Sociedad Argentina de Microbiología General

XIX CONGRESO DE LA SOCIEDAD ARGENTINA DE MICROBIOLOGÍA GENERAL

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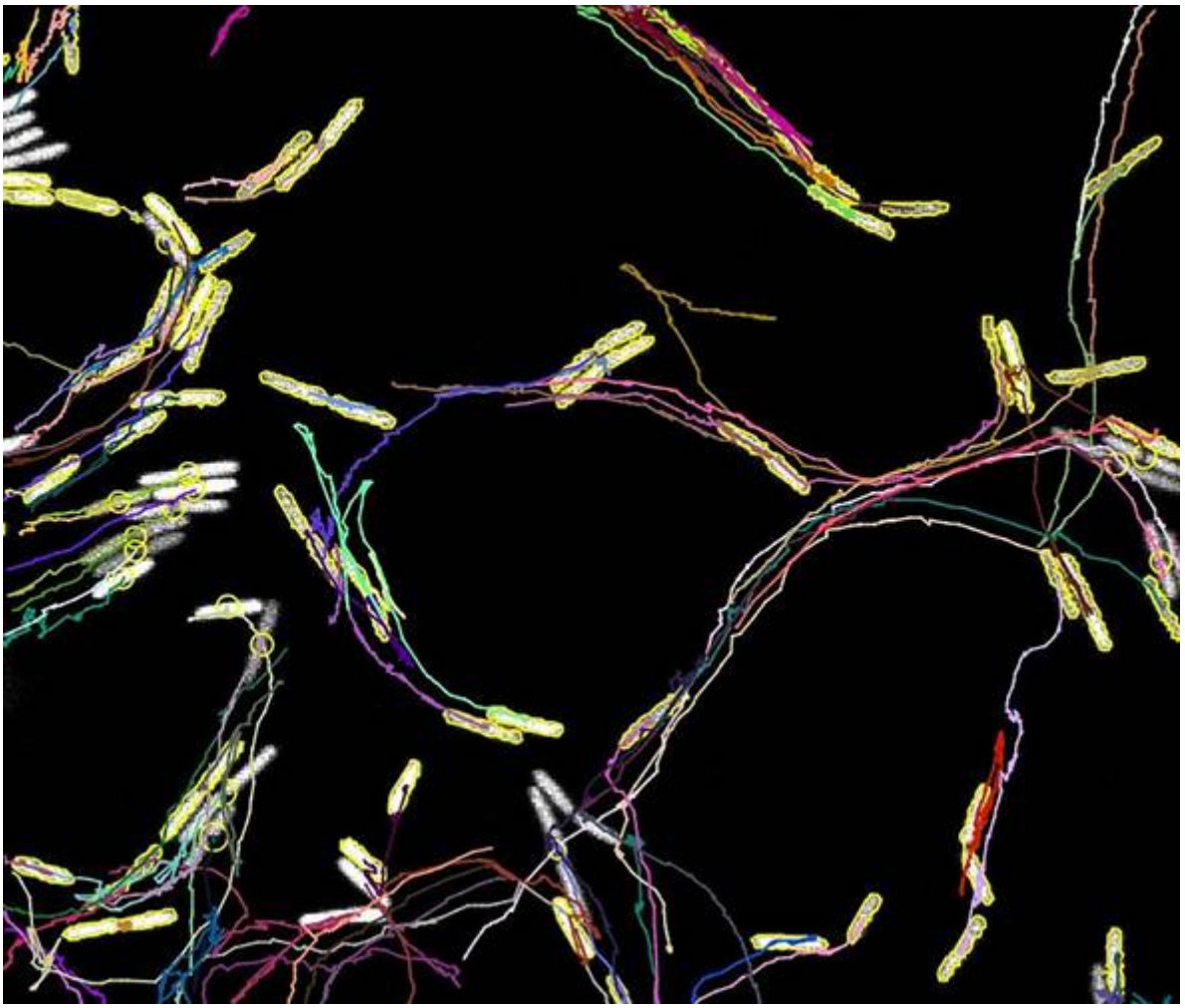

Foto: Se hace camino al andar. Celeste Dea. 1er puesto. Concurso fotográfico SAMIGE 20 años.

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BIOGENIC ZINC NANOPARTICLES: ANTIBACTERIAL, ANTIFUNGAL, AND ANTIBIOFILM ACTIVITIES

Lopez Venditti, Eliana[1,2] - Crespo Andrada Karina F.[3], Maldonado Torales Manuela[3]- Paraje, María Gabriela[3,4] - Guiñazú, Natalia[1,2]

1) Centro de Investigaciones en Toxicología Ambiental y Agrobiotecnología del Comahue (CITAAC) - CONICET - Universidad Nacional del Comahue, Neuquén, Neuquén, Argentina.
2) Facultad de Ciencias del Ambiente y la Salud, Universidad Nacional del Comahue, Neuquén, Neuquén, Argentina.
3) Cátedra de Microbiología, Facultad de Ciencias Exactas, Físicas y Naturales, Universidad Nacional de Córdoba, Córdoba, Argentina.
4) Instituto Multidisciplinario de Biología Vegetal (IMBIV), Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Córdoba, Argentina.
Contacto: gparaje@unc.edu.ar

Bacterial and fungal resistance to current treatments demands the development of new approaches in medicine. Biogenic metal nanoparticles (NPs) have attracted significant interest in this context due to their straightforward production and general biocompatibility. Zinc (Zn) is a metal involved in numerous physiological and metabolic processes and plays a crucial role in the immune and nervous systems, making it a promising candidate for biogenic NP production. This study aimed to evaluate the antimicrobial efficacy of biosynthesized ZnNPs against microorganisms relevant to human infections and microbicidal resistance, including the bacterial species *Staphylococcus* and *Escherichia* and the yeast *Candida*.The bacterial strain *Pseudomonas aeruginosa* (ATCC 27853) was used to produce ZnNPs intracellularly. The NPs were characterized using UV-vis spectroscopy, transmission electron microscopy (TEM), and Zeta potential measurements. The antimicrobial and antifungal activities of the ZnNPs were evaluated against *Staphylococcus aureus* ATCC 29213, *Escherichia coli* ATCC 25922, *Candida albicans* SC 5314, and *Candida tropicalis* NCPF 311 using the Kirby-Bauer method and were compared with reference antimicrobials. Additionally, the minimum inhibitory concentration (MIC), minimum bactericidal concentration (MBC), and minimum fungicidal concentration (MFC) were determined using the microbroth dilution method. The biofilm-forming ability of the microorganisms was assessed using the crystal violet (CV) assay, and the minimum biofilm inhibitory concentration (MBIC) was determined.The biosynthesized ZnNPs had an average size of approximately 39.5 nm with a spherical shape, and the corresponding plasmon peak was observed at 297 nm. The Zeta potential of the ZnNPs was -12.6 mV. The inhibition zone diameters for *E. coli* and *S. aureus* were 21.04 ± 0.34 mm and 28.74 ± 1.74 mm, respectively. For *C. albicans* and *C. tropicalis*, the inhibition zones were 19.88 ± 1.00 mm and 26.10 ± 0.86 mm, respectively. The MIC and MBC values for E. coli and S. aureus were 100 µg/mL and 200 µg/mL,

respectively, with MBCs matching the MICs. The MIC for both *Candida* species was 80 µg/mL, while the MFC values were 200 µg/mL for *C. albicans* and 400 µg/mL for *C. tropicalis*. Considering the MBC/MIC and MFC/MIC ratios as indicators of microbicidal capacity, ZnNPs demonstrated bactericidal activity (MBC/MIC ratio ? 4) and fungicidal activity (MFC/MIC ratio ? 4). Finally, ZnNPs significantly reduced bacterial and fungal biofilm formation in a dose-dependent manner.The study demonstrates that biosynthesized ZnNPs exhibit significant antimicrobial and antifungal activities against a range of clinically relevant microorganisms. Additionally, ZnNPs significantly reduced bacterial and fungal biofilm formation. These findings suggest that ZnNPs have considerable potential as an effective alternative to conventional microbicidal treatments, particularly in combating resistant bacterial and fungal infections.

Palabras clave: Biogenic nanoparticles- Zinc nanoparticles-Antibacterial activity-Antifungal activity- Antibiofilm activity