Electronic Supplementary Material (ESI) for Journal of Materials Chemistry B.

Supporting information

Combinatorial Delivery of Bioactive Molecules by a Nanoparticle-Decorated and Functionalized Biodegradable Scaffold

*Ewa M. Czekanska[†a], Jin Geng[†b], Michael Glinka[a], Kate White[a], Janos Kanczler[a], Nicholas D Evans[a], Richard O. C. Oreffo[*a], Mark Bradley[*b]*

a. Bone and Joint Research Group, Centre for Human Development, Stem Cells and Regeneration, Faculty of Medicine, Southampton University, Southampton, SO16 6YD, UK. Email: Richard.Oreffo@soton.ac.uk.

b. School of Chemistry, University of Edinburgh, Edinburgh, EH9 3FJ, UK. Email: mark.bradley@ed.ac.uk.

† These authors contributed equally

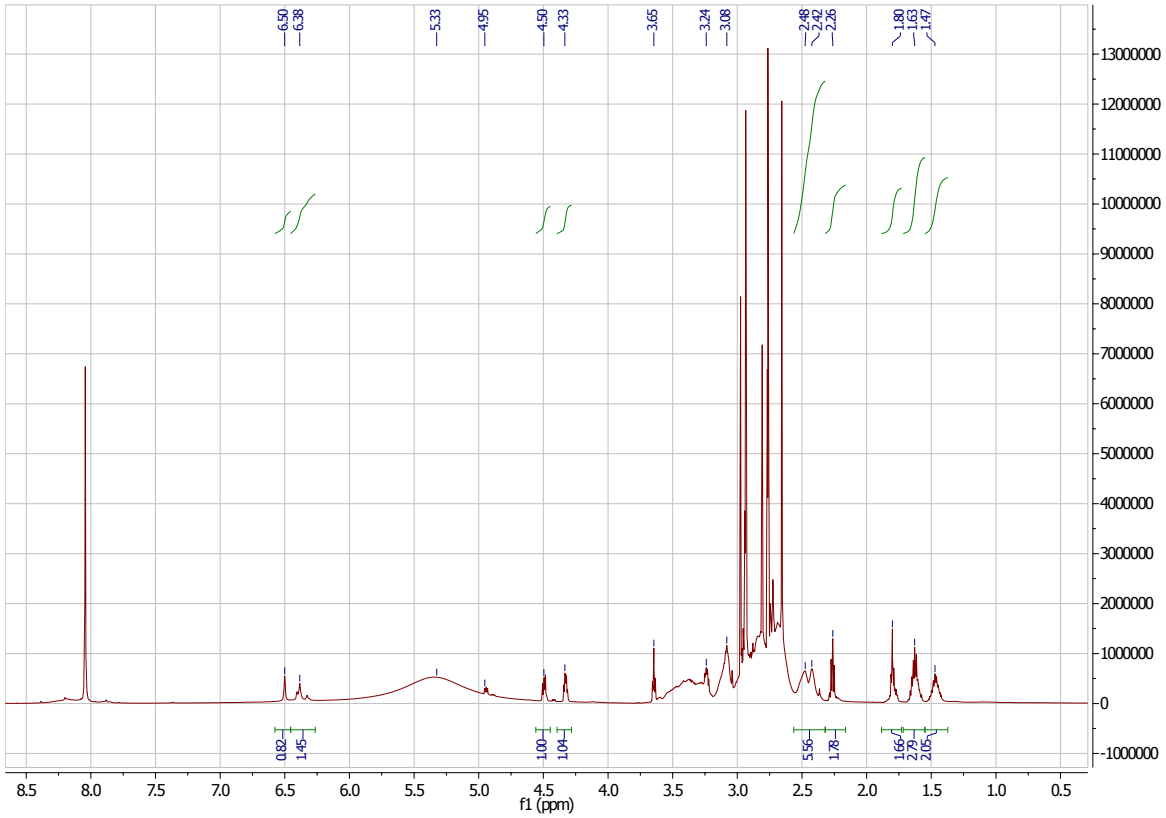

Figure S1. Proton NMR of PEI-biotin in d_7-DMF. Integrals indicate biotin and PEI backbone.

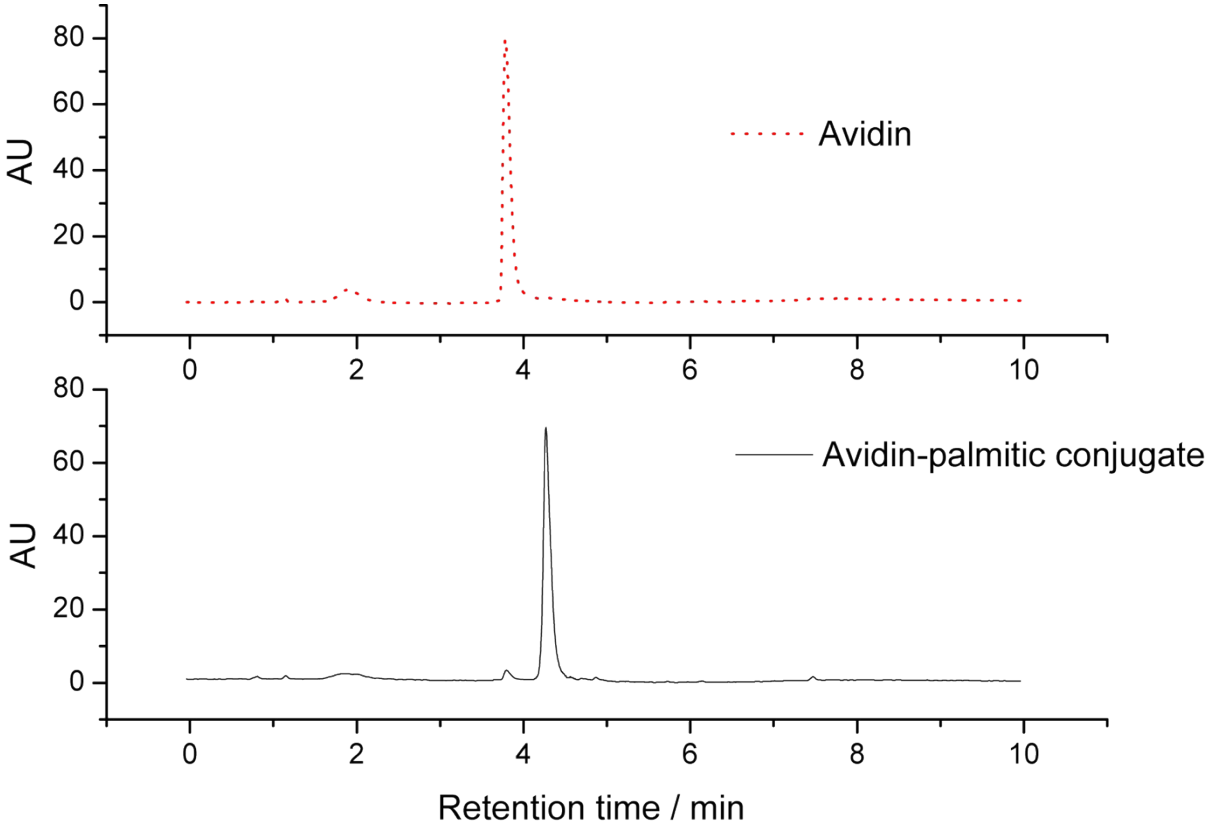

Figure S2. HPLC traces of avidin and avidin-palmitic conjugate.

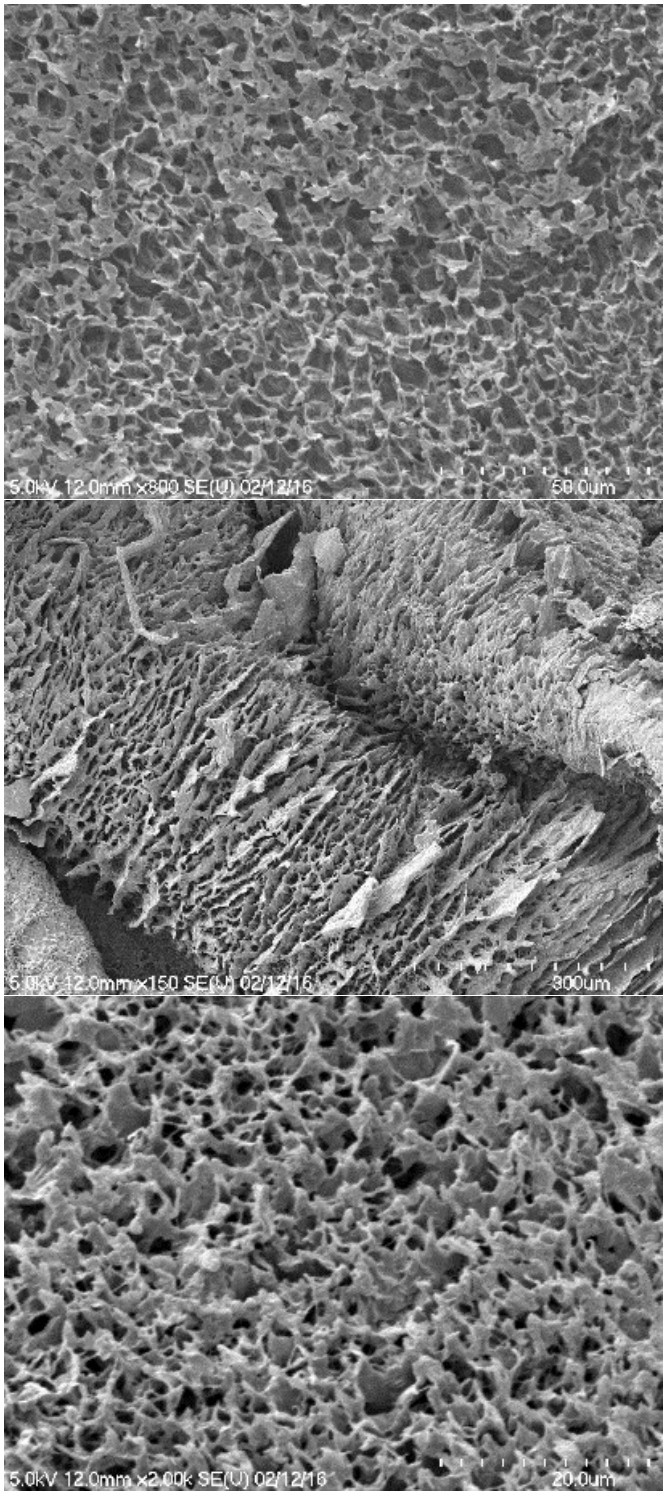

Figure S3. SEM Image of the horizontal cross sections of polymer scafforld (top) and vertical cross-section of the scaffold (middle) and horizontal cross sections of polymer scafforld decorated with PLGA nanoparticles (bottom).

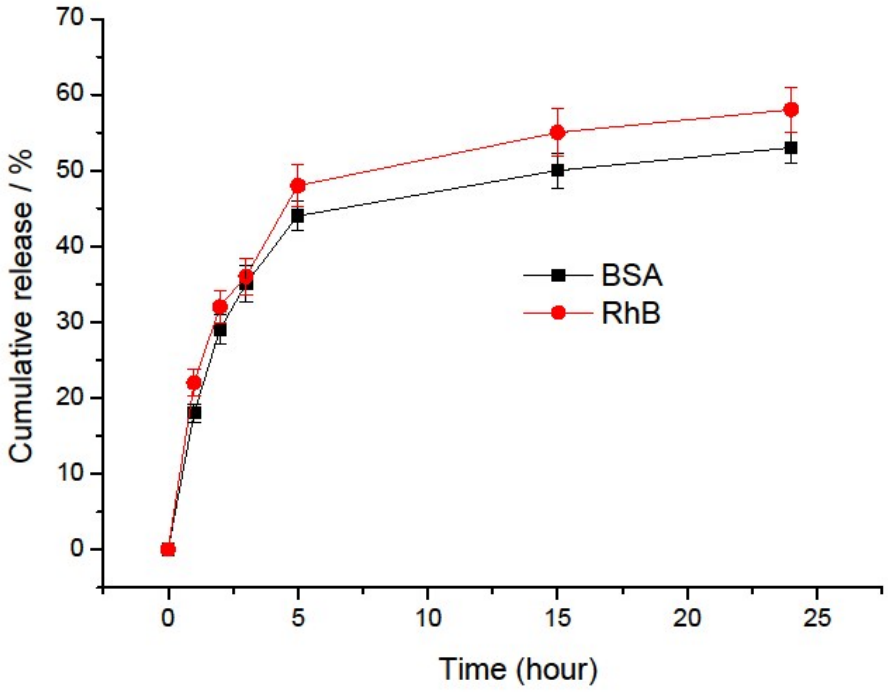

Figure S4. Release profiles of rhodamine B and BSA from PLGA nanoparticles (38 kDa; 50/50). The date presented as mean ± SD.

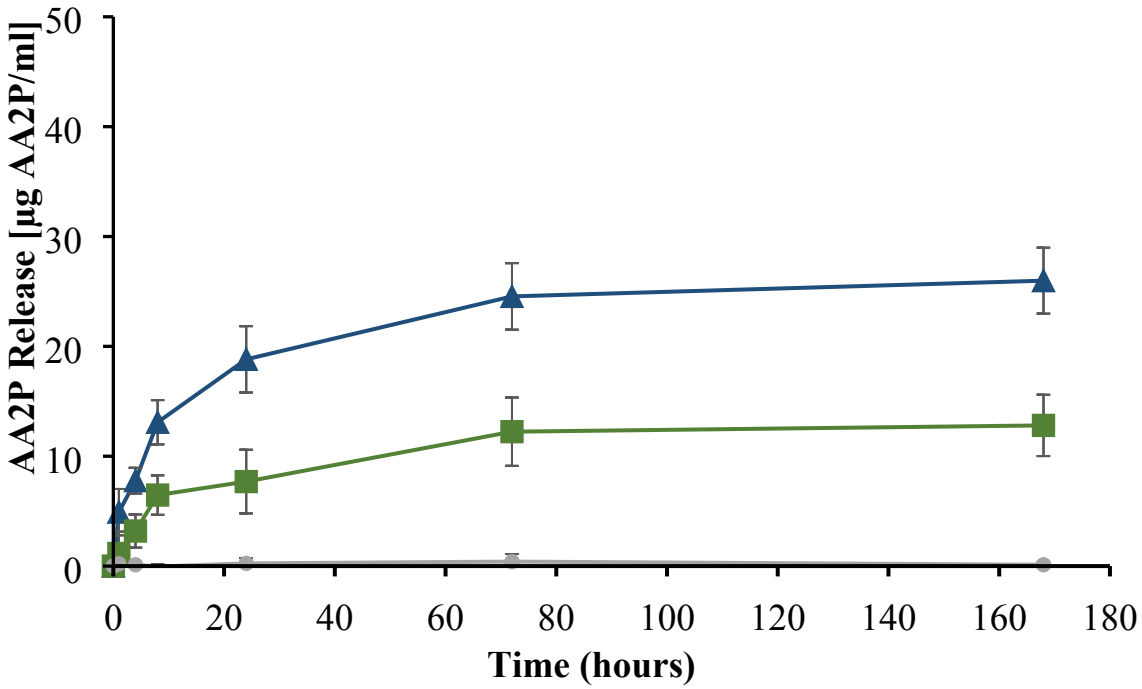

Figure S5. Release profiles of AA2P from nanoparticles with avidin (blue) and without avidin (green) modification following scaffold encapsulation over 7 days. Data presented as mean ± SD.

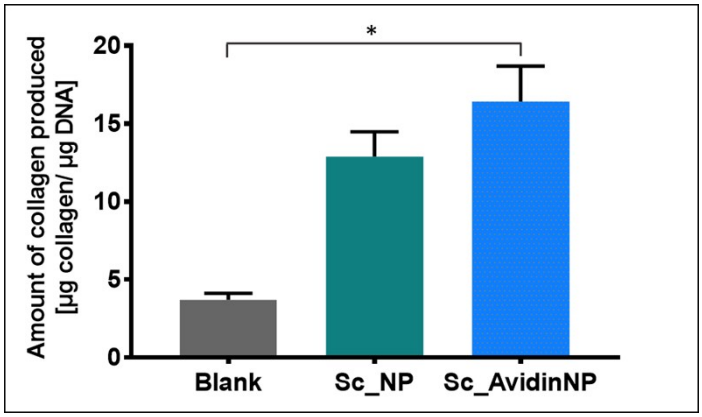

Figure S6. Production of collagen from scaffolds containing blank nanoparticles and AA2P loaded nanoparticles with and without avidin functionalization. Blank: no scaffold; Sc_NP: scaffolds containing nanoparticles in the absence of avidin functionalization; Sc_AvidinNP: scaffolds containing avidin functionalized nanoparticles. Data presented as mean +/- SD; *P<0.05; n=3.

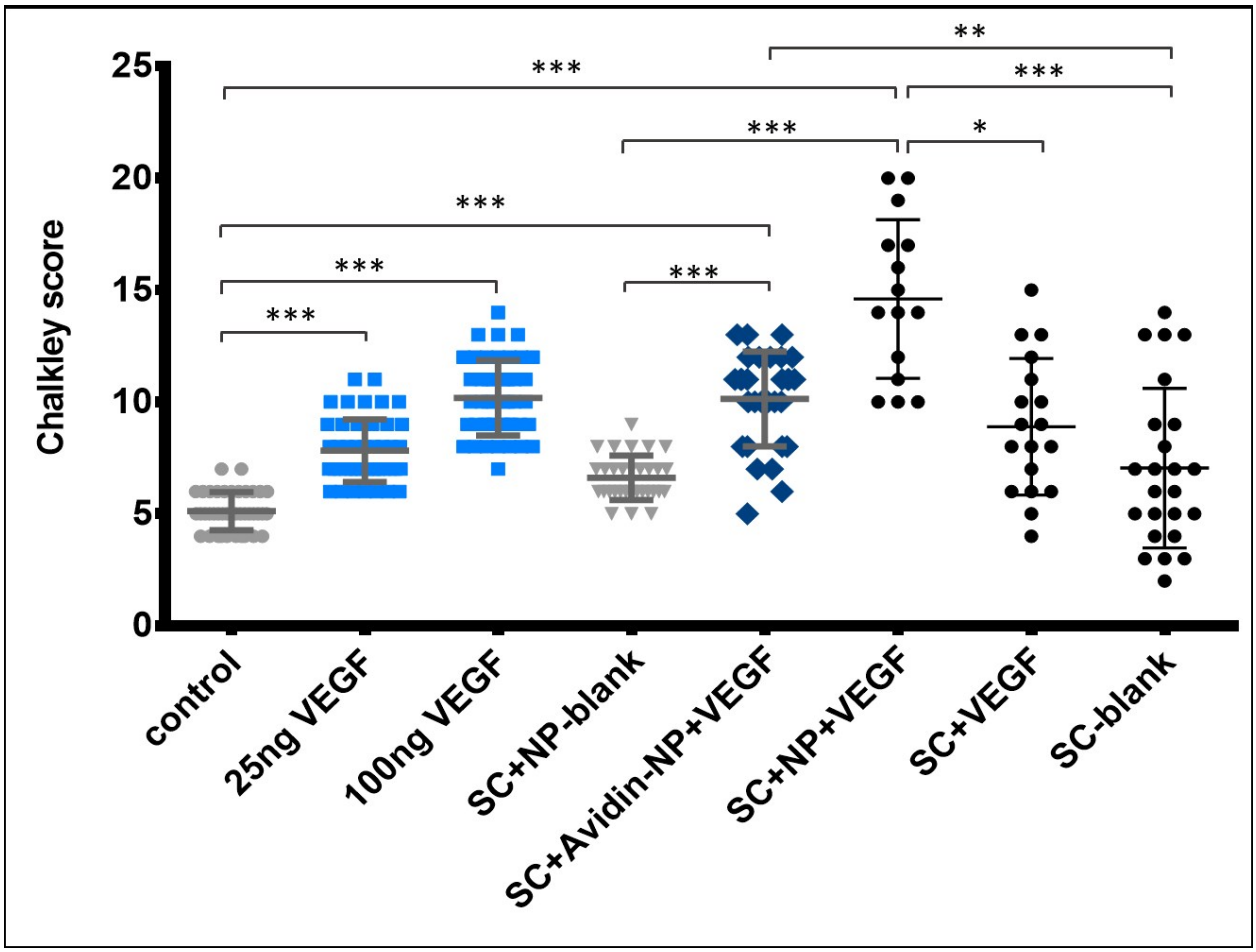

Figure S7. Evaluation of vasculature at day 18 of embryonic chick development using Chalkley score method in response to VEGF release from scaffold. No VEGF, scaffold

alone and scaffolds with blank NP were used as controls. SC+NP-blank – scaffold containing PLGA nanoparticles; SC+Avidin-NP+VEGF – scaffold containing avidin functionalised nanoparticles with VEGF; SC+NP+VEGF – scaffold containing nanoparticles with VEGF; SC+VEGF – scaffold containing VEGF; SC-blank – scaffold only; control – no treatment; 25 ng VEGF – CAM treated with 25 ng VEGF; 100 ng VEGF– CAM treated with 100 ng VEGF. Data presented as mean +/- SD; *: $p<0.05$; **: $p<0.01$; ***: $p<0.001$; n=15-45.

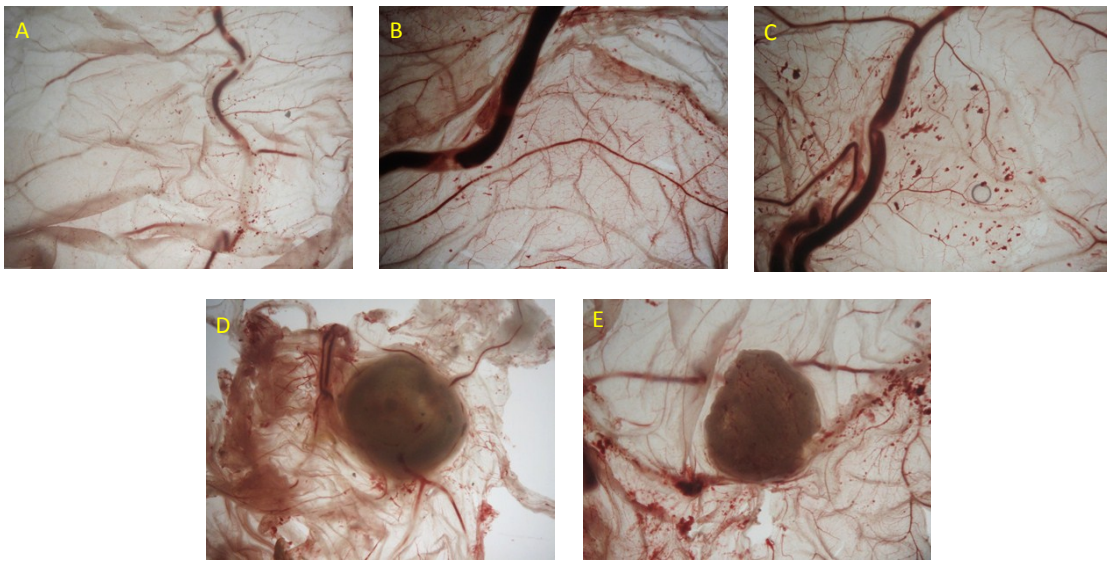

Figure S8. Morphology of CAM at day 18 of embryonic chick development. At day 10 of embryonic chick development the eggshell was opened and scaffolds with blank nanoparticles, VEGF loaded nanoparticles, VEGF in PBS or PBS only (negative control) were placed on the CAM for 8 days. A: Control group; B: CAM treated with 25 ng VEGF; C: CAM treated with 100 ng VEGF; D: CAM with scaffold containing blank nanoparticles. E: CAM with scaffold containing nanoparticles with VEGF.

Table S1. PLGA nanoparticle encapsulation efficiency of BSA and rhodamine B.

PLGA*	Cargo	EE (%)
190K Da (85/15)	BSA	12.6% ± 1.2
190K Da (85/15)	Rhodamine B	15.3% ± 2.1
50K Da (85/15)	BSA	11.9% ± 4.2
50K Da (85/15)	Rhodamine B	18.8% ± 3.7
38K Da (50/50)	BSA	17.7% ± 2.8
38K Da (50/50)	Rhodamine B	22.5% ± 2.2
7K Da (50/50)	BSA	14.1% ± 4.0
7K Da (50/50)	Rhodamine B	11.3% ± 1.7

*monomer ratio = PLA/PGA