

Cenoantibiogram: A biotechnological application for the evaluation of antibiotic resistance of mouse gut microbiota subjected to infection with influenza virus

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Abstract

The gut microbiota is constituted by complex microbial communities, that is, by microorganisms of different species that interact with each other intra- and interspecifically, as well as with their environment [1]. This ecosystem can easily be altered by several factors, among which are the flu-like processes caused by viruses of the Orthomyxoviridae family [2,3].

The causative agent of influenza (*Myxovirus influenzae*) is responsible for both the outbreaks of seasonal flu and major pandemics throughout history [4]. Often, these conditions are complicated by the involvement of secondary bacterial infections. The increasing level of resistance to antibiotics may be responsible for the death of 10 million people a year, in 2050 [1,5]. This fact increases the scientific interest to know the factors that can affect the gut microbiota and its repercussions.

The purpose of this work is to analyze the possible impact of the IAV virus on the functional status and phenotypic expression profile of the antibiotic resistance of the mice gut microbiota. To this effect, the biotechnological adequacy of techniques traditionally used for the evaluation of the antibiogram of bacterial populations was proposed, for the study of the behavior of the intestinal microbial community (microbiota) against antibiotics (cenoantibiogram). For this, mice were inoculated with influenza virus in PBS (IAV), controls inoculated with PBS buffer (Mock) and controls without virus or PBS (baseline).

Results of the statistical analysis (Random forest and Wilcoxon indices) show that the gut microbiota is significantly modified after the infection of the influenza virus, increasing its resistance to the antibiotics ampicillin and cefepime. The possible finding of factors that allow the acquisition and permanence of bacterial resistance, as well as its correlation with the influenza virus, could be a finding of great epidemiological relevance.

Recent Publications (if any-minimum 5)

1. Del Campo-Moreno, R., Alarcón-Cavero, T., D'Auria, G., Delgado-Palacio, S. and Ferrer-Martínez, M. (2018) 'Microbiota and Human Health: characterization techniques and transference', *Enferm Infecc Microbiol Clin*, 36(4), pp. 241-245.
2. Groves, H. T., Cuthbertson, L., James, P., Moffatt, M. F., Cox, M. J. and Tregoning, J. S. (2018) 'Respiratory Disease following Viral Lung Infection Alters the Murine Gut Microbiota', *Front Immunol*, 9, pp. 182.
3. Yildiz, S., Mazel-Sanchez, B., Kandasamy, M., Manicassamy, B. and Schmolke, M. (2018) 'Influenza A virus infection impacts systemic microbiota dynamics and causes quantitative enteric dysbiosis', *Microbiome*, 6(1), pp. 9.
4. Neumann, G. and Kawaoka, Y. (2015) 'Transmission of influenza A viruses', *Virology*, 479-480, pp. 234-46.
5. OMS. (2018). Resistencia a los antibióticos. Datos y Cifras. Disponible en <https://www.who.int/es/news-room/factsheets/detail/resistencia-a-los-antibióticos> . Última consulta 30/05/2019.



Agustín Probanza is the current Vice Chancellor for Teaching and Research, a job he combines with that of Professor at the San Pablo CEU University. Doctor in Biological Sciences from the UCM, his research work has been developed in Microbial Ecology applied to improve plant production through plant-microorganism interaction. **Pedro Jiménez** has a degree in Biological Sciences, from the UCM and a PhD in Microbiology from the USP-CEU. His line of research has focused on the study of antibiotic resistance in pathogenic strains of human, animal and environmental origin. He is currently responsible for the Microbiology Section of the USP-CEU. **Marina Robas** holds a degree in Environmental Sciences and completed her PhD in Microbiology under the direction of Doctors Jiménez y Probanza, at the same USP-CEU. Its line focuses on the ecological study of complex microbial communities of different nature: environmental and clinical, to adapt techniques traditionally used to evaluate antibiotic resistance in populations, to the study of the community.

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Notes/Comments: The biography that is shown corresponds with the research group in environmental microbial biotechnology of the USP-CEU.