


[Home](#) > [Journal](#) > [Chemistry & Materials Science](#) | [Medicine & Healthcare](#) > [JCDSA](#)
[Indexing](#) | [View Papers](#) | [Aims & Scope](#) | [Editorial Board](#) | [Guideline](#) | [Article Processing Charges](#)
[JCDSA](#) > Vol.3 No.1A, January 2013


Skin 3D Bioprinting. Applications in Cosmetology

PDF (Size: 274KB) PP. 85-89 DOI : 10.4236/jcdda.2013.31A012

Author(s)

Cristina Velasquillo, Eduardo A. Galue, Lourdes Rodriquez, Clemente Ibarra, L. Guillermo Ibarra-Ibarra

ABSTRACT

Tissue engineering has been used for the treatment of several skin diseases and lesions; however, tissue engineering and regenerative medicine also have a huge potential in cosmetology. They include skin substitutes, cell therapy and wound-healing treatments based on biomaterial-based replacements and 3D systems. This review focuses on the bioprinting technology and how it can improve skin functions, restoring pigmentation or helping hair follicles to develop.

KEYWORDS

3D Bioprinting; Skin Bioprinting; Scaffolds; Human Skin Cells; Cosmetology

Cite this paper

C. Velasquillo, E. Galue, L. Rodriquez, C. Ibarra and L. Ibarra-Ibarra, "Skin 3D Bioprinting. Applications in Cosmetology," *Journal of Cosmetics, Dermatological Sciences and Applications*, Vol. 3 No. 1A, 2013, pp. 85-89. doi: 10.4236/jcdda.2013.31A012.

References

- [1] G. Murphy, " Histology of the Skin," In: R. Elenitsas, C. Jaworsky and B. Johnson, Eds., *Lever' s Histopathology of the Skin*, Lippincott-Raven, Philadelphia, 1997, pp. 5-50.
- [2] S. Chunmeng and Ch. Tianmin, " Skin: A Promising Reservoir for Adult Stem Cell Populations," *Medical Hypotheses*, Vol. 62, No. 5, 2004, pp. 683-688. doi:10.1016/j.mehy.2003.12.022
- [3] H. Lin, " The Stem-Cell Niche Theory: Lessons from Flies," *Nature Reviews Genetics*, Vol. 3, No. 12, 2002, pp. 931-940. doi:10.1038/nrg952
- [4] T. W. Fischer, A. Slominski, M. A. Zmijewski, R. J. Reiter and R. Paus, " Melatonin as a Major Skin Protectant: From Free Radical Scavenging to DNA Damage Repair," *Experimental Dermatology*, Vol. 17, No. 9, 2008, pp. 713-730. doi:10.1111/j.1600-0625.2008.00767.x
- [5] R. Paus and G. Cotsarelis, " The Biology of Hair Follicles," *New England Journal of Medicine*, Vol. 341, No. 7, 1999, pp. 491-497. doi:10.1056/NEJM199908123410706
- [6] W. Liu and Y. Cao, " Application of Scaffold Materials in Tissue Reconstruction in Immunocompetent Mammals: Our Experience and Future Requirements," *Biomaterials*, Vol. 28, 2007, pp. 5078-5086. doi: 10.1016/j.biomaterials.2007.07.028
- [7] E. Sachlos and J. T. Czernuszka, " Making Tissue Engineering Scaffolds Work. Review: The Application of Solid Freeform Fabrication Technology to the Production of Tissue Engineering Scaffolds," *European Cells and Materials*, Vol. 5, 2003, pp. 29-39; discussion 39-40.
- [8] B. M. Min, S. W. Lee, J. N. Lim, et al., " Chitin and Chito-San Nanofibers: Electrospinning of Chitin and Deacetylation of Chitin Nanofibers," *Polymer*, Vol. 45, No. 21, 2004, pp. 7137-7142. doi:10.1016/j.polymer.2004.08.048
- [9] S. J. Peter, M. J. Miller, A. W. Yasko, M. J. Yaszemski and A. G. Mikos, " Polymer Concepts in Tissue Engineering," *Journal of Biomedical Materials Research*, Vol. 43, No. 4, 1998, pp. 422-427. doi:10.1002/(SICI)1097-4636(199824)43:4<422::AID-JBM9>3.0.CO;2-1

- [Open Special Issues](#)
- [Published Special Issues](#)
- [Special Issues Guideline](#)

[JCDSA Subscription](#)
[Most popular papers in JCDSA](#)
[About JCDSA News](#)
[Frequently Asked Questions](#)
[Recommend to Peers](#)
[Recommend to Library](#)
[Contact Us](#)

Downloads:	41,130
Visits:	105,205

[Sponsors, Associates, and Links >>](#)

- [10] A. Mohamed and M. Xing, "Nanomaterials and Nanotechnology for Skin Tissue Engineering," *International Journal of Burns and Trauma*, Vol. 2, No. 1, 2012, pp. 29-41.
- [11] W. C. Wilson Jr. and T. Boland, "Cell and Organ Printing 1; Protein and Cell Printers," *The Anatomical Record: Part A*, Vol. 272, No. 2, 2003, pp. 491-496.
- [12] J. J. Yoo, A. Atala, K. W. Binder, W. Zhao, D. Dice and T. Xu, Delivery System Office, United States Patent & Trademark.12/986, 2011. <http://appft1.uspto.gov/netacgi/nphParser?Sect11?4PTO1&Sect21?4HITOFF&d1?4PG01&p1?41&u1?4/netahtml/PTO/srchnum.html&r1?41&f1?4G&l1?450&s11?420110172611.PG NR>
- [13] Y. Li, J. Rodrigues and H. Tomas, "Injectable and Biodegradable Hydrogels: Gelation, Biodegradation and Biomedical Applications," *Chemical Society Reviews*, Vol. 41, No. 6, 2012, pp. 2193-2221. doi:10.1039/c1cs15203c
- [14] L. Koch, A. Deiwick, S. Schlie, S. Michael, M. Gruene, V. Coger, D. Zychlinski, A. Schambach, K. Reimers, P. M. Vogt and B. Chichkov, "Skin Tissue Generation by Laser Cell Printing," *Biotechnology and Bioengineering*, Vol. 109, No. 7, 2012, pp. 1855-1863. doi:10.1002/bit.24455
- [15] R. Czajkowski, "BRAF, HRAS, KRAS, NRAS and CDKN2A Genes Analysis in Cultured Melanocytes Used for Vitiligo Treatment," *International Journal of Dermatology*, Vol. 50, No. 2, 2011, pp.180-183. doi:10.1111/j.1365-4632.2010.04675.x
- [16] W. C. Weinberg, et al., "Reconstitution of Hair Follicle Development in Vivo: Determination of Follicle Formation, Hair Growth, and Hair Quality by Dermal Cells," *Journal of Investigative Dermatology*, Vol. 100, No. 3, 1993, pp. 229-236. doi:10.1111/1523-1747.ep12468971
- [17] J. Kishimoto, et al., "Selective Activation of the Versican Promoter by Epithelial Mesenchymal Interactions during Hair Follicle Development," *Proceedings of the National Academy of Sciences USA*, Vol. 96, No. 13, 1999, pp. 7336-7341. doi:10.1073/pnas.96.13.7336
- [18] W. Unger, R. Shapiro, M. A. Unger and U. Unger, "Hair Transplantation," 5th Edition, Informa USA, New York, 2010. doi:10.3109/9781616310073
- [19] C. M. Chuong, G. Cotsarelis and K. Stenn, "Defining Hair Follicles in the Age of Stem Cell Bioengineering," *Journal of Investigative Dermatology*, Vol. 127, No. 9, 2007, pp. 2098-2100. doi:10.1038/sj.jid.5700947