Professor David L. Kaplan
Biomedical Engineering

Selected Peer-Reviewed Publications (of >350, 2004+ listed)

2004

Mapping domain structures in silks from insects and spiders. E. Bini, D. Knight, D. L. Kaplan. *J. Molecular Biology*. 335:27-40 (2004).

Bone tissue engineering using human mesenchymal stem cells; effects of scaffold material and medium flow. Meinel, L., V. Karageorgiou, R. Fajardo, B. Snyder, V. Shinde-Patil, L. Zichner, D. L. Kaplan, R. Langer, G. Vunjak-Novakovic*. Annals Biomed. Eng*. 32:112-122 (2004).

Matrix-mediated retention of osteogenic differentiation potential by human adult bone marrow stromal cells during ex vivo expansion. J. Mauney, V. Volloch, D. L. Kaplan. *Biomaterials* 25:3233-3243 (2004).

Osteogenic Differentiation of Human Bone Marrow Stromal Cells on Partially Demineralized Bone Scaffolds *In Vitro.* Mauney JR, Blumberg J, Pirun M, Volloch V, Vunjak-Novakovic G, Kaplan DL *Tissue Engineering*, 10:81-92 (2004).

Inflammatory responses to silk films in vitro and in vivo. L. Meinel, S. Hofmann, V. Karageorgiou, C. Kirker-Head, J. McCool, G. Gronowicz, L. Zichner, R. Langer, G. Vunjak-Novakovic. D. L. Kaplan. *Biomaterials*. 26:147-155 (2004).

Nanoscale surface patterning of enzyme catalyzed polymeric conducting wires. P. Xu, D. L. Kaplan. *Advanced Materials*, 16:628-632(2004)

Porous 3D scaffolds from regenerated silk fibroin. R. Nazarov, H.-J. Jin, D. L. Kaplan. *Biomacromolecules*. 5:718-726 (2004).

Biomaterials films of *Bombyx mori* silk with poly(ethylene oxide). H.-J. Jin, J. Park, U.-J. Kim, R. Valluzzi, P. Cebe, D. L. Kaplan. *Biomacromolecules*. 5:711-717 (2004).

Structure and properties of silk hydrogels. U.-J. Kim, J. Park, C. Li, H.-J. Jin, R. Valluzzi, D. L. Kaplan. *Biomacromolecules*. 5:786-792 (2004).

Mechanical stimulation promotes osteogenic differentiation of human bone marrow stromal cells on 3-D partially demineralized bone scaffolds in vitro. J. R. Mauney, S. Sjostorm, J. Blumberg, R. Horan, J. P. O'Leary, G. Vunjak-Novakovic, V. Volloch, D. L. Kaplan. *Calcified Tissue International*, 74:458-468 (2004)

Impact of matrix trafficking by human fibroblasts. L. Abraham, J. Vorasi, D. L. Kaplan. *J. Biomedical Materials Research,* 70A:39-48 (2004).

Tissue engineering of ligaments. G. Vunjak-Novakovic, G. Altman, R. Horan, D. L. Kaplan. *Annual Review of Biomedical Engineering*. 6:14.1-14.26 (2004).

Tissue engineering of osteochondral plugs using human mesenchymal stem cells and silk scaffolds. Meinel, L., V. Karageorgiou, S. Hoffmann, R. Fajardo, B. Snyder, C. Li, L. Zichner, R. Langer, G. Vunjak-Novakovic, D. L. Kaplan. *Chemical Industry* 58:68-69 (2004).

Engineering cartilage-like tissue using human mesenchymal stem cells and silk protein scaffolds. L. Meinel, S. Hoffmann, V. Karageorgiou, L. Zichner, R. Langer, G. Vunjak-Novakovic, D. L. Kaplan. *Biotechnology and Bioengineering*. 88:379-391 (2004).

Human bone marrow stromal cell responses on electrospun silk fibroin mats. H. J. Jin, J. Chen, V. Kargeorgiou, G. H. Altman, D. L. Kaplan. *Biomaterials* 25:1039-1047 (2004).

Engineering bone-like tissue in vitro using human bone marrow stem cells and silk scaffolds. L. Meinel, V. Kargeorgiou, S. Hofmann, R. Fajardo, B. Snyder, C. Li, L. Zichner, R. Langer, G. Vunjak-Novakovic, D. L. Kaplan. *J. Biomedical Materials Research*, 71A:25-34 (2004).

Lessons from seashells: mineralized silica via protein templating, C. Wong Po Foo, J. Huang, D. L. Kaplan, *Trends in Biotechnology* 22:577-585 (2004).

Vitamin C functionalized poly(methyl methacrylate) for free radical scavenging. A. Singh, D. L. Kaplan. *J. Macromolecular Science – Pure and Appl. Chemistry* A41:1377-1386 (2004).

Horseradish peroxidase catalyzed polymerization of tyrosine derivatives for nanoscale surface patterning. P. Xu, D. L. Kaplan. *J. Macromolecular Science – Pure and Appl. Chemistry* A41:1437-1446 (2004).

Mechanical properties of electrospun silk fibers. M. Wang, H.J. Jin, D. L. Kaplan, G. C. Rutledge. Macromolecules, 37:6856-6864 (2004).

Matrix metalloproteinases and their clinical applications in orthopaedics. D. S. Bramono, J. C. Richmond, P. P. Weitzel, D. L. Kaplan, G. H. Altman. Clinical Orthopaedics & Related Research 428:272-285 (2004).

Bone morphogenetic protein-2 decorated silk fibroin films induce osteogenic differentiation of human bone marrow stromal cells. V. Karageorgiou, L. Meinel, S. Hofmann, A. Malhotra, V. Volloch, D. L. Kaplan. *J. Biomedical Materials Research*, 71A:528-537 (2004).

2005

In vitro and in vivo evaluation of differentially mineralized cancellous bone scaffolds combined with human bone marrow stromal cells for tissue engineering. J. Mauney, C. Jaquiery, V. Volloch, I. Martin, D. L. Kaplan. *Biomaterials*, 26:3173-3185 (2005).

Three dimensional aqueous-derived biomaterial scaffolds from silk fibroin. U.J. Kim, J. Park, H. J. Kim, M. Wada, D. L. Kaplan. *Biomaterials*, 26:2775-2785 (2005).

Influence of macroporous protein scaffolds on bone tissue engineering from bone marrow stem cells. H. J. Kim, U-J. Kim , G. Vunjak-Novakovic, B-H. Min, D. L. Kaplan. *Biomaterials*, 26:4442-4452 (2005).

Role of adult mesenchymal stem cells in bone tissue engineering applications: current status and future prospects. J. Mauney, V. Volloch, D. L. Kaplan. *Tissue Eng*. 11:787-802 (2005).

In vitro degradation of silk fibroin. R. L. Horan, K. Antle, A. L. Collette, Y. Wang, J. Huang, J. E. Moreau, V. Volloch, D. L. Kaplan, G. H. Altman. Biomaterials 26:3385-3393 (2005).

Sequential Growth Factor Application in Bone Marrow Stromal Cell Ligament Engineering. Moreau, J E, Chen, J, Horan, R L, Kaplan D L, and Altman G.H. *Tissue Engineering*, 11:1887-1897(2005).

Ligament Tissue Engineering in Culture of Cells for Tissue Engineering*.,* Chen, J, Altman G H, Moreau J E, Horan R L, Bramono D, Volloch V, Richmond J, Vunjak-Novakovic G, Kaplan D L. in press (2005).

Growth Factor Induced Fibroblast Differentiation from Human Bone Marrow Stromal Cells *In Vitro.* Moreau J E, Bramono D S, Chen J, Volloch V, Chernoff H, Vunjak-Novakovic G, Richmond J C, Kaplan D L, Altman G H. *J. Orthop. Res*. 23:164-174 (2005).

Matrix mediated retention of adipogenic differentiation potential of human bone marrow derived mesenchymal stem cells during ex vivo expansion. J. Mauney, V. Volloch, D. L. Kaplan. *Biomaterials*, 26:6167-6175 (2005).

Silk-implants for the Healing of Critical Size Bone Defects. Meinel, L., R. Fajardo, S. Hofmann, R. Langer, J. Chen, B. Snyder, G. Vunjak-Novakovic, D. L. Kaplan, *Bone*, 37:688-698 (2005).

Water-Stable Silk Films with Reduced β-Sheet Content, Jin, H. J., J. Park, V. Karageorgiou, U. J. Kim, R. Valluzzi, P. Cebe, D. L. Kaplan, *Advanced Functional Materials*, 15:1241-1247 (2005).

Processing windows for forming silk fibroin biomaterials in to a 3D porous matrix. H. J. Kim, H. S. Kim, A. Matsumoto, I.H. Chin, H.J. Jin, D. L. Kaplan. Australian J. Chemistry 58:1-5 (2005).

Triggered Release of Proteins from Emulsan-Alginate Beads. G. R. Castro, R. R. Kamdar, B. Panilaitis, D L. Kaplan, *J. Controlled Release,* 109: 149-157 (2005).

Porosity of 3D biomaterial scaffolds and osteogenesis. V. Karageorgiou, D. L. Kaplan. Biomaterials 26:5474-5491 (2005).

Peroxidase catalyzed in situ polymerization of surface orientated caffeic acid. Xu, P., H. Uyama, J. E. Whitten, S. Kobayasi, D. L. Kaplan. JACS (2005).

Enzymatic catalysis in the synthesis of polyanilines and derivatives of polyanilines. P. Xu, A. Singh, D. L. Kaplan. Adv. Polymer Sci. 194: (2005).

Silk apatite composites from electrospun fibers. Li, C., H.-J. Jin, G. D. Botsaris, D. L. Kaplan. J. Mater. Res. 20:3374-3384 (2005).

In vitro cartilage tissue engineering with 3D porous aqueous-derived silk scaffolds and mesenchymal stem cells. Y. Wang, U.-J. Kim, D. J. Blasioli, H.-J. Kim, D. L. Kaplan. Biomaterials 26:7082-7094 (2005).

2006

Cartilage tissue engineering with silk scaffolds and human articular chondrocytes. Y. Wang, D. J. Blasioli, H.-J. Kim, H. S. Kim, D. L. Kaplan. Biomaterials 27:4434-4442 (2006).

Expansion and osteogenic differentiation of bone marrow-derived mesenchymal stem cells on a vitamin C functionalized polymer. Y. Wang, A. Singh, P. Xu, M. A. Pindrus, D. J. Blasioli, D. L. Kaplan. Biomaterials 27:3265-3273 (2006).

Solution behavior of synthetic silk peptides and modified recombinant silk proteins. C. Wong Po Foo, E. Bini, J. Henseman, D. P. Knight, R. V. Lewis, D. L. Kaplan. Applied Physics A: Materials Science and Processing, 82:193-203 (2006).

Electrospun silk-BMP-2 scaffolds for bone tissue engineering. C. Li, C. Vepari, H.-J. Jin, H. J. Kim, D. L. Kaplan. Biomaterials 27:3115-3124 (2006).

Permeability of bacterial cellulose membranes. A. M. Kokolnicki, R. J. Fisher, T. P. Harrah, D. L. Kaplan. J. Membrane Science 272:15-27 (2006).

Role of pH and charge on silk protein assembly in insects and spiders. C. Wong Po Foo, E. Bini, J. Huang, S. Y. Lee, D. L. Kaplan. Applied Physics A: Materials Science and Processing, 82:223-233 (2006).

Unfolding the multi-length scale domain structure of silk fibroin protein. H. Shulha, C. Wong, D. L. Kaplan, V. V. Tsukruk. Polymer 47:5821-5830 (2006).

Covalently immobilized enzyme gradients within three-dimensional porous scaffolds. C. Vepari, D. L. Kaplan. Biotechnology and Bioengineering, 93:1130-1137 (2006).

Production of submicron diameter silk fibers under benign processing conditions by two-fluid electrospinning. M. Wang, J. H. Yu, D. L. Kaplan, G. C. Rutledge. Macromolecules, 39: 1102-1107 (2006).

Bone morphogenetic protein-2 binds as multilayers to a collagen delivery matrix: an equilibrium thermodynamic analysis. R. Morin, D. L. Kaplan, B. Perez. Biomacromolecules, 7:131-138 (2006).

Silk fibroin as an organic polymer for controlled drug delivery. S. Hofmann, H. M. Textor, C. Wong, F. Rossetti, H. P. Merkle, D. L. Kaplan, G. Vunjak-Novakovic, L. Meinel. J. Controlled Release, 111:219-227 (2006).

Noninvasively monitoring and quantifying the engineering of bone-like tissue from human mesenchymal stem cells cultured on silk scaffolds. H. Hagenmuller, S. Hofmann, T. Kohler, H. P. Merkle, D. L. Kaplan, G. Vunjak-Novakovic, R. Muller, L. Meinel. Bone, in press (2006).

FiberID- a technique to identify fibrous protein sub-classes. P. Waltman, A. Blumer, D. L. Kaplan. Protein Science, in press (2006).

Stem cell based tissue engineering with silk biomaterials. Y. Wang, H.-J. Kim, G. Vunjak-Novakovic, D. L. Kaplan. Biomaterials. 27: 6064-6082 (2006).

Collagen-like peptide as a matrix for enzyme immobilization in electrochemical biosensors. M. Yemini, P. Xu, J. Rishpon, D. L. Kaplan. Electroanalysis, in press (2006).

Determining beta sheet crystallinity in fibrous proteins by thermal analysis and infrared spectroscopy. X. Hu, D. L. Kaplan, P. Cebe. Macromolecules, in press (2006).

Mechanisms of silk fibroin sol-gel transitions. A. Matsumoto, J. Chen, A. L. Collette, U.J. Kim, G. H. Altman, P. Cebe, D. L. Kaplan. J. Physical Chem. In press (2006).

RGD-tethered silk substrates stimulate the differentiation of human tendon cells. T. Kardestruncer, MB McCarthy, V. Karageorgiou, D. L. Kaplan, G. Gronowicz. Clinical Orthopaedics and Related Research. In press (2006).

Porous silk fibroin 3-D scaffolds for delivery of bone morphogenic protein-2 in vitro and in vivo. V. Karageorgiou, M. Tomkins, R. Fajardo, L. Meinel, B. Snyder, K. Wade, J. Chen, G. Vunjak-Novakovic, D. L. Kaplan. J. Biomedical Materials Research 78A: 324-334 (2006).

Osteogenesis by human mesenchymal stem cells cultured on silk biomaterials: comparison of adenovirus mediated gene transfer and protein delivery of BMP-2. L. Meinel, S. Hofmann, O. Betz, R. Fajardo, H. P. Merkle, R. Langer, C. H. Evans, G. Vunjak-Novakovic, D. L. Kaplan. Bioamterials 27: 4993-5002 (2006).

Fibrous Proteins – Role in Biomaterials and Tissue Engineering. X. Wang, H-J. Kim, C. Wong, C. Vepari, A. Matsumoto, D. L. Kaplan Materials Today 9:44-53 (2006).

Novel nanocomposites from spider silk-silica fusion (chimeric) proteins. Wong, C. P. F., Kitchel, B., Huang, J., Patwardhan, S.V., Belton, D., Perry, C., Kaplan, D. L. Proc. National Academy of Science USA 103(25): 9428-9433 (2006).