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Stress-Induced Dispersal of *Staphylococcus epidermidis* Biofilm Is Due to Compositional Changes in Its Biofilm Matrix

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ABSTRACT

Biofilm formation is an important virulence factor of *Staphylococcus epidermidis*. However, little is known about the mechanisms of staphylococcal biofilm dispersal. In the present study, we investigated biofilm dispersal of the model biofilm-forming strain *S. epidermidis* RP62A under oligotrophic stress conditions. We found that oligotrophic stress led to rapid dispersal of pre-formed biofilms and concomitant changes in the composition of the extracellular matrix, including a decrease in poly-*N*-acetylglucosamine polysaccharide and an increase in proteins. Our results suggest that modifications in biofilm integrity caused by compositional changes in the biofilm matrix can induce biofilm dispersal.

KEYWORDS

Staphylococcus epidermidis; Biofilm Composition; Detachment; Nutrient Limitation

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References

[1] F. Gotz, "Staphylococcus and Biofilms," Molecular Microbiology, Vol. 43, 2002, pp. 1367-1378. doi:10.1046/j.1365-2958.2002.02827.x

[2] D. Mack, A. P. Davies, L. G. Harris, H. Rohde, M. A. Horstkotte and J. K. M. Knobloch, "Microbial Interactions in Staphylococcus epidermidis Biofilms," Analytical and Bioanalytical Chemistry, Vol. 387, No. 2, 2007, pp. 399-408. doi:10.1007/s00216-006-0745-2

[3] N. Cerca, S. Martins, G. B. Pier, R. Oliveira and J. Azeredoa, "The Relationship between Inhibition of Bacterial Adhesion to a Solid Surface by Sub-MICs of Antibiotics and Subsequent Development of a Biofilm," Research in Microbiology, Vol. 156, 2005, pp. 650-655. doi:10.1016/j.resmic.2005.02.004

[4] I. Sadovskaya, P. Chaignon, G. Kogan, A. Chokr, E. Vinogradov and S. Jabbouri, "Carbohydrate-Containing Components of Biofilms Produced in Vitro by Some Staphylococcal Strains Related to Orthopaedic Prosthesis Infections," FEMS Immunology and Medical Microbiology, Vol. 47, 2006, pp. 75-82. doi:10.1111/j.1574-695X.2006.00068.x

[5] I. Sadovskaya, E. Vinogradov, S. Flahaut, G. Kogan and S. Jabbouri, "Extracellular Carbohydrate-Containing Polymers of a Model Biofilm-Producing Strain, Staphylococcus epidermidis RP62A," Infection and Immunity, Vol. 73, No. 5, 2005, pp. 3007-3017. doi:10.1128/IAI.73.5.3007-3017.2005

[6] D. Mack, W. Fischer, A. Krokotsch, K. Leopold, R. Hartmann, H. Egge and R. Laufs, "The Intercellular Adhesin Involved in Biofilm Accumulation of Staphylococcus epidermidis Is a Linear Beta-1,6-Linked Glucosaminoglycan: Purification and Structural Analysis," Journal of Bacteriology, Vol. 178, No. 1, 1996, pp. 175-183.

[7] M. Otto, "Staphylococcal Biofilms," Current Topics in Microbiology and Immunology, Vol. 322, 2008, pp. 207-228.

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[8] R. Wang, B. A. Khan, G. Y. Cheung, T. H. Bach, M. Jameson-Lee, K. Kong, S. Y. Queck and M. Otto, "Staphylococcus epidermidis Surfactant Peptides Promote Biofilm Maturation and Dissemination of Biofilm-Associated Infection in Mice," Journal of Clinical Investigation, Vol. 121, No. 1, 2011, pp. 238-248. doi:10.1172/JCI 42520.

[9] G. Kogan, I. Sadovskaya, P. Chaignon, A. Chokr and S. Jabbouri, "Biofilms of Clinical Strains of Staphylococcus that Do Not Contain Polysaccharide Intercellular Adhesin," FEMS Microbiology Letters, Vol. 255, 2006, pp. 11-16. doi:10.1111/j.1574-6968.2005.00043.x

[10] H. Rohde, C. Burdelski, K. Bartscht, M. Hussain, F. Buck, M. A. Horstkotte, J. K.-M. Knobloch, C. Heilmann, M. Herrmann and D. Mack, "Induction of Staphylococcus epidermidis Biofilm Formation via Proteolytic Processing of the Accumulation-Associated Protein by Staphylococcal and Host Proteases," Molecular Microbiology, Vol. 55, 2005, pp. 1883-1895. doi:10.1111/j.1365-2958.2005.04515.x

[11] J. B. Kaplan, "Biofilm Dispersal: Mechanisms, Clinical Implications, and Potential Therapeutic Uses," Journal of Dental Research, Vol. 89, No. 3, 2010, pp. 205-218. doi:10.1177/0022034509359403

[12] S. M. Hunt, E. M. Werner, B. Huang, M. A. Hamilton and P. S. Stewart, "Hypothesis for the Role of Nutrient Starvation in Biofilm Detachment," Applied and Environmental Microbiology, Vol. 70, No. 12, 2004, pp. 7418-7425. doi:10.1128/AEM.70.12.7418-7425.2004

[13] P. J. Delaquis, D. E. Caldwell, J. R. Lawrence and A. R. McCurdy, "Detachment of Pseudomonas fluorescens from Biofilms on Glass Surfaces in Response to Nutrient Stress," Microbial Ecology, Vol. 18, 1989, pp. 199-210. doi:10.1007/BF02075808

[14] M. Gjermansen, M. Nilsson, L. Yang and T. Tolker-Nielsen, "Characterization of Starvation-Induced Dispersion in Pseudomonas putida Biofilms: Genetic Elements and Molecular Mechanisms," Molecular Microbiology, Vol. 75, 2010, pp. 815-826. doi:10.1111/j.1365-2958.2009.06793.x

[15] L. K. Sawyer and S. W. Hermanowicz, "Detachment of Biofilm Bacteria Due to Variations in Nutrient Supply," Water Science and Technology, Vol. 37, No.4, 1998, pp. 211-214. doi:10.1016/S0273-1223(98)00108-5

[16] B. R. Boles and A. R. Horswill, "Agr-Mediated Dispersal of Staphylococcus aureus Biofilms," PLoS Pathogens, Vol. 4, 2008, Article ID: e1000052. doi:10.1371/journal.ppat.1000052

[17] S. Jager, D. Mack, H. Rohde, M. A. Horstkotte and J. K.-M. Knobloch, "Disintegration of Staphylococcus epidermidis Biofilms under Glucose-Limiting Conditions Depends on the Activity of the Alternative Sigma Factor Sigma B," Applied and Environmental Microbiology, Vol. 71, No. 9, 2005, pp. 5577-5581. doi:10.1128/AEM.71.9.5577-5581.2005

[18] G. D. Christensen, W. A. Simpson, J. J. Younger, L. M. Baddour, F. F. Barrett, D. M. Melton and E. H. Beachey, "Adherence of Coagulase-Negative Staphylococci to Plastic Tissue Culture Plates: A