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Continuing Professional Development and the *Journal of Hospital Infection*

Answers linked to Lindsay D, von Holy A. Bacterial biofilms within the clinical setting: what healthcare professionals should know. *J Hosp Infect* 2006;**64**:313–325.

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1. In one sentence, define a microbial biofilm.

Answer: A biofilm may be defined as a community of interacting micro-organisms irreversibly attached to a surface, producing extracellular polymeric substances and exhibiting an altered phenotype compared with corresponding planktonic cells, especially regarding gene transcription.

2. Name six virulence factors of the bacterial pathogen, *Pseudomonas aeruginosa*, that also play an important role in biofilm development.

Answer: Flagella, pili, lipopolysaccharide, alginate and the quorum-sensing autoinducer, exotoxin A.

3. Bacteria in biofilms are highly resistant to treatment with antimicrobial agents. Name the various resistance mechanisms that have been suggested to account for this phenomenon.

Answer: The exact mechanisms that confer antimicrobial resistance on biofilm cells are not fully understood. However, several have been proposed, as follows: role of extracellular polymeric substances, bacterial cell surface properties, slower growth rate and role of *rpoS*, production of enzymes; role of plasmids, presence of resistant phenotypes and surface topography. Overall, no single mechanism has been proposed that accounts for cell resistance in biofilms satisfactorily and fully. Rather, it is believed that multiple resistance mechanisms may act synergistically, conferring the reduced susceptibility to antimicrobial compounds frequently manifested in biofilms.

4. Name the bacterium that has recently been ranked as one of the top five micro-organisms causing human infections in various sites, including

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Summarizing the instructions from the Royal College of Pathologists:

(1) One CPD point is allowed for each question and answer set (up to five questions and answers).
(2) Answers must be recorded referenced back to the questions and recorded in the CPD portfolio.
(3) It is essential that participants include the completed response form showing both questions and answers in their portfolio as these may be subject to audit by RCPath.

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Professional Standards Unit,
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Royal College of Pathologists,
2 Carlton House Terrace,
London, SW1Y 5AF, UK.
E-mail: CPD@rcpath.org or visit http://www.rcpath.org

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infections associated with intensive care units, and which is also a prolific biofilm former.

Answer: *Pseudomonas aeruginosa*.

5. Give five examples of surfaces/hospital/medical equipment that are prone to biofilm formation, resulting in possible chronic infections in patients.

Answer: Wounds, teeth, the gastrointestinal tract, indwelling medical devices, prostheses, water systems, dialysis equipment, ventilator systems and endoscopes.