

The survival strategies of a bacterium that causes hospital infections

July 16 2019



Maite Orruño. Credit: UPV/EHU

A group in the Department of Immunology, Microbiology and Parasitology at the UPV/EHU has conducted an in-depth study into the survival of the *Acinetobacter baumannii* bacterium, as well as the strategies it uses to survive. This bacterium is responsible for many



outbreaks of hospital or nosocomial infections that arise in intensive care units. It is capable of surviving long periods of time in liquid media as well as on solid surfaces, even when up against the action of disinfectants.

Acinetobacter baumannii causes all kinds of infections, ranging from pneumonia to blood infections in people admitted to hospital, especially those in intensive care units. "We studied the capacity of this bacterium to persist in various conditions that may be similar to those found in the hospital environment, the <u>survival strategies</u> it uses and its capacity to resist disinfectants," explained Maite Orruño-Beltrán, Ph.D. in Biology and one of the lead authors of this study. The results of the study have been published in the *Journal of Hospital Infection*.

For their research, they used four strains of *A. baumannii* obtained from standard culture collection as well as from clinical isolates from the Hospital de Valdecilla. "To conduct the survival studies, we incubated the strains for 30 days without nutrients at various temperatures (20 and 37 degrees) and in various media (in liquid and on different solid surfaces). We also checked the effect exerted by various disinfectants routinely used in hospitals. From time to time we gathered samples to determine how many remained cultivable and/or viable," said Orruño.

Surviving for periods of up to 90 days

Factoring out disinfectants, the researchers found that the survival of the bacteria was affected by temperature and the <u>surface</u> on which they were placed. Orruño says, "Above all, we found that those kept at 20 degrees on <u>solid surfaces</u> resisted 30 days in a cultivable state without any apparent changes. We even extended some experiments to 90 days, and the population still remained cultivable."

The bacteria that remained at 37 degrees displayed reduced survival.



"That temperature is the optimum one for growth, but not for survival when they are deprived of nutrients. In these conditions, bacteria in general withstand lower temperatures better," explained Dr. Orruño.

As they were able to confirm in the research, at 37 degrees, the surviving bacteria adopted two survival strategies: "Some moved to a state known as viable but nonculturable. In that state, although the bacteria are unable to grow, they remain in a dormant state from which they could recover if conditions become favourable again. This state could be of considerable importance, because many techniques for detecting microorganisms are based on their cultivability, and therefore do not detect the presence of these bacteria, which can however retain their pathogenicity," said the researcher.

The second strategy that some strains developed was that many of the cells lose viability. They may be mostly dead cells, but a more or less significant fraction of the population remains cultivable by using the nutrients from the cells that have died off.

With respect to the effect of disinfectants, they found that even though the vast majority of the cells became non-cultivable, *Acinetobacter baumannii* was not eliminated from the surfaces studied, and a considerable fraction retained viability. This phenomenon could entail risks since <u>hospital</u> workers could regard the disinfection procedure as having been sufficient, although some <u>bacteria</u> remain on surfaces as potential spreaders of diseases.

More information: Z. Bravo et al. Analysis of Acinetobacter baumannii survival in liquid media and on solid matrices as well as effect of disinfectants, *Journal of Hospital Infection* (2019). <u>DOI:</u> <u>10.1016/j.jhin.2019.04.009</u>



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Provided by University of the Basque Country

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