ANTIBIOTIC RELEASE TESTS ON SPHERHA HYDROXYAPATITE SCAFFOLDS

Reconstructive bone surgery aims to regenerate the loss or resorption of bone through materials and techniques that allow to mimic and activate specific and fundamental reparative mechanisms such as osteogenesis, osteoinduction, and osteoconduction [1]. With good general health conditions, the bone displays an excellent healing capacity; therefore, in case of bone defects it is sufficient to fill the void of the loss of substance with grafts or bone substitutes to provide the three-dimensional structure to sustain the regeneration process [2]. However, infection, e.g., osteomyelitis, is one of the major post-operative complications and evolves in complete bone disruption [3]. Local delivery of antibiotics maximizes target tissue concentration and minimizes systemic toxicity risks [4]. The use of bone substitutes exploited as antibiotic carriers is ideal to plan efficient and tailored bone regeneration strategies [5].

BIBLIOGRAPHY

1. Roberts, T.T.; Rosenbaum, A.J. Bone grafts, bone substitutes and orthobiologics. Organogenesis 2012, 8, 114–124, doi:10.4161/org.23306.
2. Giannoudis, P. V.; Einhorn, T.A.; Schmidmaier, G.; Marsh, D. The diamond concept - open questions. Injury 2008, 39, S5, doi:10.1016/S0020-1383(08)70010-X.
3. Lew, P.D.P.; Waldvogel, P.F.A. Osteomyelitis. Lancet 2004, 364, 369–379, doi:10.1016/S0140-6736(04)16727-5.
4. ter Boo, G.J.A.; Grijpma, D.W.; Moriarty, T.F.; Richards, R.G.; Eglin, D. Antimicrobial delivery systems for local infection prophylaxis in orthopedic- and trauma surgery. Biomaterials 2015, 52, 113–125, doi:10.1016/j.biomaterials.2015.02.020.
5. El-Husseiny, M.; Patel, S.; MacFarlane, R.J.; Haddad, F.S. Biodegradable antibiotic delivery systems. J. Bone Jt. Surg. - Ser. B 2011, 93 B, 151–157, doi:10.1302/0301-620X.93B2.24933.

SpherHA

TISS'YOU REGENERATIVE COMPANY

METHODOLOGY

We tested the antibiotic release efficacy of SpherHA, a bio-mimetic nano-structured hydroxyapatite. We loaded 0.5 ml of SperHA dense granules (0.5-1 mm of granulometry) with different antibiotic solutions (Rifampicin, Vancomycin, and Gentamicin; 5mg in 0.5 ml each). After loading the antibiotics, the bone substitutes were placed at the bottom of a 50 ml falcon tube filled with 10mM ascorbic acid solution and placed in the incubator at 35°C. Every 24 hours, in the following 5 days, 3 ml of sample was collected to measure antibiotic concentration through HPLC analysis, and 3 ml of buffer citrate solution (pH 5) was added to avoid antibiotic super concentration.

Table with recommended* antibiotic loading concentrations.

Antibiotic	Concentration
Rifampicin	50 mg/ml
Vancomycin	40 mg/ml
Gentamicin	60 mg/ml

**The physician is responsible for deciding the type and amount of antibiotic used. Contraindications of the antibiotic applied must be considered.*

SpherHA dense granules Ref. list

SHA-D0501	(0.5-1 mm)	1 btl.	0.5 cc
SHA-D0506	(0.5-1 mm)	6 btl.	0.5 cc
SHA-D1001	(0.5-1 mm)	1 b tl.	1 cc
SHA-D1006	(0.5-1 mm)	6 btl.	1 cc
SHA-D2001	(0.5-1 mm)	1 btl.	2 cc
SHA-D2006	(0.5-1 mm)	6 btl.	2 cc
SHA-D4001	(0.5-1 mm)	1 btl.	2 cc
SHA-D4006	(0.5-1 mm)	6 btl.	2 cc
SHA-D20501	(1-2 mm)	1 btl.	5 cc
SHA-D21001	(1-2 mm)	1 btl.	10 cc
SHA-D22001	(1-2 mm)	1 btl.	20 cc
SHA-D23001	(1-2 mm)	1 btl.	30 cc
SHA-D24001	(1-2 mm)	1 btl.	40 cc
SHA-D25001	(1-2 mm)	1 btl.	50 cc

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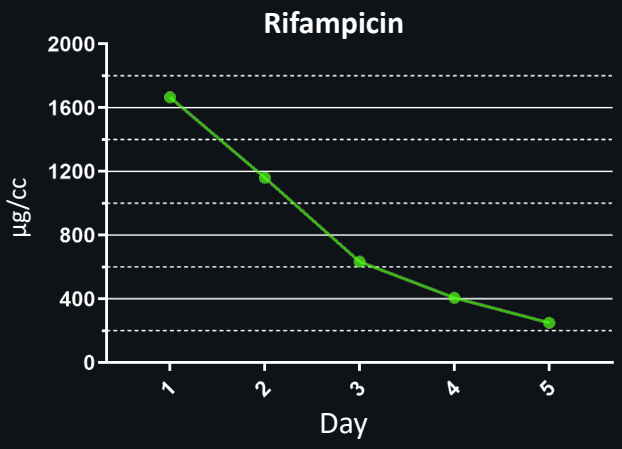
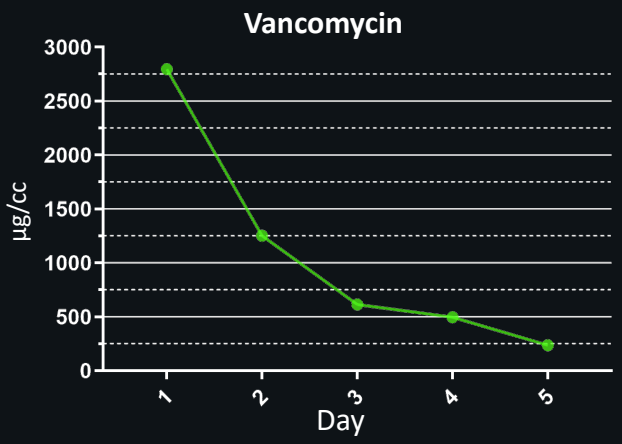
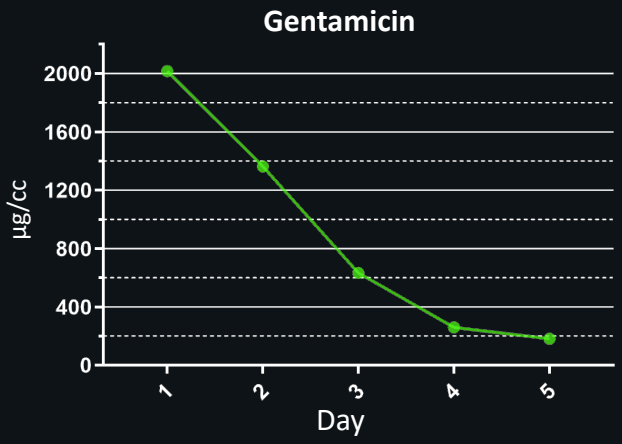
TEST RESULTS

Daily mean antibiotic release [µg/day] for SpherHA dense granules.







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