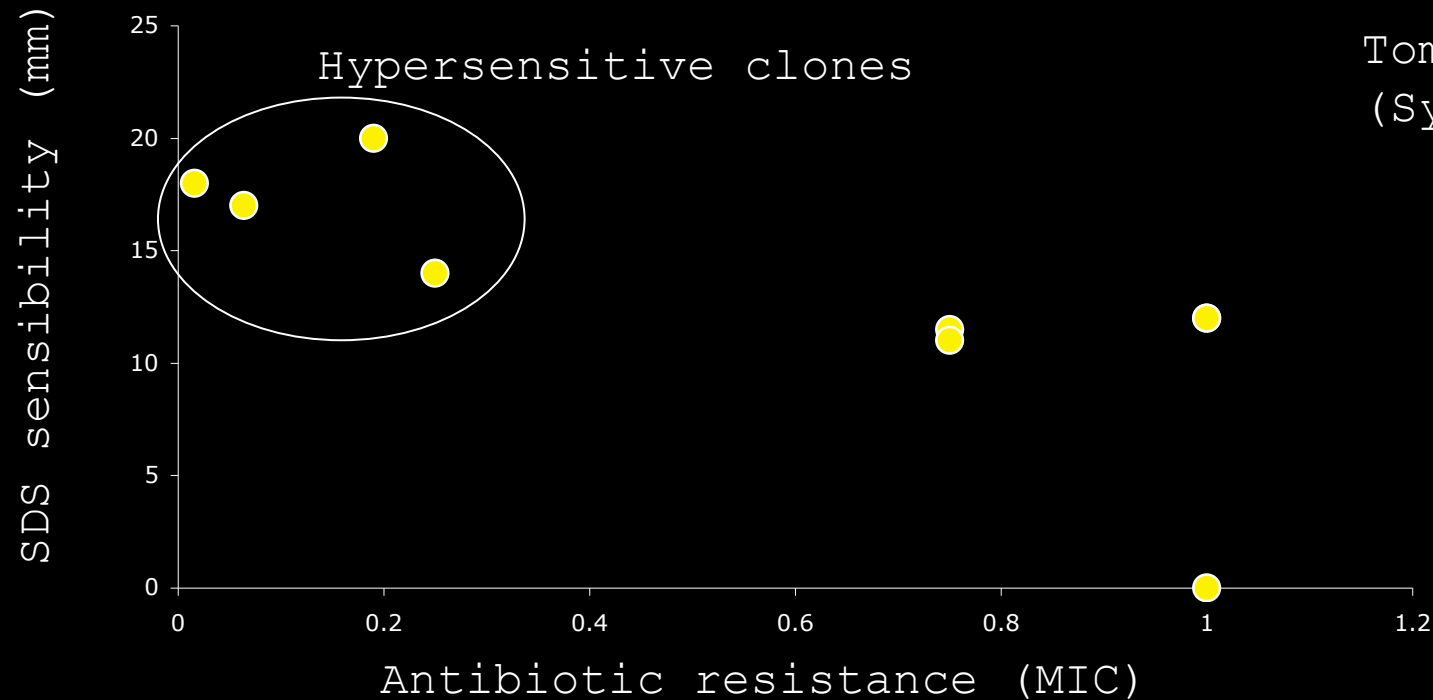
$p < 5\%$

Molecular bases of the change

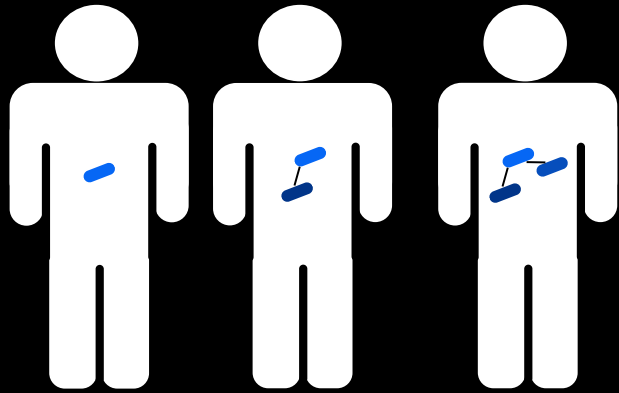
- Plasmid losses
- Permeability changes



Tom Ferenci
(Sydney)



Growth variability



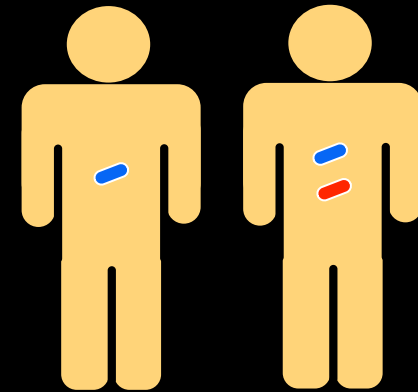
11

6

2

infected

healthy

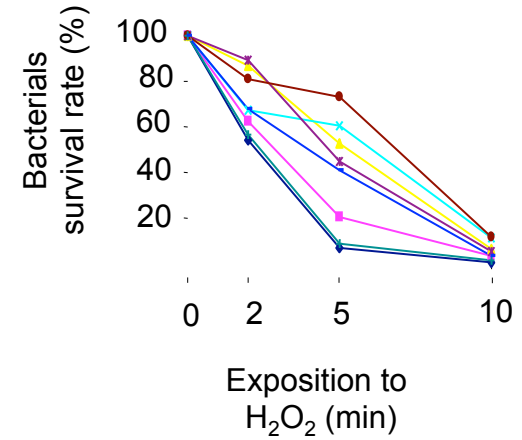
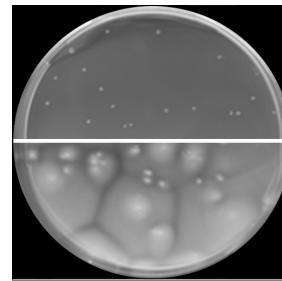
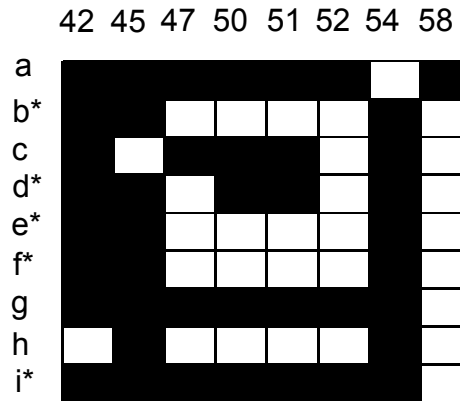


14

1

$p < 5\%$

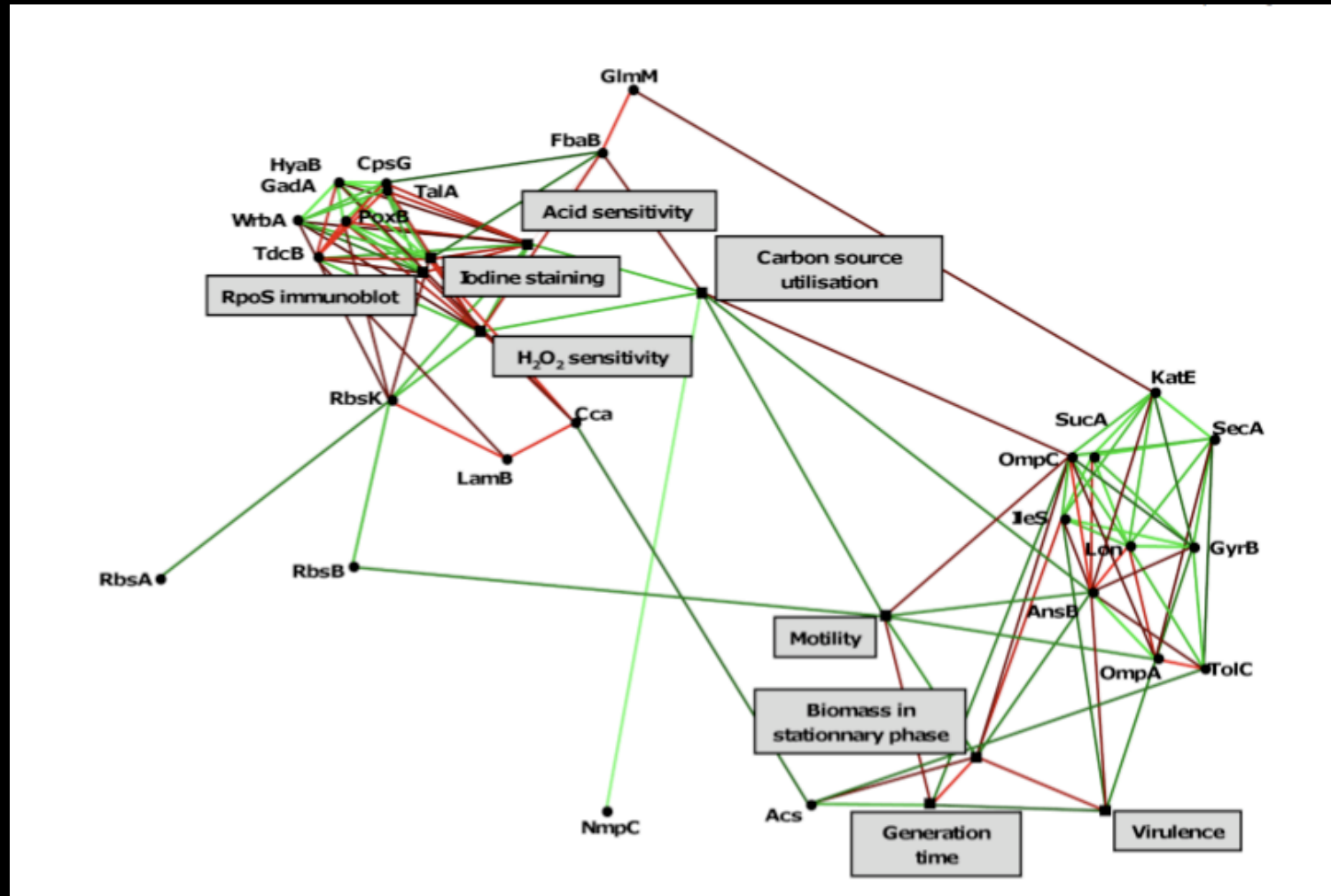
Molecular bases



rpoS

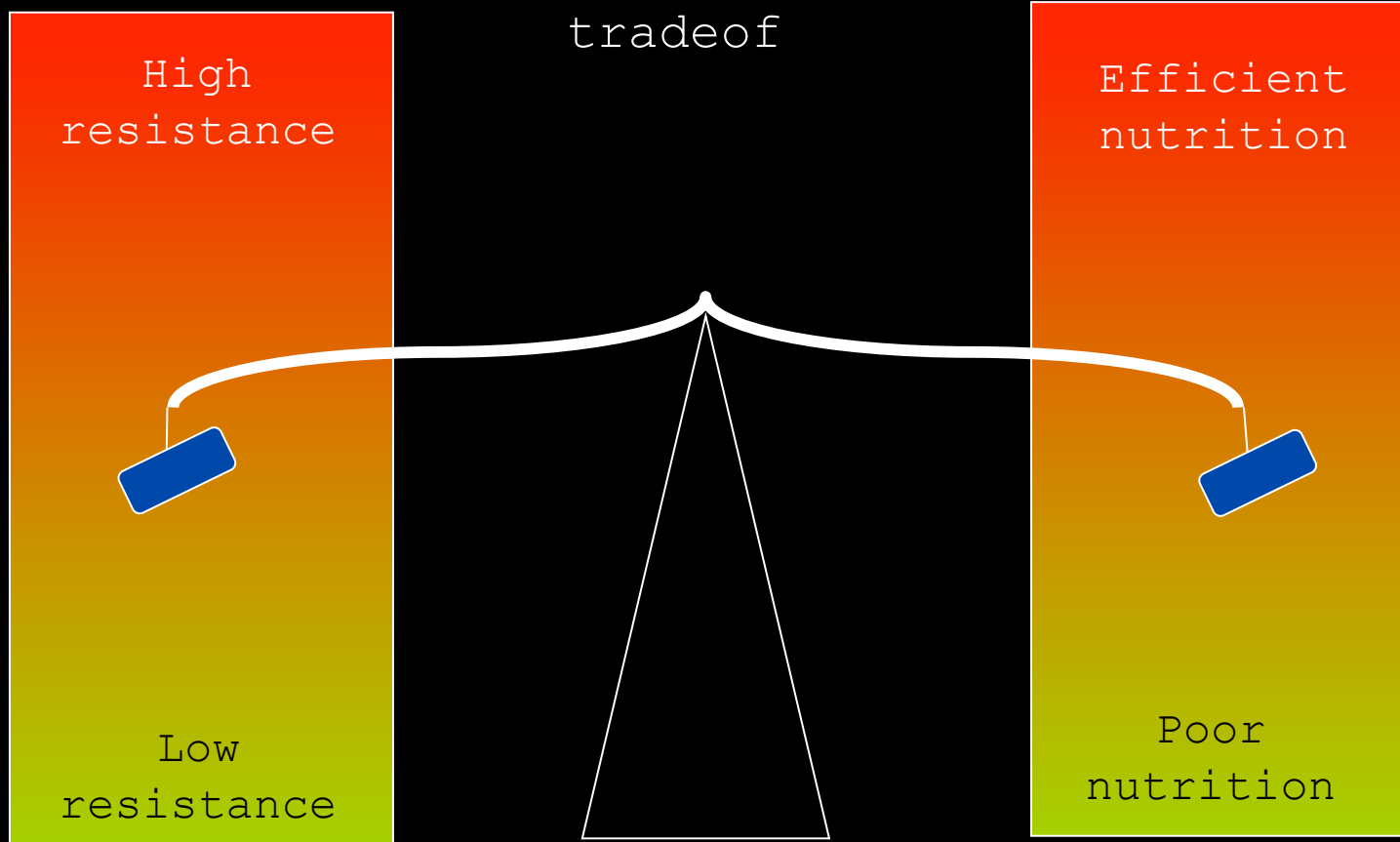
Strain	42	45	47	50	51	52	54	58	<i>rpoS</i>
RpoS (38 kD)									
RpoS band/constant band (Mean of two experiments)	1.4	1.2	1.6	1.65	1.75	1.9	1.6	1.2	

All phenotypes are linked



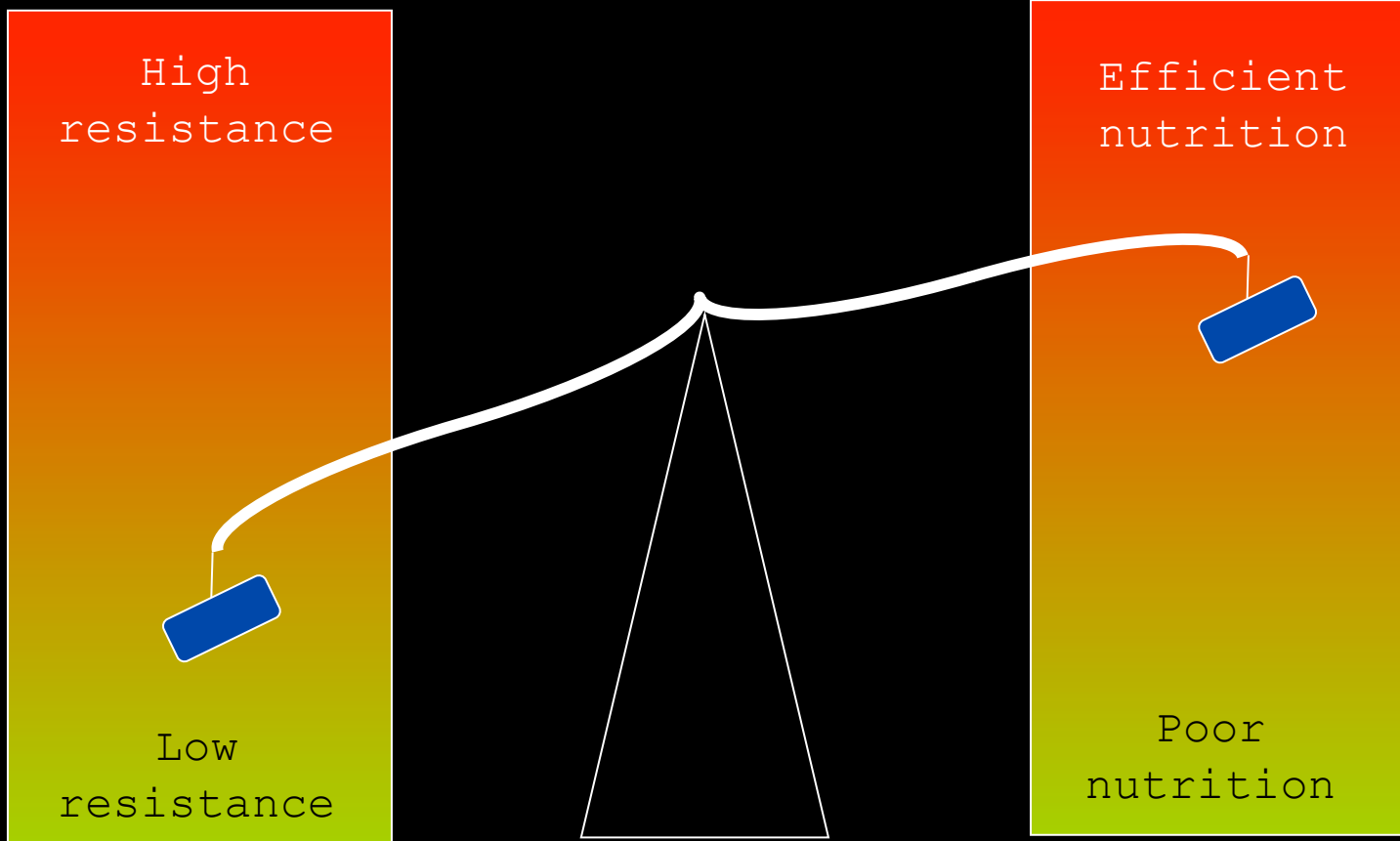
Ecological bases for such radiation

Self-Preservation And Nutritional Competence



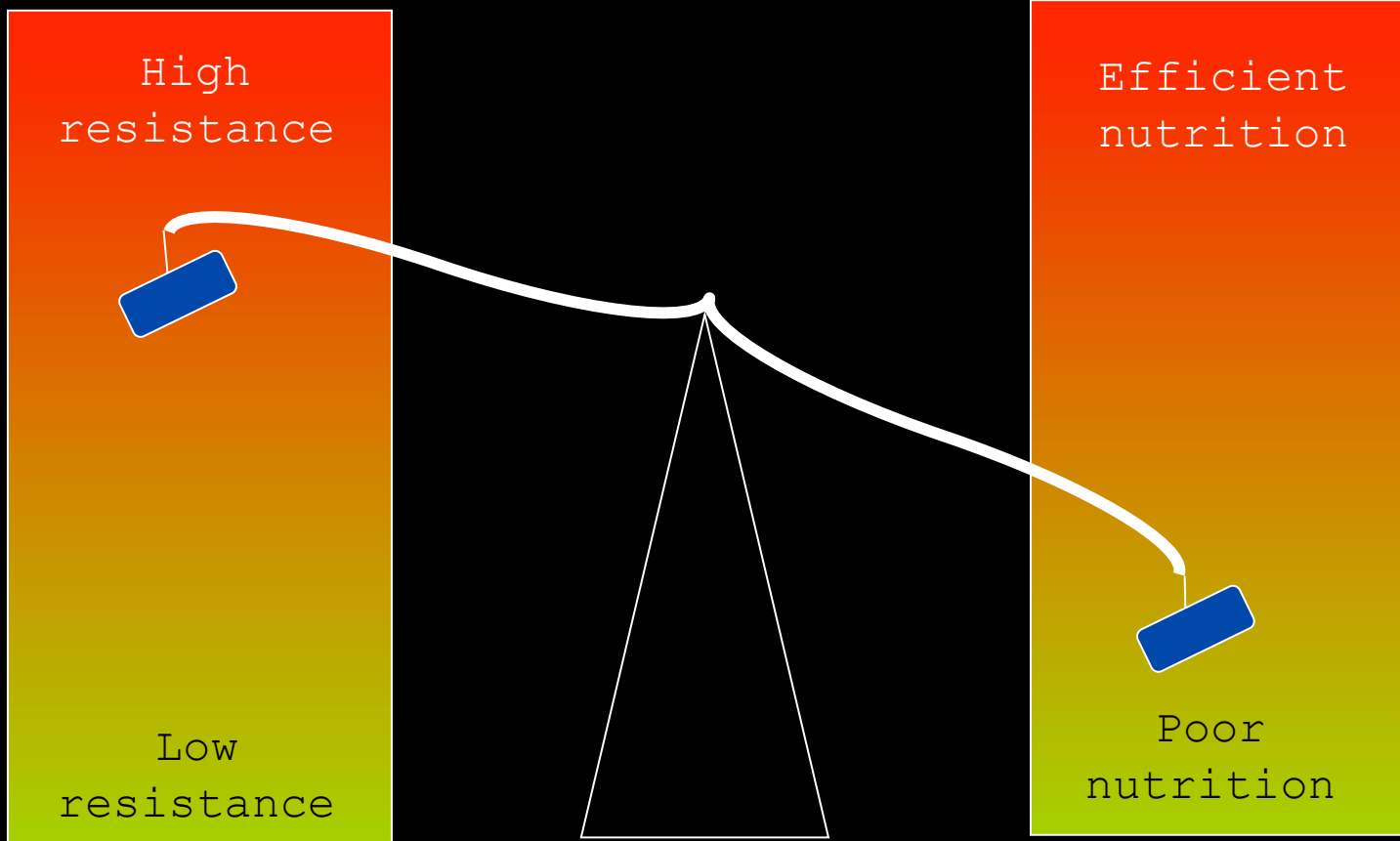
Ecological bases for such radiation

Higher permeability

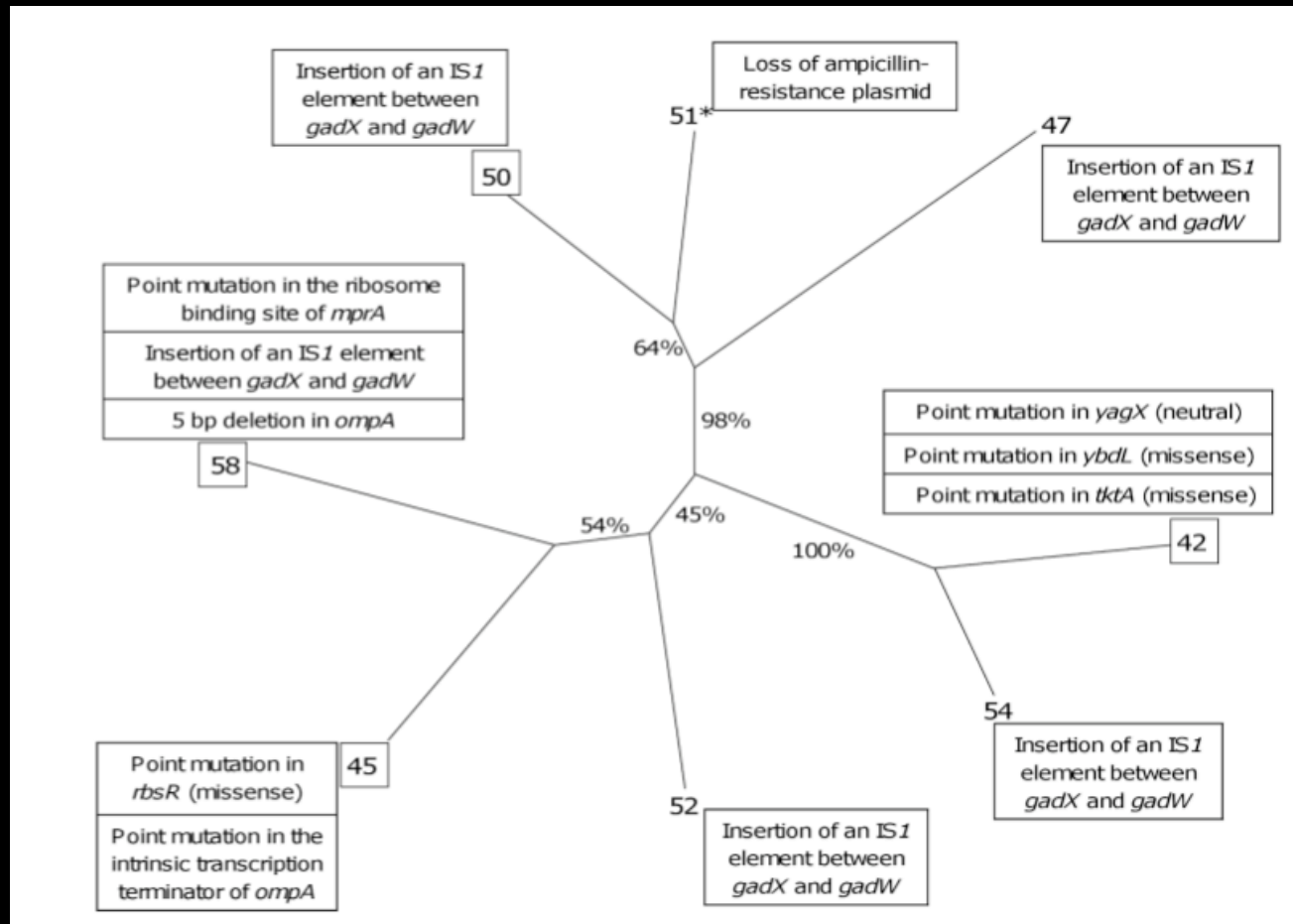


Ecological bases for such radiation

Higher rpos level



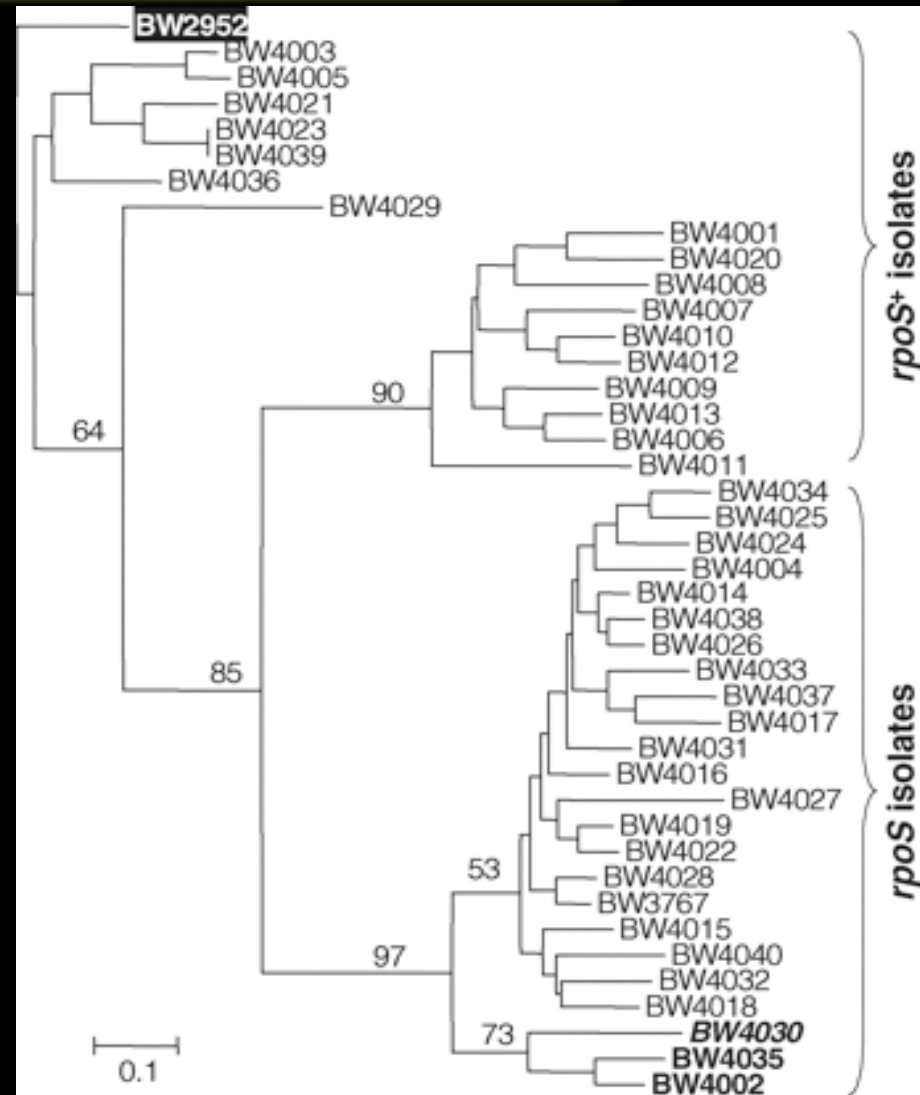
Molecular bases of the radiation



Many mutations affect SPANC balance

An ecological radiation

Similarities
between
in vitro
and
in infectio
evolution



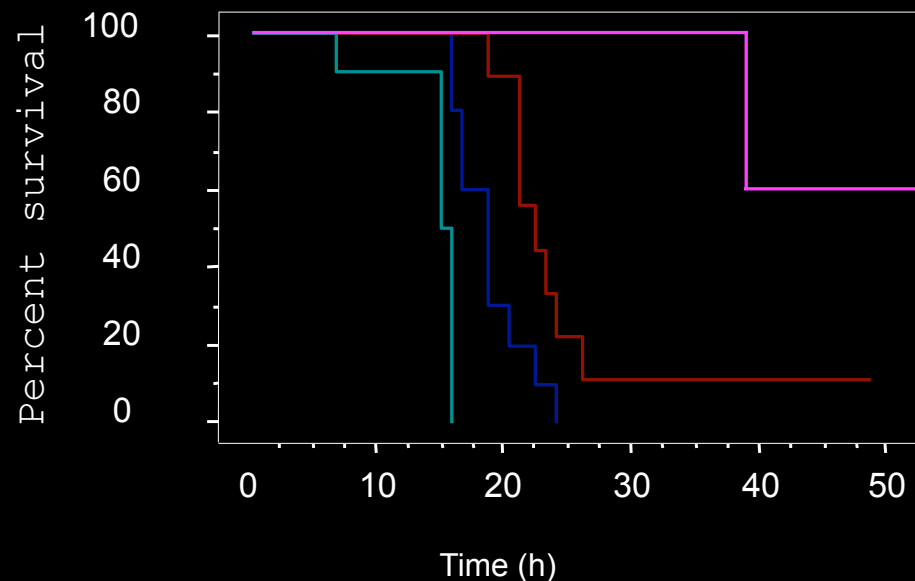
Within species interactions stronger in infections

- Cross feeding
- Cheaters

Can appear in high density of intraspecific bacteria as encountered in some stage of infection while in the gut other species limit such interactions

Impact of virulence

- Infection promotes diversification and various levels of stress resistance,
- However, stress resistant strains are less virulent



However!!!!

Diversity in antibiotic resistance can lead to wrong antibiotic treatment

