

# Impact of locking solutions on conditioning biofilm formation in tunnelled haemodialysis catheters and inflammatory response activation

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Mario Jiménez Hernández<sup>1,2</sup> , Alex Soriano<sup>3</sup>, Xavier Filella<sup>4</sup>,  
María Calvo<sup>5</sup>, Elisenda Coll<sup>5</sup>, Josep M Rebled<sup>6</sup>, Esteban Poch<sup>1</sup>,  
Fredzia Graterol<sup>7</sup>, María Teresa Compte<sup>8</sup>, Francisco Maduell<sup>1</sup> and  
Néstor Fontserè<sup>1,9</sup>

## Abstract

**Introduction:** The surface of tunnelled cuffed catheters provides an optimal environment for the development of biofilms, which have recently been described as conditioning films because of the presence of adherent biological materials. These biofilms are associated with infection and thrombosis and potentially increase patients' inflammatory response. These complications could be reduced by the use of locking solutions.

**Objective:** To analyse biofilm formation, using confocal and electron microscopy, in tunnelled cuffed catheters locked with three different solutions and to determine the relationship between these solutions and inflammatory response.

**Study design:** This prospective study included 35 haemodialysis patients with tunnelled cuffed catheter removal for non-infection-related reasons. The participants were divided into three groups according to the lock solution used: (1) heparin 1: 5000 IU; (2) citrate 4%; and (3) taurolidine 1.35%, citrate 4% and heparin 500 IU (taurolock); in the latter group, 25,000 IU taurolidine-urokinase was used in the last weekly session. All tunnelled cuffed catheters were cultured, and the inner surface was evaluated with confocal and electron microscopy. The inflammatory profile of included patients was determined at tunnelled cuffed catheter removal.

**Results:** There were no differences in clinical or demographic variables between the three subgroups. Biofilm thickness was lower in the taurolidine group than in the citrate 4% and heparin groups ( $28.85 \pm 6.86$  vs  $49.99 \pm 16.56$  vs  $56.2 \pm 15.67 \mu\text{m}$ , respectively;  $p < 0.001$ ), as was biofilm volume ( $1.01 \pm 1.18$  vs  $3.7 \pm 2.15$  vs  $5.55 \pm 2.44 \mu\text{m}^3$ , respectively;  $p < 0.001$ ). The mean interleukin-6 value was 39%, which was 50% lower than in the citrate and heparin groups, but without significance differences.

**Conclusion:** Our results show that biofilms were found in all tunnelled cuffed catheters, but the thickness and volume were significantly lower in tunnelled cuffed catheters locked with taurolidine solution. Therefore, the type of locking solution used in tunnelled cuffed catheters should maintain tunnelled cuffed catheter sterility and prevent catheter-related bloodstream infections. No significant difference was observed in the inflammatory profile according to the type of locking solution.

<sup>1</sup>Department of Nephrology, Hospital Clínic de Barcelona, Barcelona, Spain

<sup>2</sup>School of Medicine, Universidad de las Americas Puebla, San Andrés Cholula, Puebla, Mexico

<sup>3</sup>Department of Infectious Diseases, Hospital Clínic de Barcelona, Barcelona, Spain

<sup>4</sup>Biomedical Diagnostic Center, Hospital Clínic de Barcelona, Barcelona, Spain

<sup>5</sup>Advanced Optical Microscopy Unit, Scientific and Technological Centers of the University of Barcelona, Barcelona, Spain

<sup>6</sup>Unitat de Microscòpia Electrònica (TEM/SEM), Centres Científics i Tecnològics, Barcelona, Spain

<sup>7</sup>Department of Nephrology, Hospital Universitari Germans Trias i Pujol, Badalona, Spain

<sup>8</sup>Hospital de la Santa Creu de Jesús, Tortosa, Spain

<sup>9</sup>Vascular Access Unit, Hospital Clínic, University of Barcelona, Barcelona, Spain

## Corresponding author:

Mario Jiménez Hernández, School of Medicine, Universidad de las Americas Puebla, Ex Hacienda Sta. Catarina Mártir S/N, Cholula, San Andrés Cholula 72810, Mexico.  
Email: majimenez@clinic.cat

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