

Contents

List of contributors	page ix
Preface	xv

Part I Introduction to stem cells and regenerative medicine

1	Embryonic stem cells	3
	Nicole Slawny and Gary D. Smith	
2	Induced pluripotent stem cells	19
	Akitsu Hotta and Shinya Yamanaka	
3	Connective tissue stem and progenitor cells	34
	Pamela Gehron Robey	
4	Hematopoietic stem cells and their niches	44
	Geeta Mehta, Yusuke Shiozawa and Russell Taichman	
5	Using biomaterials for fetal stem cell isolation, expansion and directed-differentiation	64
	David Mack, Aleksander Skardal, Shay Soker and Anthony Atala	
6	The hematopoietic stem cell niche	80
	Aparna Venkatraman, Meng Zhao and Linheng Li	

Part II Porous scaffolds for regenerative medicine

7	Nanofibrous polymer scaffolds with designed pore structure for regeneration	91
	Zhanpeng Zhang, Jeremy M. Holzwarth and Peter X. Ma	

8	Electrospun micro/nanofibrous scaffolds	104	19	Organ printing	332
	Vince Beachley and Xuejun Wen			Tao Xu, Daniel Reyna-Soriano, Jorge I. Rodríguez-Dévora, Mohammad Bhuyan and Thomas Boland	
9	Biological scaffolds for regenerative medicine	133			
	Vineet Agrawal and Stephen F. Badylak				
10	Bioceramic scaffolds	151			
	Zhanwen Xiao, Zhe Wang, Bangcheng Yang and Xingdong Zhang				
11	Collagen-based tissue repair composite	183			
	Xiaoming Li and Fu-zhai Cui				
12	Polymer/ceramic composite scaffolds for tissue regeneration	203			
	Ian O. Smith, Melanie J. Gupte and Peter X. Ma				
13	Computer-aided tissue engineering for modeling and fabrication of three-dimensional tissue scaffolds	215			
	Qudus Hamid, Chengyang Wang, Jessica Snyder and Wei Sun				
	Part III Hydrogel scaffolds for regenerative medicine			Part IV Biological factor delivery	
14	Polysaccharide hydrogels for regenerative medicine applications	247	20	Growth factor delivery on scaffolds	377
	Jacob A. Simson and Jennifer H. Elisseeff			Kai Feng, Jiang Hu, Zubad Newaz and Peter X. Ma	
15	Functionalized poly(ethylene glycol) hydrogels for controlling stem cell fate	263	21	Gene delivery for periodontal regeneration	391
	Chien-Chi Lin			Andrei D. Taut and William V. Giannobile	
16	Fumarate-based hydrogels in regenerative medicine applications	279	22	Endogenous stem/progenitor cell recruitment for tissue regeneration	405
	Steven Lu, Kyobum Kim, Johnny Lam, F. Kurtis Kasper and Antonios G. Mikos			Mildred Embree, Chang Hun Lee, Ziming Dong, Mo Chen, Kimi Kong, Hemin Nie, Avital Mendelson, Bhranti Shah, Shoko Cho, Takahiro Suzuki, Rujing Yang, Nan Jiang and Jeremy J. Mao	
17	Hydrogel scaffolds for regenerative medicine	295	23	Affinity-based delivery systems	419
	Edward A. Sander, Erin D. Grassl and Robert T. Tranquillo			Jeffrey Mark Halpern and Horst A. von Recum	
18	Microfabricated gels for tissue engineering	317	24	DNA delivery for regeneration	431
	Gulden Camci-Unal, Jesper Hjortnaes, Hojae Bae, Mehmet Remzi Dokmeci and Ali Khademhosseini			Stephanie K. Seidlits, Kelan Hlavaty and Lonnie D. Shea	
				Part V Animal models and clinical applications	
			25	Bone regeneration	449
				Eric W. Hsu, Pedro Alvarez, Lyndsey Shutte, Amy Donovan, Shiguang Liu, Arun R. Shivats and Jeffrey O. Hollinger	
			26	Biomaterials for engineered tendon regeneration	478
				Wei Liu and Yilin Cao	
			27	Advancing articular cartilage repair through tissue engineering: from materials and cells to clinical translation	488
				Megan J. Farrell and Robert L. Mauck	
			28	Engineering tissue-to-tissue interfaces	514
				Nora T. Khanarian, Nancy M. Lee, Marissa R. Solomon and Helen H. Lu	

29	Models of composite bone and soft-tissue limb trauma	534	34	In-vitro blood vessel regeneration	603
	Brent A. Urrig, Mon-Tzu A. Li, Nick J. Willett and Robert E. Guldberg			Sashka Dimitrievska and Laura E. Niklason	
30	Tooth development and regeneration	555	35	Stem cells for vascular engineering	621
	Weibo Zhang and Pamela C. Yelick			Y. Eugene Chen, Changqing Xie and Bo Yang	
31	Dentin-pulp tissue engineering and regeneration	570	36	Cardiac tissue regeneration in bioreactors	640
	Jing Wang, Xiaobing Jin and Peter X. Ma			Loraine L. Y. Chiu, Boyang Zhang, Yun Xiao and Milica Radisic	
32	Dental enamel regeneration	583	37	Bladder regeneration	669
	Xanthippi Chatzistavrou and Petros Papagerakis			Yuanyuan Zhang and Anthony Atala	
33	Hair follicle and skin regeneration	590		Index	680
	Makoto Takeo and Mayumi Ito				