



## First rabbit gut microbial gene catalog and metagenomic insights into the resistome: links with antibiotic use

Caroline Achard, Yulixaxis Ramayo Caldas, Amine Ghozlane, Mathieu M. Almeida, Samuel Boucher, Stéphane Chatellier, Adeline Chaubet, Sylvie Combes, Catherine Denis, Benoit Dile, et al.

### ► To cite this version:

Caroline Achard, Yulixaxis Ramayo Caldas, Amine Ghozlane, Mathieu M. Almeida, Samuel Boucher, et al.. First rabbit gut microbial gene catalog and metagenomic insights into the resistome: links with antibiotic use. 16. International Symposium on Microbial Ecology - ISME16, Aug 2016, Montréal, Canada. hal-02792973

**HAL Id: hal-02792973**

**<https://hal.inrae.fr/hal-02792973>**

Submitted on 5 Jun 2020

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution - ShareAlike 4.0 International License

# FIRST RABBIT GUT MICROBIAL GENE CATALOG AND METAGENOMIC INSIGHTS INTO THE RESISTOME : LINKS WITH ANTIBIOTIC USE

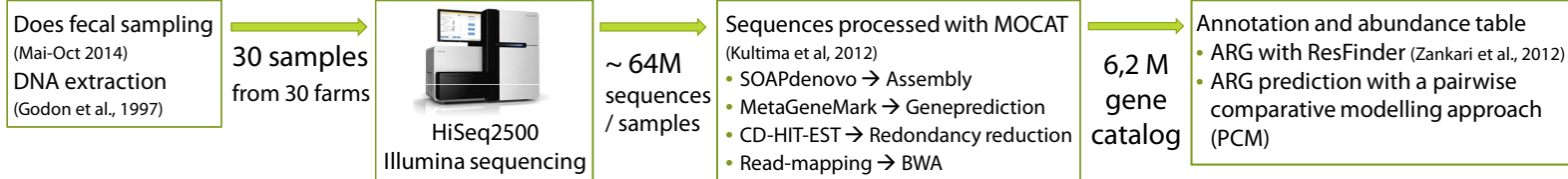
Caroline S. ACHARD<sup>1</sup>, Y. RAMAYO-CALDAS<sup>2</sup>, A. GHOZLANE<sup>3</sup>, M. ALMEIDA<sup>4</sup>, S. BOUCHER<sup>5</sup>, S. CHATELLIER<sup>6</sup>, A. CHAUBET<sup>7</sup>, S. COMBES<sup>1</sup>, C. DENIS<sup>2</sup>, B. DILE<sup>5</sup>, D. ESQUERRE<sup>7</sup>, B. GABINAUD<sup>1</sup>, B. LE NORMAND<sup>6</sup>, N. PONS<sup>3</sup>, E. RUPPE<sup>3</sup>, J. ESTELLE<sup>2</sup>, O. ZEMB<sup>1</sup>



## INTRODUCTION

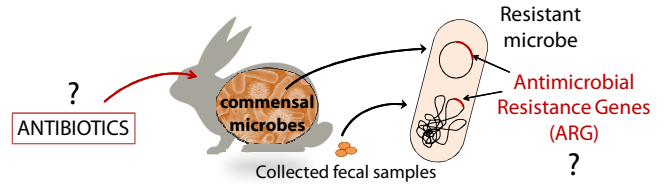
Microbial antibiotic resistance genes emerging in livestock are a major public health concern. It is crucial to consider the prevalence of Antibiotic Resistance Genes (ARG) in commensal microbes which represent the vast majority of the gut microbiota of healthy individuals and can convey ARG between animal and human. ARG can be carried by mobile genetic element and transferred between bacterial species, ending up in human pathogens.

## METHODS



## OBJECTIVES

- ❖ To generate a first rabbit gut microbial gene catalog.
- ❖ To characterize the gut resistome in French meat rabbit farming.



## RESULTS

### ANTIBIOTIC USES

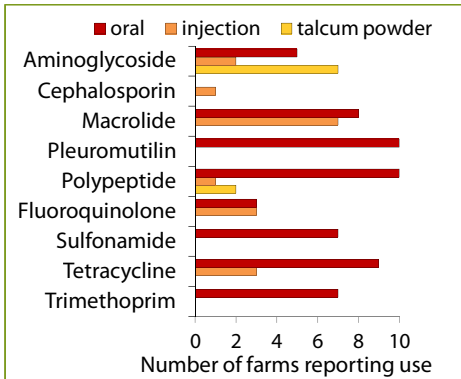


Figure 1 : Number of different antimicrobial molecules used in the rabbit farm panel per class and administration mode.

### A global link between antibiotic uses and the sum of the relative abundance of all ARG detected.

Table 1 : Antibiotic uses and ARG detected

| Farm            | # antibiotics used | # detected ResFinder ARG | Sum of ResFinder ARG abundance |
|-----------------|--------------------|--------------------------|--------------------------------|
| 02              | 0                  | 17                       | 5,49E+03                       |
| 12              | 0                  | 18                       | 1,06E+04                       |
| 05              | 0                  | 23                       | 1,09E+04                       |
| 32              | 1                  | 44                       | 1,53E+04                       |
| 26              | 0                  | 43                       | 2,22E+04                       |
| 07              | 1                  | 20                       | 2,74E+04                       |
| 33              | 0                  | 18                       | 3,78E+04                       |
| 01              | 0                  | 23                       | 4,58E+04                       |
| 16              | 4                  | 18                       | 5,19E+04                       |
| 18              | 0                  | 49                       | 5,24E+04                       |
| 15              | 4                  | 16                       | 5,71E+04                       |
| 13              | 1                  | 22                       | 5,94E+04                       |
| 27              | 3                  | 20                       | 6,35E+04                       |
| 17              | 3                  | 24                       | 6,51E+04                       |
| 04              | 2                  | 21                       | 6,55E+04                       |
| 24              | 2                  | 18                       | 6,73E+04                       |
| 23              | 4                  | 19                       | 6,85E+04                       |
| 14              | 1                  | 61                       | 6,95E+04                       |
| 30              | 8                  | 28                       | 7,17E+04                       |
| 11              | 4                  | 21                       | 7,53E+04                       |
| 22              | 5                  | 62                       | 7,71E+04                       |
| 03              | 6                  | 20                       | 7,71E+04                       |
| 19              | 4                  | 23                       | 7,78E+04                       |
| 25              | 5                  | 24                       | 8,11E+04                       |
| 31              | 8                  | 34                       | 8,38E+04                       |
| 10              | 5                  | 49                       | 8,74E+04                       |
| 28 <sup>a</sup> | 0                  | 68                       | 9,04E+04                       |
| 08 <sup>b</sup> | 1                  | 50                       | 9,13E+04                       |
| 21              | 6                  | 68                       | 1,07E+05                       |
| 20              | 7                  | 77                       | 1,94E+05                       |

Oral exposure to antibiotics

Non oral exposure to antibiotics

<sup>a</sup> oral exposure to antibiotics until end-2013

<sup>b</sup> oral exposure to antibiotics until end-2012

Figure 4 : ResFinder ARG relative abundance

• RWA farms • standard farms

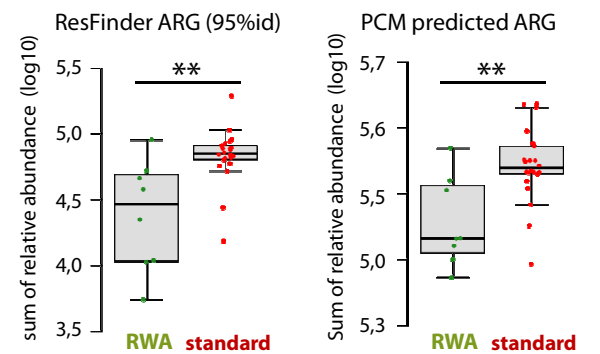
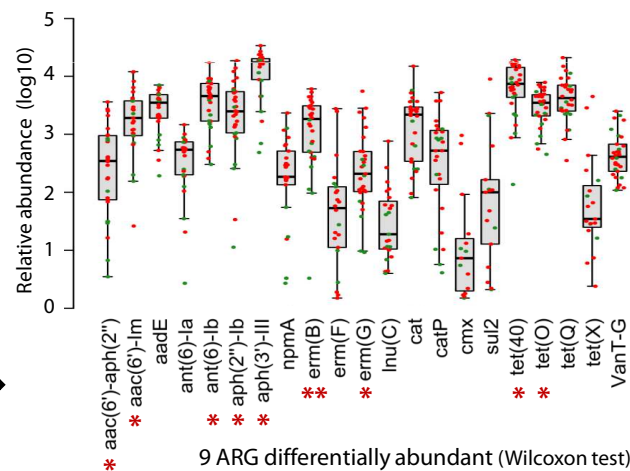


Figure 3 : Sum of relative abundances of all ARG in Raised Without Antibiotic (RWA) farms and in standard farm using antibiotics.



### RESFINDER → 80 ARG DETECTED

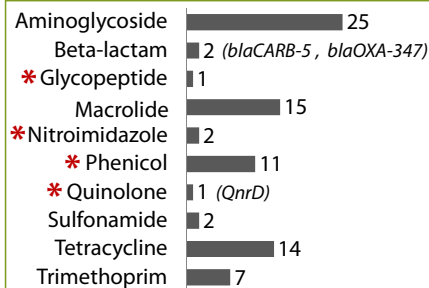


Figure 2 : Number of ARG identified in the gene catalog using ResFinder per antibiotic class. \* antibiotics not used

## CONCLUSION

- First rabbit gut microbial gene catalog : 80 antibiotic resistance genes (ARG Resfinder) and 8235 ARG candidates (pairwise comparative modelling approach).
- Decreasing the antibiotic use decreases the global abundance of antibiotic resistance genes.
- Some antibiotic resistance genes persist in antibiotic farms reducing their antibiotic use : an active strategy is needed (see poster 328B)

<sup>1</sup>GenPhySE, Université de Toulouse, INRA, INPT, INP-ENVT, Castanet Tolosan, France

<sup>2</sup>INRA, UMR1313 Génétique Animale et Biologie Intégrative, Jouy-en-Josas, France

<sup>3</sup>INRA, US1367 MetaGenoPolis, Jouy-en-Josas, France

<sup>4</sup>Center for Bioinformatics and Computational Biology, College Park, MD, USA

<sup>5</sup>Labovet, Réseau Cristal, Beaupréau et Les Herbiers, France

<sup>6</sup>Clinique Vétérinaire des Marches de Bretagne, Fougères et St Brice en Cogles, France

<sup>7</sup>INRA, GeT-PlaGe, Castanet Tolosan, France.

