Sociedad Argentina de Microbiología General

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.

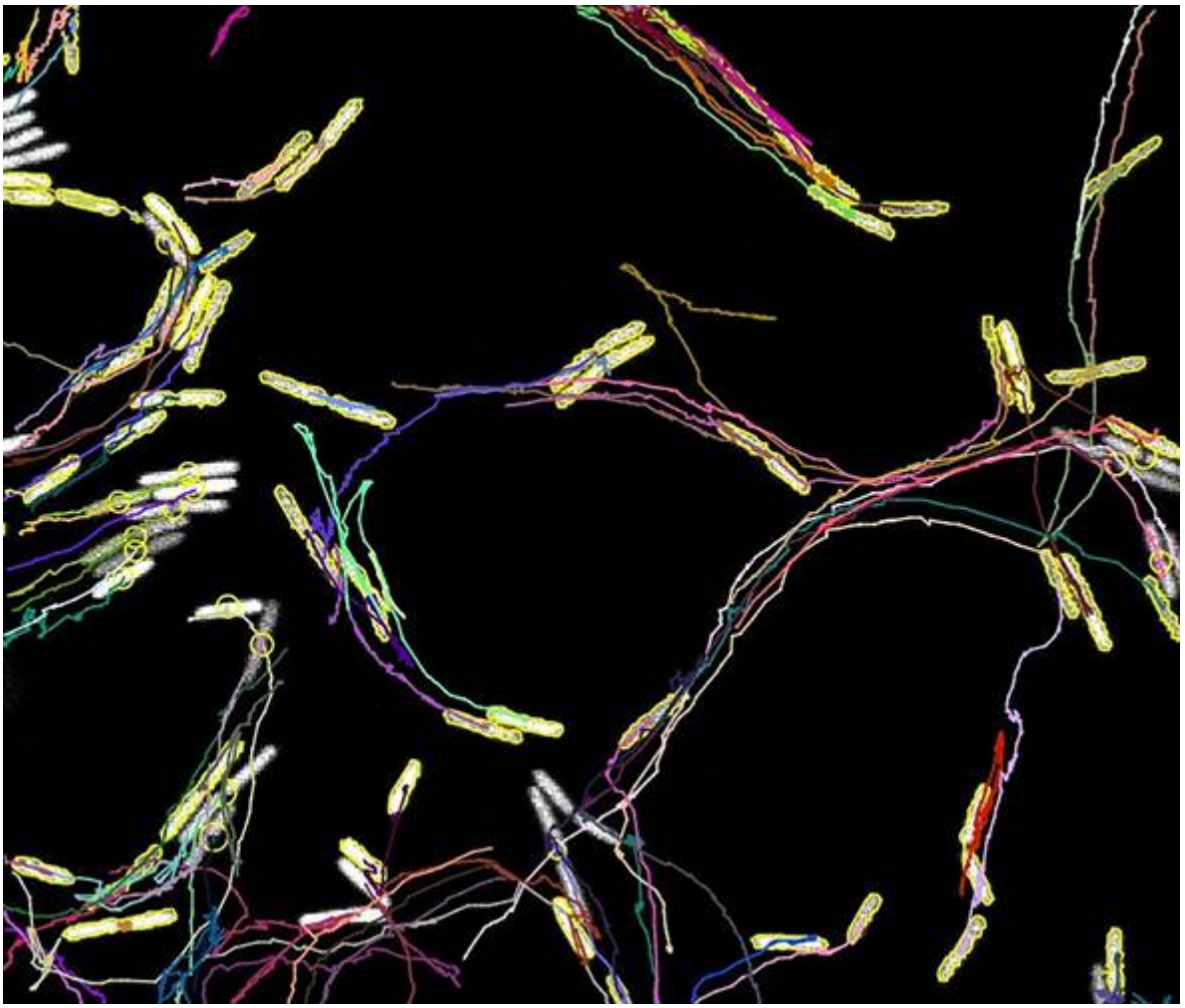

Foto: Se hace camino al andar. Celeste Dea. 1er puesto. Concurso fotográfico SAMIGE 20 años.

6 - Biotecnología y Bioprocesos

GOLD@N-BUTIL POLYCYANOACRYLATE NANOSPHERE AS A COATING WITH ANTIBACTERIAL AND ANTI-BIOFILM PROPERTIES

Cruz Jorge, Erlen Yizenia[1],- Navarro Martínez, Nicolás[1,2,3]-González, María José[1]- Ramos Carriles, Yaquelín[4,5] - Méndez, Eduardo[6]- Robino, Luciana[7] - Álvarez Brito, Rubén[4,5] - Scavone, Paola [1].

1) Departamento de Microbiología - Laboratorio de Biofilms Microbianos - Instituto de Investigaciones Biológicas Clemente Estable - Montevideo - Uruguay
2) Advanced Center for Chronic Diseases (ACCDiS) - Santiago - Chile.
3) Center of New Drugs for Hypertension (CENDHY) - Santiago - Chile.
4) Universidad de la Habana - Facultad de Química - La Habana - Cuba
5) Centro de Ingeniería Genética y Biotecnología@Universidad de la Habana - Laboratorio conjunto de nano-biomedicina - La Habana - Cuba
6) Universidad de la República - Facultad de Ciencias - Laboratorio de Biomateriales - Montevideo - Uruguay
7) Universidad de la República - Facultad de Medicina - Departamento de Bacteriología y Virología - Montevideo - Uruguay.
Contacto: erlen85@gmail.com

Bacterial adhesion and biofilm formation on biomaterials represent serious economic and health problems. Biofilms, whether mono-microbial or poly-microbial, exhibit significant resistance to antimicrobials and host defenses. Although antibiotics are a common treatment and prevention strategy, their effectiveness decreases due to the resistance induced by biofilms and the increase in multi-resistant strains. As an alternative, new materials and coatings are being developed. Nano-structured coatings, such as gold nanoparticles (Au-NPs), have intrinsic antimicrobial properties. Additionally, alkyl pol cyanoacrylates (PCA) are biocompatible polymers with antimicrobial activity against Gram-positive and some Gram-negative bacteria. This study synthesizes and evaluates a coating based on gold@pol cyanoacrylate n-butyl nanoparticles (Au-PCAB-Nps) to combat biofilms on biomaterials. Au-PCAB-Nps were synthesized by nanoprecipitation using a non-ionic surfactant as a stabilizer. They were characterized by Transmission Electron Microscopy, with hydrodynamic radius determined by Dynamic Light Scattering and Z-potential measured by Electrophoretic Light Scattering. The viability of *E. coli* 144, *P. mirabilis* 2921, *S. aureus* ATCC 6538, *S. epidermidis* M20200221, *A. baumannii* ATCC 19606, and *P. aeruginosa* ATCC 902 against the nanoparticles (Nps) was assessed using resazurin assays. The ability of the Nps to inhibit and eradicate biofilms was evaluated in a static assay on 96-well plates, using concentrations of 1x, 2x, and 4x. The obtained dispersion revealed two nanoparticle populations with hydrodynamic diameters of 79±1nm and 167±2nm, and a polydispersity index of 0.169. The observed Z-potential was -18.15±0.02mV. Au-PCAB-Nps exhibited minimum inhibitory concentration and minimum bactericidal concentration values above 4x for all tested strains. The viability assay showed

that Au-PCAB-Nps had no cytotoxic effect on *E. coli*, *P. mirabilis*, *S. aureus*, *S. epidermidis*, and *A. baumannii* under the tested conditions (24 h, concentrations of 0.002x to 4x), but did show cytotoxic effects on *P. aeruginosa* at 24 h and concentrations of 0.5x to 4x. Compared to Au-Nps, Au-PCAB-Nps had a similar effect, while PBCA-Nps showed no cytotoxic effects on any of the evaluated strains. Au-PCAB-Nps significantly reduced biofilm formation of *E. coli*, *P. mirabilis*, *S. aureus*, *S. epidermidis*, and *A. baumannii* compared to the control. PBCA-Nps showed a similar effect, while Au-Nps had no impact under any of the studied conditions. However, Au-PCAB-Nps did not reduce the biomass of mature biofilms of the studied bacteria, a behavior also observed with Au-Nps. PBCA-Nps reduced the biomass of mature biofilms only in *P. mirabilis* and *S. aureus*. These results suggest that Au-PCAB-Nps have promising potential as a coating for biomaterials to prevent bacterial biofilm-related infections. However, their efficacy does not surpass that of PBCA-Nps and is comparable to Au-Nps.

Palabras clave: Biofilms - Nanoparticles - Gold - n-Butyl Polycyanoacrylate - Coating Materials