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MINIREVIEWS

Defensive antibacterial coating in orthopaedic surgery: Current evidence and future direction

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Abstract

Periprosthetic joint infections contribute significantly to patient morbidity, prolonged hospital stays, and escalating healthcare costs. Defensive antibacterial coating (DAC®) hydrogel has emerged as a promising strategy to combat these infections. It forms a biodegradable barrier that reduces bacterial adhesion and can deliver local antibiotics, thereby addressing a key mechanism in biofilm formation. Early clinical evidence suggests that DAC® effectively lowers infection recurrence in revision hip and knee arthroplasties, with additional benefits in trauma procedures and soft tissue repairs. Moreover, it has demonstrated compatibility with existing implants and surgical techniques, while potentially reducing overall antibiotic use and hospital stays. Despite these encouraging findings, data for its use in primary arthroplasty remains limited, underscoring the need for large-scale, high-quality studies. Future research is poised to refine DAC®'s antimicrobial efficacy through novel antibiotic combinations, personalised delivery systems, and broader applications beyond lower limb procedures. As the prevalence of comorbidities continues to rise, DAC® represents a valuable addition to multifaceted infection control protocols, potentially transforming orthopaedic care by enhancing patient outcomes and mitigating the economic and clinical burden of implant-related infections.

Key Words: Hospital-acquired infections; Surgical site infections; Periprosthetic joint infections; Implant-related infections; Orthopaedic surgery; Antibiotic prophylaxis; Defensive antibacterial coating; Biofilm prevention; Revision arthroplasty; Patient outcomes

Core Tip: Orthopaedic implant-related infections, including prosthetic joint and osteosynthesis-associated infections, significantly burden healthcare systems clinically and economically. Defensive antibacterial coating (DAC®) hydrogel emerges as a promising bioresorbable adjunct to traditional prophylactic strategies, effectively reducing infection rates and antibiotic overuse in orthopaedic surgery. While robust evidence supports DAC® in revision arthroplasty and trauma surgery, further high-quality studies are needed to confirm its role in primary joint replacement and expand applications to diverse patient populations and anatomical sites.

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INTRODUCTION

Hospital-acquired infections (HAIs) continue to impose a significant burden on healthcare systems worldwide due in increasing rates of antibiotic resistance[1,2]. In highincome countries, roughly 5.7%-7% of patients develop at least one healthcareassociated infection (HAI) during their hospital stay. The proportion rises to about 15%-19.2% in low and middleincome countries. Altogether, HAIs are responsible for an estimated 16 million additional hospitaldays in Europe each year[3-6]. Furthermore, the prevalence of HAIs has been increasing by 0.06% annually, with the highest rates observed in lower income regions[7]. Surgical site infections (SSIs), a common type of HAI, have been associated with increased healthcare costs due to additional treatments and extended patient recovery[8]. Some estimates are that 11 out of every 100 surgical patients may develop an SSI within 30 days post-operation[9]. SSIs significantly impact patient outcomes and healthcare systems in trauma and orthopaedic surgery.

Prosthetic joint infections (PJIs) represent a particularly challenging subset of SSIs, carrying substantial clinical and economic consequences in orthopaedic surgery. The incidence of PJIs in orthopaedics is estimated between 1% and 2%, and with the increasing number of orthopaedic surgeries performed annually, the absolute number of PJI cases is on the rise[10,11]. These infections lead to considerable patient morbidity, manifesting as prolonged pain, diminished joint function, and elevated mortality rates[12,13]. Notably, patients with PJIs have up to a five-fold higher mortality rate compared to those undergoing uninfected primary arthroplasties[14]. Similarly, osteosynthesis-associated infections (OAIs) remain a significant concern, with infection rates varying from 1% to 5% following closed fractures and escalating up to 30% after open fractures[15]. These infections can impair bone healing due to prolonged inflammatory processes, increasing the risk of functional loss or even amputation of the affected limb[16]. The rising incidence of these infections underscores the necessity for improved preventive and therapeutic strategies to enhance patient outcomes and alleviate the associated healthcare burden.

In addition to the clinical burden, PJIs and OAIs impose a significant economic strain on healthcare systems. In the United Kingdom, the cost of a single revision total hip replacement due to PJI can reach £42000, compared to approximately £7000 for a primary procedure[17]. Nationally, the annual expenditure on managing these infections exceeds £300 million, reflecting the substantial allocation of healthcare resources required[18]. By 2030, the cumulative cost associated with PJIs in the UK is projected to surpass £1 billion if current trends continue[19]. Similarly, in the United States, the combined annual hospital costs related to PJIs of the hip and knee are estimated to reach $1.85 billion by 2030[20]. Furthermore, an aging population inherently leads to a higher number of joint arthroplasties; projections indicate that primary total knee arthroplasty procedures will increase by 143% and total hip arthroplasties by 75% between 2014 and 2030[21]. This trend necessitates heightened vigilance and the development of tailored preventive measures to address the evolving risk profile of the patient population undergoing orthopaedic procedures

Established strategies to mitigate SSIs in orthopaedics include perioperative antibiotic prophylaxis, judicious hair removal, optimisation of glycaemic control, and topical skin preparations[22]. Additionally, laminar airflow (LAF) ventilation systems have been widely implemented in orthopaedic operating rooms with the aim of reducing SSIs by minimising airborne microbial contamination. However, recent studies have questioned their effectiveness, with recent evidence indicates that LAF systems do not significantly reduce the incidence of SSIs in orthopaedic surgeries and may not be cost-effective[23,24].

The Defensive antibacterial coating (DAC®) hydrogel has emerged as a promising innovation in reducing periprosthetic joint and osteosynthesis related infections across various patient groups[25,26]. This bioresorbable hydrogel is composed of two polymers: Hyaluronic acid and poly-D,L-lactide. Together, they form a biodegradable coating that can be applied to orthopaedic metalwork and soft tissue during surgery (Figure 1)[27]. The hydrogel functions by creating a physical barrier that inhibits bacterial adhesion to the hydrophobic surfaces of implants-a critical initial step in the development of biofilm-related infections[28]. Additionally, DAC® hydrogel can act as a carrier for antibiotics, facilitating their localized delivery and sustained release at the surgical site[29]. The aim of this review is to evaluate the role of DAC® in orthopaedic surgery, examining current evidence, identifying knowledge gaps, and clarifying the technology's potential to reduce infection risk, minimise antibiotic overuse, and improve patient outcomes across diverse musculoskeletal surgical applications, with an emphasis on future directions.

Figure 1 Defensive antibacterial coating (DAC®) hydrogel kit shown in its original sterile peel-pouch packaging. The single-use, pre-filled 3 mL syringe is wrapped to preserve sterility until opened in the operating theatre.

REVISION

Hip

Despite routine systemic antibiotic prophylaxis and advancements in surgical techniques, PJI continues to be a significant cause of total hip arthroplasty (THA) failure, with recent evidence suggesting a underestimation of PJI on national registry data[30]. Current research using DAC® has particularly targeted its application in revision THA procedures for periprosthetic hip infections. This focus arises from the recognition that reinfection following revision surgery poses serious health risks to patients and places considerable economic strain on healthcare systems.

Emerging evidence has assessed the efficacy of DAC® in one-stage THA. Pellegrini and Legnani[31] reported complete infection eradication in a series of ten patients undergoing cementless one-stage revision THA with DAC®-coated implants. Similarly, Capuano and colleagues observed successful infection control in all five patients treated using DAC®-coated prostheses in single-stage revision procedures, reinforcing DAC®'s potential as an effective adjunct in managing periprosthetic joint infections[32]. These findings suggest that DAC® may enhance infection prevention in one-stage hip revisions; however, larger-scale studies are needed to confirm these results.

DAC® has also shown promise in two-stage hip revision surgeries. In a cohort of 28 patients undergoing two-stage cementless hip revisions with DAC®-coated implants only 2 cases had recurrence and no loosening or failure in the remaining 26 patients[33]. Another study involving 21 patients who received silver-coated mega prostheses for infected hip arthroplasties with severe femoral bone loss reported an infection eradication rate of 90.5% at an approximately mean 5-year follow-up[34]. These findings suggest that DAC®, including silver coatings, may enhance infection control in two-stage hip revision procedures.

Furthermore SINBIOSE-H trial is currently evaluating the effectiveness of single-stage surgery using DAC® combined with antibiotic-loaded hydrogels compared to traditional two-stage procedures. This multicentre, prospective, randomised trial hypothesises that single-stage surgery with DAC®-coated implants is non-inferior regarding infection control while potentially reducing complications, patient morbidity, and healthcare costs associated with prolonged hospitalisation and two-stage interventions[35].

Knee

Similar to PJI of the hip, revision surgeries for PJI of the knee remain a significant economic burden for both patients and healthcare systems worldwide[36]. Encouraging evidence has emerged demonstrating promising results for the use of DAC® in managing periprosthetic infections of the knee[36,37]. In a case-control study involving 17 knee revisions treated with DAC®-coated implants, infection recurrence occurred in 9.1% of cases at a mean follow-up of 29.3 months, compared to 13.6% in patients undergoing two-stage revisions without DAC®. Notably, DAC® significantly reduced hospital stay and antibiotic treatment duration, suggesting that DAC®-coated implants effectively control infection while reducing patient morbidity and healthcare costs[32].

PRIMARY ARTHROPLASTY

Current research specifically assessing DAC® in primary hip arthroplasty remains limited. The majority of evidence predominantly focuses on antibiotic-loaded cement systems such as polymethylmethacrylate, which have shown efficacy in reducing infection rates in cemented implants, notably with infection reductions of approximately 50% when combined with systemic prophylaxis. However, the increasing preference for cementless implants highlights a gap in infection prophylaxis strategies[38]. A clinical trial of DAC®-coated implants showed a significant reduction in early SSIs

in primary hip arthroplasty, from 3% in controls to 0.7% in the DAC® group, without adverse events or impaired osteointegration[26]. Despite these promising findings, DAC® has less published evidence when compared to extensively studied antibiotic-loaded cement systems, which continue to dominate clinical practice due to robust data supporting their efficacy in reducing infection and associated complications[26].

In a recent biomechanical study by Orfanos *et al*[39], the effect of adjuvant antibiotic-loaded hydrogel on uncemented hip stem stability. Using synthetic femora, the study found that axial stiffness was slightly higher in the hydrogel group (4588 ± 448 N/mm) *vs* the control (4176 ± 240 N/mm). Additionally, while stem subsidence increased with load in both groups, no significant differences were observed between them. Importantly, the hydrogel was distributed homogeneously around the implant, suggesting that its use for local antibiotic delivery does not compromise the primary mechanical stability of uncemented hip stems. These results support the potential of adjuvant antibiotic-loaded hydrogel as a feasible strategy for infection prophylaxis in hip arthroplasty revisions without adversely affecting implant fixation.

TRAUMA

DAC® has emerged as a promising strategy to prevent implant-related infections in orthopaedic trauma surgery[40]. In a multicentre randomised controlled trial involving 256 patients undergoing internal fixation for closed fractures, the application of antibiotic-loaded DAC® resulted in a significant reduction in SSI where no infections were observed in the DAC®-treated group[41]. Further supporting these findings, a retrospective observational study assessed the efficacy of DAC® in preventing fracture-related infections (FRIs) among 27 high-risk patients. The study reported only one case of FRI (2.94%) at five months post-surgery, suggesting that local antibiotic prophylaxis with DAC® effectively reduces infection incidence compared to the estimated preoperative risk[42].

These studies highlight the potential of DAC® as an effective adjunctive measure in reducing infection rates in orthopaedic trauma surgeries. Its application has demonstrated a significant decrease in both SSIs and FRIs, underscoring its value in clinical practice.

SOFT TISSUE

Achilles tendon repair

Infections following surgical repair of the Achilles tendon are challenging complications that can compromise tendon healing and function. A study by Babiak *et al*[43] investigated the use of DAC® hydrogel loaded with gentamicin and vancomycin in eight patients with postoperative infections without significant soft tissue defects. The treatment involved debridement of the infected area followed by application of 5 mL DAC® hydrogel containing 160 mg gentamicin and 50 mg vancomycin. Over a follow-up period ranging from 6 to 43 months, all patients achieved complete resolution of the infection, with no adverse effects related to the hydrogel reported indicating the potential benefit in soft tissue foot and ankle surgery.

Anterior cruciate ligament reconstruction

Anterior cruciate ligament (ACL) reconstruction is a common procedure with a risk of postoperative infections, though relatively low, such infections can lead to graft failure and poor clinical outcomes. A feasibility study by Aicale *et al*[44] assessed the safety and efficacy of DAC® hydrogel with vancomycin applied to hamstring tendon autografts during ACL reconstruction. The study included patients undergoing ACL reconstruction with semitendinosus and gracilis tendon autografts. The application of DAC® hydrogel was found to be safe, with no adverse events reported, and effective in preventing early SSIs.

SPINES

DAC® has been investigated for its potential to reduce SSI in spinal surgery. Parbonetti *et al*[45] conducted a study involving 73 patients undergoing instrumented vertebral surgery for degenerative spinal disorders. They reported an infection rate of 0% in the DAC®-treated group, compared to 2.94% in posterior cervical surgeries without DAC®. Another study highlighted that spinal implant infections occur in 0.7% to 11.9% of cases, underscoring the need for effective preventive measures. These findings suggest that DAC® may significantly lower infection rates in spinal procedures.

FUTURE DIRECTION

The future application of DAC® in orthopaedic trauma patients with multiple comorbidities appears promising, especially given the increasing complexity of patient profiles. Patients with diabetes, cardiovascular disease, chronic kidney disease, and immunosuppressive conditions experience significantly elevated risks for SSI and FRIs due to compromised immune responses and impaired wound healing processes[46]. As DAC® hydrogels have demonstrated efficacy in reducing implant-related infections in trauma settings, their proactive application could substantially improve

outcomes in this vulnerable group[47]. Future research must focus on personalised antibiotic loading tailored to specific microbial profiles and resistance patterns, optimising efficacy while minimising risks of resistance[48]. Additionally, long-term clinical trials examining DAC® effectiveness specifically in trauma patients with significant comorbidities are essential to fully establish its role in routine clinical practice and potentially reduce healthcare costs associated with complications.

While current evidence regarding DAC® has demonstrated promising outcomes in revision arthroplasty, particularly in reducing infection rates, there remains limited data evaluating its efficacy in primary arthroplasty of the hip and knee[47]. Given the considerable clinical and economic implications of PJIs, further high-quality, randomised controlled trials are required to conclusively establish the benefits of DAC® in primary joint replacement settings[49]. Additionally, the application of DAC® should extend beyond hip and knee arthroplasty, encompassing other joint replacements, such as shoulders, elbows, and ankles, where the burden of infection can have significant functional and quality-of-life consequences[50-52]. Future research must particularly target patient populations identified as high-risk, including those with diabetes, immunosuppression, obesity, or prior joint infections, who stand to gain substantially from improved infection prophylaxis. As DAC® evolves, continued technological advancements will enhance its antimicrobial efficacy and biocompatibility, further integrating such strategies into routine orthopaedic practice[53]. Ultimately, robust, multi-centre collaborative studies will be critical in determining the precise role and cost-effectiveness of DAC across various arthroplasty procedures, facilitating evidence-based implementation into clinical pathways to improve patient outcomes [47].

Next-generation DAC® hydrogels are emerging as a promising strategy for infection prophylaxis and treatment in orthopaedics, particularly for patients at high risk of infection or those harbouring multidrug-resistant organisms[54]. Ongoing research into novel antibiotic combinations and adjunct anti-biofilm therapies aims to enhance both short- and long-term effectiveness of these treatments. For instance, studies have demonstrated that combining bacteriophages with antibiotics can effectively disrupt biofilms, making bacteria more susceptible to treatment. Additionally, the development of multifunctional hydrogels incorporating antimicrobial agents, such as curcumin, shows potential in preventing and controlling periprosthetic joint infections[55,56]. Expanding the application of DAC® technologies to diverse anatomical sites beyond hip, knee, and shoulder arthroplasty-such as the spine and foot–ankle joints-needs further direction.

CONCLUSION

The application of DAC® represents a significant advancement in the management of implant-related infections across various orthopaedic disciplines. This review highlights that, despite the persistent challenge of hospital-acquired infections and their associated clinical and economic burdens, DAC® hydrogel offers promising results in reducing the incidence of SSIs from primary arthroplasty to revision surgeries, trauma cases, and soft tissue repairs.

Moreover, the future direction of DAC® technology appears clear, with the potential for personalised antibiotic loading and integration with novel antimicrobial agents. Such innovations could expand its application to underexplored areas like shoulder, ankle, and hand surgeries, as well as soft tissue repairs. Addressing the growing complexity of patient profiles, especially in populations with multiple comorbidities, will be critical in optimising these strategies.

Ultimately, this review underscores the transformative potential of DAC® in orthopaedic infection prophylaxis. As further clinical trials and biomechanical studies refine its use, DAC® is poised to become an integral component of comprehensive infection control protocols, thereby improving both the quality of care and long-term patient outcomes in orthopaedic practice.

FOOTNOTES

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REFERENCES

1 **Hasan SA**, Raoof WM, Ahmed KK. Antibacterial activity of deer musk and Ziziphus spina-christi against carbapebem resis-tant gram negative bacteria isolated from patients with burns and wounds. *Regul Mech Biosyst* 2024; **15**: 267-278 [DOI: 10.15421/022439] [FullText]

2 **Ahmed SK**, Hussein S, Qurbani K, Ibrahim RH, Fareeq A, Mahmood KA, Mohamed MG. Antimicrobial resistance: impacts, challenges, and future prospects. *J Med Surg Public Health* 2024; **2**: 100081 [DOI: 10.1016/j.glmedi.2024.100081] [FullText]

3 **Voidazan S**, Albu S, Toth R, Grigorescu B, Rachita A, Moldovan I. Healthcare Associated Infections-A New Pathology in Medical Practice? *Int J Environ Res Public Health* 2020; **17**: 760 [PMID: 31991722 DOI: 10.3390/ijerph17030760] [FullText]

4 **Allegranzi B**, Bagheri Nejad S, Combescure C, Graafmans W, Attar H, Donaldson L, Pittet D. Burden of endemic health-care-associated infection in developing countries: systematic review and meta-analysis. *Lancet* 2011; **377**: 228-241 [PMID: 21146207 DOI: 10.1016/S0140-6736(10)61458-4] [FullText]

5 **Schumacher M**, Allignol A, Beyersmann J, Binder N, Wolkewitz M. Hospital-acquired infections--appropriate statistical treatment is urgently needed! *Int J Epidemiol* 2013; **42**: 1502-1508 [PMID: 24038717 DOI: 10.1093/ije/dyt111] [FullText]

6 **Magill SS**, Edwards JR, Bamberg W, Beldavs ZG, Dumyati G, Kainer MA, Lynfield R, Maloney M, McAllister-Hollod L, Nadle J, Ray SM, Thompson DL, Wilson LE, Fridkin SK; Emerging Infections Program Healthcare-Associated Infections and Antimicrobial Use Prevalence Survey Team. Multistate point-prevalence survey of health care-associated infections. *N Engl J Med* 2014; **370**: 1198-1208 [PMID: 24670166 DOI: 10.1056/NEJMoa1306801] [FullText]

7 **Raoofi S**, Pashazadeh Kan F, Rafiei S, Hosseinipalangi Z, Noorani Mejareh Z, Khani S, Abdollahi B, Seyghalani Talab F, Sanaei M, Zarabi F, Dolati Y, Ahmadi N, Raoofi N, Sarhadi Y, Masoumi M, Sadat Hosseini B, Vali N, Gholamali N, Asadi S, Ahmadi S, Ahmadi B, Beiramy Chomalu Z, Asadollahi E, Rajabi M, Gharagozloo D, Nejatifar Z, Soheylirad R, Jalali S, Aghajani F, Navidriahy M, Deylami S, Nasiri M, Zareei M, Golmohammadi Z, Shabani H, Torabi F, Shabaninejad H, Nemati A, Amerzadeh M, Aryankhesal A, Ghashghaee A. Global prevalence of nosocomial infection: A systematic review and meta-analysis. *PLoS One* 2023; **18**: e0274248 [PMID: 36706112 DOI: 10.1371/journal.pone.0274248] [FullText]

8 **Totty JP**, Moss JWE, Barker E, Mealing SJ, Posnett JW, Chetter IC, Smith GE. The impact of surgical site infection on hospitalisation, treatment costs, and health-related quality of life after vascular surgery. *Int Wound J* 2021; **18**: 261-268 [PMID: 33331066 DOI: 10.1111/iwj.13526] [FullText]

9 **Gillespie BM**, Harbeck E, Rattray M, Liang R, Walker R, Latimer S, Thalib L, Andersson AE, Griffin B, Ware R, Chaboyer W. Worldwide incidence of surgical site infections in general surgical patients: A systematic review and meta-analysis of 488,594 patients. *Int J Surg* 2021; **95**: 106136 [PMID: 34655800 DOI: 10.1016/j.ijsu.2021.106136] [FullText]

10 **Bozic KJ**, Kurtz SM, Lau E, Ong K, Chiu V, Vail TP, Rubash HE, Berry DJ. The epidemiology of revision total knee arthroplasty in the United States. *Clin Orthop Relat Res* 2010; **468**: 45-51 [PMID: 19554385 DOI: 10.1007/s11999-009-0945-0] [FullText]

11 **Kurtz SM**, Lau E, Watson H, Schmier JK, Parvizi J. Economic burden of periprosthetic joint infection in the United States. *J Arthroplasty* 2012; **27**: 61-5.e1 [PMID: 22554729 DOI: 10.1016/j.arth.2012.02.022] [FullText]

12 **Natsuhara KM**, Shelton TJ, Meehan JP, Lum ZC. Mortality During Total Hip Periprosthetic Joint Infection. *J Arthroplasty* 2019; **34**: S337-S342 [PMID: 30642705 DOI: 10.1016/j.arth.2018.12.024] [FullText]

13 **Phelan DM**, Osmon DR, Keating MR, Hanssen AD. Delayed reimplantation arthroplasty for candidal prosthetic joint infection: a report of 4 cases and review of the literature. *Clin Infect Dis* 2002; **34**: 930-938 [PMID: 11880958 DOI: 10.1086/339212] [FullText]

14 **Xu Y**, Huang TB, Schuetz MA, Choong PFM. Mortality, patient-reported outcome measures, and the health economic burden of prosthetic joint infection. *EFORT Open Rev* 2023; **8**: 690-697 [PMID: 37655835 DOI: 10.1530/EOR-23-0078] [FullText]

15 **Renz N**, Feihl S, Dlaska CE, Schütz MA, Trampuz A. [Osteosynthesis-associated infections : Epidemiology, definition and diagnosis]. *Unfallchirurg* 2017; **120**: 454-460 [PMID: 28540566 DOI: 10.1007/s00113-017-0364-8] [FullText]

16 **Giannitsioti E**, Salles MJ, Mavrogenis A, Rodriguez-Pardo D, Los-Arcos I, Ribera A, Ariza J, Del Toro MD, Nguyen S, Senneville E, Bonnet E, Chan M, Pasticci MB, Petersdorf S, Benito N, O' Connell N, Blanco García A, Skaliczki G, Tattevin P, Kocak Tufan Z, Pantazis N, Megaloikonomos PD, Papagelopoulos P, Soriano A, Papadopoulos A; The Esgiai Collaborators Study Group. Osteosynthesis-associated infection of the lower limbs by multidrug-resistant and extensively drug-resistant Gram-negative bacteria: a multicentre cohort study. *J Bone Jt Infect* 2022; **7**: 279-288 [PMID: 36644590 DOI: 10.5194/jbji-7-279-2022] [FullText]

17 **Vanhegan IS**, Malik AK, Jayakumar P, Ul Islam S, Haddad FS. A financial analysis of revision hip arthroplasty: the economic burden in relation to the national tariff. *J Bone Joint Surg Br* 2012; **94**: 619-623 [PMID: 22529080 DOI: 10.1302/0301-620X.94B5.27073] [FullText]

18 **Moore AJ**, Blom AW, Whitehouse MR, Gooberman-Hill R. Deep prosthetic joint infection: a qualitative study of the impact on patients and their experiences of revision surgery. *BMJ Open* 2015; **5**: e009495 [PMID: 26644124 DOI: 10.1136/bmjopen-2015-009495] [FullText]

19 **Holleyman RJ**, Jameson SS, Meek RMD, Khanduja V, Reed MR, Judge A, Board TN. Association between surgeon and hospital volume and outcome of first-time revision hip arthroplasty for aseptic loosening. *Bone Joint J* 2024; **106-B**: 1050-1058 [PMID: 39348904 DOI: 10.1302/0301-620X.106B10.BJJ-2024-0347.R1] [FullText]

20 **Premkumar A**, Kolin DA, Farley KX, Wilson JM, McLawhorn AS, Cross MB, Sculco PK. Projected Economic Burden of Periprosthetic Joint Infection of the Hip and Knee in the United States. *J Arthroplasty* 2021; **36**: 1484-1489.e3 [PMID: 33422392 DOI: 10.1016/j.arth.2020.12.005] [FullText]

21 **Schwartz AM**, Farley KX, Guild GN, Bradbury TL Jr. Projections and Epidemiology of Revision Hip and Knee Arthroplasty in the United States to 2030. *J Arthroplasty* 2020; **35**: S79-S85 [PMID: 32151524 DOI: 10.1016/j.arth.2020.02.030] [FullText]

22 **Tucci G**, Romanini E, Zanoli G, Pavan L, Fantoni M, Venditti M. Prevention of surgical site infections in orthopaedic surgery: a synthesis of current recommendations. *Eur Rev Med Pharmacol Sci* 2019; **23**: 224-239 [PMID: 30977890 DOI: 10.26355/eurrev_201904_17497] [FullText]

23 **Ouyang X**, Wang Q, Li X, Zhang T, Rastogi S. Laminar airflow ventilation systems in orthopaedic operating room do not prevent surgical site infections: a systematic review and meta-analysis. *J Orthop Surg Res* 2023; **18**: 572 [PMID: 37543643 DOI: 10.1186/s13018-023-03992-2] [FullText]

24 **Lewandowski DA**, Hussain A, Chun C, Chiang L, Ahuja S. Evaluation of Surgical Site Infection Rates in Traumatic Surgical Fixation and Arthroplasty Performed in Laminar Flow Versus Non-laminar Flow Theatres During the COVID Pandemic. *Cureus* 2024; **16**: e69154 [PMID: 39398697 DOI: 10.7759/cureus.69154] [FullText]

25 **Zoccali C**, Scoccianti G, Biagini R, Daolio PA, Giardina FL, Campanacci DA. Antibacterial hydrogel coating in joint mega-prosthesis: results

of a comparative series. *Eur J Orthop Surg Traumatol* 2021; **31**: 1647-1655 [PMID: 33547509 DOI: 10.1007/s00590-021-02884-7] [FullText]

26 **Romanò CL**, Malizos K, Capuano N, Mezzoprete R, D'Arienzo M, Van Der Straeten C, Scarponi S, Drago L. Does an Antibiotic-Loaded Hydrogel Coating Reduce Early Post-Surgical Infection After Joint Arthroplasty? *J Bone Jt Infect* 2016; **1**: 34-41 [PMID: 28529851 DOI: 10.7150/jbji.15986] [FullText]

27 **Romanò CL**, Scarponi S, Gallazzi E, Romanò D, Drago L. Antibacterial coating of implants in orthopaedics and trauma: a classification proposal in an evolving panorama. *J Orthop Surg Res* 2015; **10**: 157 [PMID: 26429342 DOI: 10.1186/s13018-015-0294-5] [FullText]

28 **Campoccia D**, Montanaro L, Arciola CR. The significance of infection related to orthopedic devices and issues of antibiotic resistance. *Biomaterials* 2006; **27**: 2331-2339 [PMID: 16364434 DOI: 10.1016/j.biomaterials.2005.11.044] [FullText]

29 **Drago L**, Boot W, Dimas K, Malizos K, Hänsch GM, Stuyck J, Gawlitta D, Romanò CL. Does implant coating with antibacterial-loaded hydrogel reduce bacterial colonization and biofilm formation in vitro? *Clin Orthop Relat Res* 2014; **472**: 3311-3323 [PMID: 24622801 DOI: 10.1007/s11999-014-3558-1] [FullText]

30 **Jin X**, Gallego Luxan B, Hanly M, Pratt NL, Harris I, de Steiger R, Graves SE, Jorm L. Estimating incidence rates of periprosthetic joint infection after hip and knee arthroplasty for osteoarthritis using linked registry and administrative health data. *Bone Joint J* 2022; **104-B**: 1060-1066 [PMID: 36047015 DOI: 10.1302/0301-620X.104B9.BJJ-2022-0116.R1] [FullText]

31 **Pellegrini A**, Legnani C. High rate of infection eradication following cementless one-stage revision hip arthroplasty with an antibacterial hydrogel coating. *Int J Artif Organs* 2022; **45**: 113-117 [PMID: 33594902 DOI: 10.1177/0391398821995507] [FullText]

32 **Capuano N**, Logoluso N, Gallazzi E, Drago L, Romanò CL. One-stage exchange with antibacterial hydrogel coated implants provides similar results to two-stage revision, without the coating, for the treatment of peri-prosthetic infection. *Knee Surg Sports Traumatol Arthrosc* 2018; **26**: 3362-3367 [PMID: 29549387 DOI: 10.1007/s00167-018-4896-4] [FullText]

33 **Franceschini M**, Sandiford NA, Cerbone V, Araujo LCT, Kendoff D. Defensive antibacterial coating in revision total hip arthroplasty: new concept and early experience. *Hip Int* 2020; **30**: 7-11 [PMID: 32907424 DOI: 10.1177/1120700020917125] [FullText]

34 **Logoluso N**, Pedrini FA, Morelli I, De Vecchi E, Romanò CL, Pellegrini AV. Megaprostheses for the revision of infected hip arthroplasties with severe bone loss. *BMC Surg* 2022; **22**: 68 [PMID: 35216567 DOI: 10.1186/s12893-022-01517-y] [FullText]

35 **Boyer B**, Cazorla C, Carricajo A, Labruyere C, Chapelle C, Presles E, Zufferey P, Botelho-Nevers E. Single-stage surgery with antibiotic-loaded hydrogel-coated implants versus two-stage surgery for chronic periprosthetic hip joint infection in French tertiary referral hospitals: the SINBIOSE-H non-inferiority, randomised, controlled trial study protocol. *BMJ Open* 2025; **15**: e085146 [PMID: 40000087 DOI: 10.1136/bmjopen-2024-085146] [FullText]

36 **Morcos MW**, Kooner P, Marsh J, Howard J, Lanting B, Vasarhelyi E. The economic impact of periprosthetic infection in total knee arthroplasty. *Can J Surg* 2021; **64**: E144-E148 [PMID: 33666386 DOI: 10.1503/cjs.012519] [FullText]

37 **Iqbal F**, Shafiq B, Noor SS, Ali Z, Memon N, Memon N. Economic Burden of Periprosthetic Joint Infection Following Primary Total Knee Replacement in a Developing Country. *Clin Orthop Surg* 2020; **12**: 470-476 [PMID: 33274024 DOI: 10.4055/cios20037] [FullText]

38 **Springer BD**, Cahue S, Etkin CD, Lewallen DG, McGrory BJ. Infection burden in total hip and knee arthroplasties: an international registry-based perspective. *Arthroplast Today* 2017; **3**: 137-140 [PMID: 28695187 DOI: 10.1016/j.artd.2017.05.003] [FullText]

39 **Orfanos G**, Zderic I, Gueorguiev B, Nylund P, D'Este M, Varga P, Okoro T. The impact of adjuvant antibiotic hydrogel application on the primary stability of uncemented hip stems. *BMJ Surg Interv Health Technol* 2024; **6**: e000307 [PMID: 39434829 DOI: 10.1136/bmjsit-2024-000307] [FullText]

40 **Pressato D**, Battista A, Govoni M, Vivarelli L, Dallari D, Pellegrini A. The Intraoperative Use of Defensive Antibacterial Coating (DAC(®)) in the Form of a Gel to Prevent Peri-Implant Infections in Orthopaedic Surgery: A Clinical Narrative Review. *Materials (Basel)* 2023; **16**: 5304 [PMID: 37570009 DOI: 10.3390/ma16155304] [FullText]

41 **Malizos K**, Blauth M, Danita A, Capuano N, Mezzoprete R, Logoluso N, Drago L, Romanò CL. Fast-resorbable antibiotic-loaded hydrogel coating to reduce post-surgical infection after internal osteosynthesis: a multicenter randomized controlled trial. *J Orthop Traumatol* 2017; **18**: 159-169 [PMID: 28155060 DOI: 10.1007/s10195-017-0442-2] [FullText]

42 **De Meo D**, Cera G, Pica R, Perfetti F, Martini P, Perciballi B, Ceccarelli G, Persiani P, Villani C. Antibiotic-Loaded Coatings to Reduce Fracture-Related Infections: Retrospective Case Series of Patients with Increased Infectious Risk. *Antibiotics (Basel)* 2023; **12**: 287 [PMID: 36830197 DOI: 10.3390/antibiotics12020287] [FullText]

43 **Babiak I**, Banasiewicz J, Luboiński Ł, Sieczych K. Defensive antibacterial coating (DAC) hydrogel with gentamycin and vancomycin for the therapy of achilles tendon infection after surgical repair without massive soft-tissue defect. Results in 8 cases. *Postępy Higieny i Medycyny Doświadczalnej* 2023; **77**: 176-181 [DOI: 10.2478/ahem-2023-0022] [FullText]

44 **Aicale R**, Oliva F, Maffulli N, Maffulli N. Defensive Antibacterial Coating (DAC®) for prevention of infection in ACL reconstruction: a feasibility study. *Muscle Ligaments Tendons J* 2020; **10**: 151 [DOI: 10.32098/mltj.01.2020.22] [FullText]

45 **Parbonetti G**, Puglisi A, La Maida E, Rizzo B, Granata R. Antibiotic-Loaded Hydrogel Coating for the Prevention of Local Infection after Vertebral Surgery: A Retrospective Cohort Analysis. *Surg Technol Int* 2021; **39**: 441-446 [PMID: 34380171 DOI: 10.52198/21.STI.39.NS149] [FullText]

46 **Metsemakers WJ**, Kuehl R, Moriarty TF, Richards RG, Verhofstad MHJ, Borens O, Kates S, Morgenstern M. Infection after fracture fixation: Current surgical and microbiological concepts. *Injury* 2018; **49**: 511-522 [PMID: 27639601 DOI: 10.1016/j.injury.2016.09.019] [FullText]

47 **Romanò CL**, Tsuchiya H, Morelli I, Battaglia AG, Drago L. Antibacterial coating of implants: are we missing something? *Bone Joint Res* 2019; **8**: 199-206 [PMID: 31214332 DOI: 10.1302/2046-3758.85.BJR-2018-0316] [FullText]

48 **Gadgaard NR**, Varnum C, Nelissen RGHH, Vandenbroucke-Grauls C, Sørensen HT, Pedersen AB. Comorbidity and risk of infection among patients with hip fracture: a Danish population-based cohort study. *Osteoporos Int* 2023; **34**: 1739-1749 [PMID: 37330437 DOI: 10.1007/s00198-023-06823-6] [FullText]

49 **Akindolire J**, Morcos MW, Marsh JD, Howard JL, Lanting BA, Vasarhelyi EM. The economic impact of periprosthetic infection in total hip arthroplasty. *Can J Surg* 2020; **63**: E52-E56 [PMID: 31995337 DOI: 10.1503/cjs.004219] [FullText]

50 **Kew ME**, Mathew JI, Wimberly AC, Fu MC, Taylor SA, Blaine TA, Carli AV, Dines JS, Dines DM, Gulotta LV. Outcomes after débridement, antibiotics, and implant retention for prosthetic joint infection in shoulder arthroplasty. *J Shoulder Elbow Surg* 2024; **33**: e68-e78 [PMID: 37468030 DOI: 10.1016/j.jse.2023.06.012] [FullText]

51 **Mercurio M**, Cofano E, Colace S, Piro F, Cerciello S, Galasso O, Gasparini G. Outcomes, Complications, and Eradication Rates of Two-Stage Revision Surgery for Periprosthetic Shoulder, Elbow, Hip, and Knee Infections: A Systematic Review. *Prosthesis* 2024; **6**: 1240-1258 [DOI: 10.3390/prosthesis6050089] [FullText]

52 **Teehan E**, Braswell M, Henry J, Demetracopoulos C. Periprosthetic Joint Infection in Modern Total Ankle Arthroplasty: the Outcomes Are Still Dire. *Foot Ankle Orthop* 2024; **9** [DOI: 10.1177/2473011424s00427] [FullText]

53 **Khan SA**, Shakoor A. Recent Strategies and Future Recommendations for the Fabrication of Antimicrobial, Antibiofilm, and Antibiofouling Biomaterials. *Int J Nanomedicine* 2023; **18**: 3377-3405 [PMID: 37366489 DOI: 10.2147/IJN.S406078] [FullText]

54 **Bove A**, Braile A, Matino G, Del Regno N, Sirico S, Orabona N, Braile M. The Efficacy of Defensive Antibacterial Coating (DAC™) Periprosthetic Joint Infection Prevention in the Hip: A Systematic Review. *J Clin Med* 2025; **14**: 270 [PMID: 39797352 DOI: 10.3390/jcm14010270] [FullText]

55 **Burduja N**, Virzì NF, Nocito G, Ginestra G, Saita MG, Spitaleri F, Patanè S, Nostro A, Pittalà V, Mazzaglia A. Curcumin-laden hydrogel coating medical device for periprosthetic joint infection prevention and control. *Int J Pharm* 2025; **672**: 125283 [PMID: 39890088 DOI: 10.1016/j.ijpharm.2025.125283] [FullText]

56 **Mayorga-Ramos A**, Carrera-Pacheco SE, Barba-Ostria C, Guamán LP. Bacteriophage-mediated approaches for biofilm control. *Front Cell Infect Microbiol* 2024; **14**: 1428637 [PMID: 39435185 DOI: 10.3389/fcimb.2024.1428637] [FullText]

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