XIX CONGRESO DE LA SOCIEDAD ARGENTINA DE MICROBIOLOGÍA GENERAL

22 al 25 de octubre del 2024
Centro cultural y Pabellón Argentina de la Universidad Nacional de Córdoba, Córdoba, ARGENTINA.

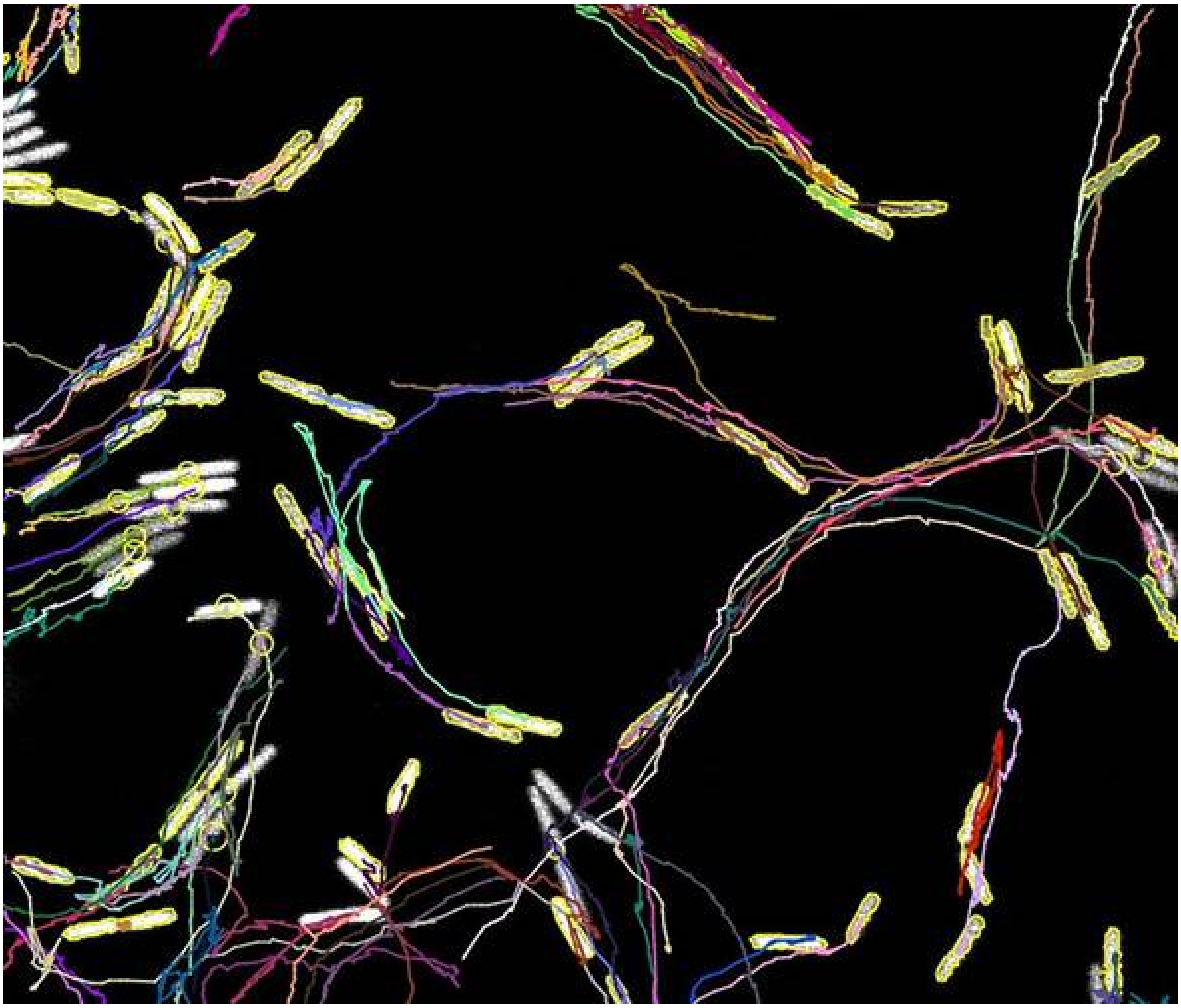

Foto: Se hace camino al andar. Celeste Dea. 1er puesto. Concurso fotográfico SAMIGE 20 años.

EXPLORING BACTERIAL NANOMECHANICAL AND MORPHOLOGICAL PROPERTIES USING ATOMIC FORCE MICROSCOPY

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Over the past decades, atomic force microscopy (AFM) has established itself as a powerful tool for the structural and morphological analysis of microorganisms at the single-cell level. AFM operates by detecting the interactions between a sharp tip, attached to a cantilever, and the surface of a sample. As the cantilever bends in response to these interactions, its deflection is captured by reflecting a laser onto a position-sensitive quadrant detector, allowing the detailed reconstruction of surface topography and precise calculation of bacterial cell roughness.
One of the key advantages of AFM is its ability to examine samples without requiring chemical fixation, dehydration, drying, or metallic coatings, which can alter surface properties. The force-distance curves generated during the AFM tip's vertical movement provide insights into cellular membrane properties such as elasticity, turgor pressure, and surface hydrophobicity and charge. Additionally, AFM can be employed to detect living microorganisms by monitoring their nanometric oscillations in real-time.
In this presentation, I will discuss nanomechanical alterations in the respiratory pathogen Bordetella pertussis, focusing on its virulent and avirulent phases under antibiotic exposure. Our studies reveal that only virulent B. pertussis cells exhibit a decrease in cellular elastic modulus and height following antimicrobial treatment, while avirulent cells remain unaffected. Furthermore, I will demonstrate the distribution of the filamentous hemagglutinin adhesin (FHA)—the primary adhesion factor of virulent B. pertussis—within the bacterial cell envelope using antibody-functionalized AFM tips in force spectroscopy. Additionally, I will present findings on AFM-based nanomotion detection, which enables rapid monitoring of microbial responses to antibiotics within minutes. The unique capabilities of AFM—including super-resolution imaging, piconewton force sensitivity, nanomanipulation, and the ability to operate under physiological conditions— offer promising avenues for cellular and molecular biology research. When combined with complementary techniques, AFM addresses crucial questions in microbiology, particularly regarding bacterial pathogens.

Palabras clave: palabras_clave