

## Ten principles for preventing biofilm-related infections in surgical practice

**To the Editor:** There is a growing body of literature regarding the impact of biofilm on device-associated infections (DAI). It has been estimated that DAIs will cost the USA alone more than US\$1 billion. Much of the literature is in the context of the use of orthopaedic, cardiovascular, and plastic surgical prostheses, especially joint and breast implants, but biofilm has been implicated in all surgical fields where foreign materials are placed.

In the growing elderly population, there are increasing indications for the use of prostheses of many varieties. Breast augmentation and implant-based breast reconstructions remain some of the more requested and performed plastic surgical procedures. Biofilm is also the leading culprit in the persistence of many chronic and complex wounds, particularly in diabetics and those with peripheral arterial and venous disease.

Biofilm is a complex community or network (extracellular polymeric slime) created by bacteria following attachment to a surface. Its development has been shown to protect bacteria from antibiotics, the immune system, and topical antiseptics. It also enables bacterial species to maintain an inflammatory state, which improves supply of nutrients, and also permits multiple species to co-exist, share genetic information, as well as to disseminate and colonise new surfaces by seeding off planktonic bacteria. Biofilm-related infections are difficult to confirm using traditional techniques.

Our unit has designed a protocol (with 10 principles) for the placement of prostheses, which may be applied or adapted to any surgical setting:

1. Exclude and manage biofilm-related infections preoperatively in elective patients (e.g. urinary tract infections, otitis media, dental infections).
2. Prophylactic intravenous antibiotics on induction of anaesthesia.
3. Avoid incisions or dissection in contaminated or clean-contaminated fields (e.g. peri-areolar incisions for breast implant placement; use nipple shields or film).
4. Maintain careful surgical dissection principles (i.e. atraumatic handling, pedantic haemostasis).
5. Pocket irrigation with an antimicrobial agent (e.g. triple antibiotic or Betadine).
6. Use new instruments, gloves or even drapes prior to insertion.
7. Minimise opening time and avoid unnecessary contact with the implant (i.e. one surgeon only, minimal repositioning, consider introduction sleeves).
8. Employ layered suture-closure methods.
9. Reconsider the use of drains (there is limited evidence for efficacy in most settings).
10. Apply products with antibacterial coatings and/or deliver antibiotics locally (nanocrystalline silver, for instance, has demonstrated a broad spectrum of action with little resistance).

Much work is being undertaken to investigate methods of managing biofilm once it has developed, but it is widely acknowledged that, like

most things in medicine 'prevention is better than cure'. At present, DAIs caused by biofilm all too often result in the removal of the prosthesis with delayed replacement, or prolonged (and largely ineffective) antibiotic courses.

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