Enferm Infecc Microbiol Clin. 2017;35(6):398

Enfermedades Infecciosas y Microbiología Clínica

www.elsevier.es/eimc

News SEIMC

Procedures in Clinical Microbiology (number 60, 2nd edition 2017)☆

Procedimientos en Microbiología Clínica (número 60, 2.ª edición 2017)

Microbiological diagnosis of infections related to biofilm formation

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Infections associated with biofilm formation have become a serious health problem, accounting for 65–80% of all infections. This type of infection is generally chronic and characterised by persistence of the aetiological agents owing to their high level of resistance to both the immune system and antibiotics. These infections can be located in almost any tissue in the human body (chronic wound infections and chronic lung infections such as cystic fibrosis are particularly common) and also affect exogenous devices such as vascular catheters, valves, pacemakers and grafts, artificial joints, implants, urinary catheters, etc.

In general, infections associated with biofilm formation are difficult to diagnose and treat, and there is still very little information available to provide guidance to clinicians and microbiologists. Traditionally, Clinical Microbiology laboratories have focused on isolating and conducting sensitivity studies on bacteria in planktonic growth. However, releasing the microorganisms from the biofilms leads to loss of the characteristics of this type of growth, with the result that choosing antibiotics based on these planktonic growth studies could lead to therapeutic failure or recurrence of chronic infections.

This paper addresses both the microbiological diagnosis and sensitivity studies in infections related to the formation of biofilms for which no standardised or consensus-based techniques are yet available.

The procedure includes one scientific document and three technical documents. The scientific document describes the different infections associated with the formation of biofilms from a clinical and microbiological point of view. Recommendations on the microbiological diagnosis of infections associated with biofilm formation are based on the European recommendations document published in 2014 by the European Society of Clinical Microbiology and Infectious Diseases, and current literature. The available microscopy techniques and other types of support, such as molecular techniques, are reviewed. Special emphasis is placed on pre-culture processing of the samples. Also discussed are the different models for studying the sensitivity of biofilms, their pros and cons and the likelihood of them being implemented as routine in microbiology laboratories, followed by what the pharmacokinetic and pharmacodynamic parameters contribute and how the clinical studies correlate with these tests. Lastly, recommendations are given on how to report the results derived from microbiological diagnosis in biofilm-related infections.

The second part of the document contains three standard operating procedures (SOP) on general pre-processing of samples associated with biofilm formation, and two relevant methods which are applicable to sensitivity studies: the Calgary device for bacterial biofilms and multi-well plates for yeast biofilms.

More detail on all the aspects mentioned above can be consulted in the Sociedad Española de Enfermedades Infecciosas y Microbiología Clínica (SEIMC) [Spanish Society of Infectious Diseases and Clinical Microbiology] microbiological procedure number 60: "Microbiological diagnosis of infections related to biofilm formation" (2nd edition 2017) (www.seimc.org/protocolos/microbiologia).

☆ Please cite this article as: Procedimientos en Microbiología Clínica (número 60, 2.ª edición 2017). Enferm Infecc Microbiol Clin. 2017;35:398.

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2529-993X/