TABLE V - Example of studies exploring different biodegradable carriers materials to treat chronic osteomyelitis in animal model

Class	Material	Antibiotic	Tested m.o.	Animal model	Reference
Bioceramic	Calcium phosphate	Gentamicin	*S. aureus*	Rabbits	Joosten *et al*., 2004
	Calcium sulphate	Moxifloxacin	MRSA	Rabbits	Kanellakopoulou *et al*., 2009
	Calcium sulphate	Tobramycin sulphate	*S. aureus*	Rabbits	Nelson *et al*., 2002
	Hydroxyapatite	Vancomycin	*S. aureus*	Rabbits	Shirtliff *et al*., 2002
	Hydroxyapatite	Gentamicin sulphate	*S. aureus*	Rats	Korkusuz *et al*., 1993
	Hydroxyapatite	Vancomycin	MRSA	Rabbits	Joosten *et al*., 2005
Polymer	Collagen	Gentamicin	*S. aureus*	Rabbits	Riegels-Nielsen *et al*., 1995
	PEG, PLGA	Tobramycin, Cefazolin	*S. aureus*	Rabbits	Ambrose *et al*., 2004
	Polyhydroxy-alkanoate	Sulbactam, cefoperazone, ampicillin	*S. aureus*	Rabbits	Gursel *et al*., 2001
	Polylactide/polyglicolide	Gentamicin	*S. aureus*	Dogs	Garvin *et al*., 1994
	P(SA-RA)	Gentamicin	*S. aureus*	Rats	Brin *et al*., 2008
	P(SA-RA)	Gentamicin	*S. aureus*	Rats	Krasko et al., 2007
Bioactive glass	Borate	Vancomycin	MRSA	Rabbits	Xie *et al*., 2011
	Borate	Vancomycin	MRSA	Rabbits	Xie *et al*., 2009
	Borosilicate	Ceftriaxone-sulbactam	*S. aureus*	Rabbits	Kundu *et al*., 2011
Composite	Chitosan, borate glass	Teicoplanin	*S. aureus*	Rabbits	Zhang *et al*., 2010
	PLGA, bioactive glass	Ciprofloxacin	*S. aureus, S.epidermidis, E. coli, P. aeruginosa*	Rabbits	Mäkinen *et al*., 2005
	Poly(D,L-lactide), tricalcium-phosphate, hydroxyapatite	Ciprofloxacin	*S. aureus*	Rabbits	Alvarez *et al*., 2008
	Poly-ε-caprolactone, tricalcium phosphate	Gatifloxacine	*S. milleri*, *B. fragilis*	Rabbits	Miyai *et al*., 2008

Legend: m.o.-microorganism; MRSA-methicillin-resistant *S. aureus*; PEG-poly(ethylene glycol); PLGA-poly(DL-lactic-co-glycolic acid); P(SA-RA)-Poly(sebacic-co-ricinoleic-ester-anhydride).

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Among the numerous antibiotics that have been reported to be useful in the treatment of osteomyelitis, vancomycin has been used for decades to treat MRSA associated infection. However poor vancomycin bone penetration and increasing rates of heteroresistance and glycopeptide tolerance have encouraged the search for newer agents, namely linezolid, daptomycin, quinupristin-dalfopristin and tigecycline.

Management of chronic osteomyelitis with the local delivery of antibiotics has the advantage of achieving high antibiotic concentrations at the site of infection without the systemic toxicity associated with the parenteral route. The most commonly used non-biodegradable carrier material has long been PMMA in the form of beads or bone cement. A novel number of biodegradable carriers systems have been developed in recent years with promising clinical potential, combining local delivery of the drug with osteogenic potential. This is an emerging area of research with great potential in the near future to treat osteomyelitis.

MOISE, P.A.; NORTH, D.; STEENBERGEN, J.N.; SAKOULAS, G. Susceptibility relationship between vancomycin and daptomycin in staphylococcus aureus: facts and assumptions. *Lancet Infect. Dis.*, v.9, n.10, p.617-624, 2009.

MONTANARO, L.; TESTONI, F.; POGGI, A.; VISAI, L.; SPEZIALE, P.; ARCIOLA, C.R. Emerging pathogenetic mechanisms of the implant-related osteomyelitis by *Staphylococcus aureus*. *Int. J. Artif. Organs,* v.34, n.9, p.781-788, 2011.

MOUZOPOULOS, G.; KANAKARIS, N.K.; KONTAKIS, G.; OBAKPONOVWE, O.; TOWNSEND, R.; GIANNOUDIS, P.V. Management of bone infections in adults: the surgeon's and microbiologist's perspectives. *Injury-Int. J. Care Injured*, v.42, suppl.5, p.S18-S23, 2011.

NAIR, M.B.; KRETLOW, J.D.; MIKOS, A.G.; KASPER, F.K. Infection and tissue engineering in segmental bone defects - a mini review. *Curr. Opin. Biotechnol.*, v.22, n.5, p.721-725, 2011.

NANDI, S.K.; MUKHERJEE, P.; ROY, S.; KUNDU, B.; DE, D.K.; BASU, D. Local antibiotic delivery systems for the treatment of osteomyelitis - a review. *Mat. Sci. Eng C.*, v.29, n.8, p.2478-2485, 2009.

NELSON, C.L.; MCLAREN, S.G.; SKINNER R.A.; SMELTZER M.S.; THOMAS J.R.; OLSEN, K.M. The treatment of experimental osteomyelitis by surgical debridement and the implantation of calcium sulfate tobramycin pellets. *J. Orthop. Res.,* v.20, n.4, p.643-647, 2002.

PÄÄKKÖNEN, M.; PELTOLA, H. Antibiotic treatment for acute haematogenous osteomyelitis of childhood: moving towards shorter courses and oral administration. *Int. J. Antimicrob. Agents*, v.38, n.4, p.273-280, 2011.

PAWAR, D.; BHANDARI, P. Newer antibiotics for musculoskeletal infections. *Indian J. Rheumatol.*, v.6, n.1, p.80-86, 2011.

RICE, L.B. Antimicrobial resistance in gram-positive bacteria. *Am. J. Med., v.*119, n.6, suppl.1, p.S11-S19, 2006.

RIEGELS-NIELSEN, P.; ESPERSEN, F.; HÖLMICH, L.R.; FRIMODT-MØLLER, N. Collagen with gentamicin for prophylaxis of postoperative infection - *Staphylococcus aureus* osteomyelitis studied in rabbits. *Acta Orthop. Scand.*, v.66, n.1, p.69-72, 1995.

SAMUEL, S.; MATHEW, B.S.; VEERARAGHAVAN, B.; FLEMING, D.H.; SAMUEL, B.; CHITTARANJAN, S.B.; PRAKASH, J.A. *In vitro* study of elution kinetics and bio-activity of meropenem-loaded acrylic bone cement. *J. Orthopaedics Traumatol*., v.13, n.3, p.131-136, 2012.

SÁNCHEZ, E.; BARO, M; SORIANO, I.; PERERA, A.; ÉVORA, C. *In vivo-in vitro* study of biodegradable and osteointegrable gentamicin bone implants. *Eur. J. Pharm. Biopharm.*, v.52, n.2, p.151-158, 2001.

SCHADE, V.L.; ROUKIS, T.S. The role of polymethylmethacrylate antibiotic–loaded cement in addition to debridement for the treatment of soft tissue and osseous infections of the foot and ankle. *J. Foot Ankle Surg.*, v.49, n.1, p.55-62, 2010.

SHIRTLIFF, M.E.; CALHOUN, J.H.; MADER, J.T. Experimental osteomyelitis treatment with antibiotic-impregnated hydroxyapatite. *Clin. Orthop. Relat. Res.,* v.401, p.239-247, 2002.

SIA, I.G.; BERBARI, E.F. Osteomyelitis. *Best Pract. Res. Clin. Rheumatol.*, v.20, n.6, p.1065-1081, 2006.

TICE, A.D.; HOAGLUND, P.A; SHOULTZ, D.A. Risk factors and treatment outcomes in osteomyelitis. *J. Antimicrob. Chemother.*, v.51, n.5, p.1261-1268, 2003a.

TICE, A.D.; HOAGLUND, P.A.; SHOULTZ, D.A. Outcomes of osteomyelitis among patients treated with outpatient parenteral antimicrobial therapy. *Am. J. Med.*, v.114, n.9, p.723-728, 2003b.

VILHENA, C.; BETTENCOURT, A. Daptomycin: a review of properties, clinical use, drug delivery and resistance. *Mini. Rev. Med. Chem*., v.12, n.3, p.202-209, 2012.

WALENKAMP, G.H.I.M. Self-mixed antibiotic bone cement: western countries learn from developing countries. *Acta Orthop.*, v.80, n.5, p.505-507, 2009.

WRIGHT, J.A.; NAIR S.P. Interaction of staphylococci with bone. *Int. J. Med. Microbiol.,* v.300, n.2-3, p.193-204, 2010.

XIE, Z.; LIU, X.; JIA, W.; ZHANG, C.; HUANG, W. Vancomycin-loaded bioactive borate glass for treatment of chronic osteomyelitis in rabbit. *Zhongguo Xiu Fu Chong Jian Wai Ke Za Zhi,* v.25, n.7, p.830-836, 2011.

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