

## REFERENCES

- Alashwal, B. Y., Saad Bala, M., Gupta, A., Sharma, S., & Mishra, P. (2019). Improved properties of keratin-based bioplastic film blended with microcrystalline cellulose: A comparative analysis. *Journal of King Saud University - Science*. doi:10.1016/j.jksus.2019.03.006
- Alexiadou, K., & Doupis, J. (2012). Management of Diabetic Foot Ulcers. *Diabetes Therapy*, 3(1). doi:10.1007/s13300-012-0004-9
- Amin, N., & Doupis, J. (2016). Diabetic foot disease: From the evaluation of the "foot at risk" to the novel diabetic ulcer treatment modalities. *World Journal of Diabetes*, 7(7), 153. doi:10.4239/wjd.v7.i7.153
- Aswathy, S. H., Narendrakumar, U., & Manjubala, I. (2020). Commercial hydrogels for biomedical applications. *Heliyon*, 6(4), e03719. doi:10.1016/j.heliyon.2020.e03719
- Azarniya, A., Tamjid, E., Eslahi, N., & Simchi, A. (2019). Modification of bacterial cellulose/keratin nanofibrous mats by a tragacanth gum-conjugated hydrogel for wound healing. *International Journal of Biological Macromolecules*. doi:10.1016/j.ijbiomac.2019.05.023
- Bhardwaj, N., Sow, W. T., Devi, D., Ng, K. W., Mandal, B. B., & Cho, N.-J. (2015). Silk fibroin–keratin based 3D scaffolds as a dermal substitute for skin tissue engineering. *Integrative Biology*, 7(1), 53–63. doi:10.1039/c4ib00208c
- Cai, Z., & Kim, J. (2010). Preparation and Characterization of Novel Bacterial Cellulose/Gelatin Scaffold for Tissue Regeneration Using Bacterial Cellulose Hydrogel. *Journal of Nanotechnology in Engineering and Medicine*, 1(2), 021002. doi:10.1115/1.4000858
- Carrejo, N. C., Moore, A. N., Lopez Silva, T. L., Leach, D. G., Li, I. C., Walker, D. R., & Hartgerink, J. D. (2018). Multidomain peptide hydrogel accelerates healing of full-thickness wounds in diabetic mice. *ACS biomaterials science & engineering*, 4(4), 1386-1396. doi:10.1021/acsbomaterials.8b00031
- Chatterjee, S., Khunti, K., & Davies, M. J. (2017). Type 2 diabetes. *The Lancet*, 389(10085), 2239–2251. doi:10.1016/s0140-6736(17)30058-2
- Chen, Y., Li, Y., Yang, X., Cao, Z., Nie, H., Bian, Y., & Yang, G. (2021). Glucose-triggered in situ forming keratin hydrogel for the treatment of diabetic wounds. *Acta Biomaterialia*, 125, 208–218. doi:10.1016/j.actbio.2021.02.035
- Ciecholewska-Juśko, D., Żywicka, A., Junka, A., Drozd, R., Sobolewski, P., Migdał, P., ... Fijałkowski, K. (2021). Superabsorbent crosslinked bacterial cellulose biomaterials for chronic wound dressings. *Carbohydrate Polymers*, 253, 117247. doi:10.1016/j.carbpol.2020.117247
- De Oliveira Barud, H. G., da Silva, R. R., da Silva Barud, H., Tercjak, A., Gutierrez, J., Lustri, W. R., ... Ribeiro, S. J. L. (2016). A multipurpose natural and renewable polymer in medical applications: Bacterial cellulose. *Carbohydrate Polymers*, 153, 406–420. doi:10.1016/j.carbpol.2016.07.059
- Desmouliere, A., Darby, I. A., Laverdet, B., & Bonté, F. (2014). Fibroblasts and myofibroblasts in wound healing. *Clinical, Cosmetic and Investigational Dermatology*, 301. doi:10.2147/ccid.s50046
- DiMeglio, L. A., Evans-Molina, C., & Oram, R. A. (2018). Type 1 diabetes. *The Lancet*, 391(10138), 2449–2462. doi:10.1016/S0140-6736(18)31320-5
- Fernández, J., Morena, A. G., Valenzuela, S. V., Pastor, F. I. J., Díaz, P., & Martínez, J. (2019). Microbial Cellulose from a Komagataeibacter intermedius Strain Isolated from Commercial Wine Vinegar. *Journal of Polymers and the Environment*. doi:10.1007/s10924-019-01403-4
- Foong, C. Y., Hamzah, M. S. A., Razak, S. I. A., Saidin, S., & Nayan, N. H. M. (2018). Influence of Poly(lactic acid) Layer on the Physical and Antibacterial Properties of Dry Bacterial Cellulose Sheet for Potential Acute Wound Healing Materials. *Fibers and Polymers*, 19(2), 263–271. doi:10.1007/s12221-018-7850-7
- Gorgieva, & Trček. (2019). Bacterial Cellulose: Production, Modification and Perspectives in Biomedical Applications. *Nanomaterials*, 9(10), 1352. doi:10.3390/nano9101352
- Guo, S., & DiPietro, L. A. (2010). Factors Affecting Wound Healing. *Journal of Dental Research*, 89(3), 219–229. doi:10.1177/0022034509359125

- Guo, T., Li, W., Wang, J., Luo, T., Lou, D., Wang, B., & Hao, S. (2018). Recombinant human hair keratin proteins for halting bleeding. *Artificial Cells, Nanomedicine, and Biotechnology*, 1–6. doi:10.1080/21691401.2018.1459633
- Gupta, A., Briffa, S. M., Swingler, S., Gibson, H., Kannappan, V., Adamus, G., ... Radecka, I. (2020). Synthesis of silver nanoparticles using curcumin-cyclodextrins loaded into bacterial cellulose based hydrogels for wound dressing applications. *Biomacromolecules*. doi:10.1021/acs.biomac.9b01724
- Harding, J. L., Pavkov, M. E., Magliano, D. J., Shaw, J. E., & Gregg, E. W. (2018). Global trends in diabetes complications: a review of current evidence. *Diabetologia*. doi:10.1007/s00125-018-4711-2
- Keskin, Z., Sendemir Urkmez, A., & Hames, E. E. (2017). Novel keratin modified bacterial cellulose nanocomposite production and characterization for skin tissue engineering. *Materials Science and Engineering: C*, 75, 1144–1153. doi:10.1016/j.msec.2017.03.035
- Koşarsoy Ağçeli, G., Hammamchi, H., & Cihangir, N. (2021). Novel levan/bentonite/essential oil films: characterization and antimicrobial activity. *Journal of Food Science and Technology*. doi:10.1007/s13197-021-05009-4
- Kim, S. Y., Park, B. J., Lee, Y., Park, N. J., Park, K. M., Hwang, Y.-S., & Park, K. D. (2019). Human hair keratin-based hydrogels as dynamic matrices for facilitating wound healing. *Journal of Industrial and Engineering Chemistry*. doi:10.1016/j.jiec.2019.01.017
- Léguillier, T., Lecsö-Bornet, M., Lémus, C., Rousseau-Ralliard, D., Lebouvier, N., Hnawia, E., ... Rat, P. (2015). The Wound Healing and Antibacterial Activity of Five Ethnomedical Calophyllum inophyllum Oils: An Alternative Therapeutic Strategy to Treat Infected Wounds. *PLOS ONE*, 10(9), e0138602. doi:10.1371/journal.pone.0138602
- Li, Y., Xu, T., Tu, Z., Dai, W., Xue, Y., Tang, C., ... Lin, C. (2020). Bioactive antibacterial silica-based nanocomposites hydrogel scaffolds with high angiogenesis for promoting diabetic wound healing and skin repair. *Theranostics*, 10(11), 4929–4943. doi:10.7150/thno.41839
- Moraes, P. R. F. de S., Saska, S., Barud, H., Lima, L. R. de, Martins, V. da C. A., Plepis, A. M. de G., ... Gaspar, A. M. M. (2016). Bacterial Cellulose/Collagen Hydrogel for Wound Healing. *Materials Research*, 19(1), 106–116. doi:10.1590/1980-5373-mr-2015-0249
- Noor, S., Zubair, M., & Ahmad, J. (2015). Diabetic foot ulcer—A review on pathophysiology, classification and microbial etiology. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, 9(3), 192–199. doi:10.1016/j.dsx.2015.04.007
- Pan, X., Hobbs, R. P., & Coulombe, P. A. (2013). The expanding significance of keratin intermediate filaments in normal and diseased epithelia. *Current Opinion in Cell Biology*, 25(1), 47–56. doi:10.1016/j.ceb.2012.10.018
- Portela, R., Leal, C. R., Almeida, P. L., & Sobral, R. G. (2019). Bacterial cellulose: a versatile biopolymer for wound dressing applications. *Microbial Biotechnology*, 12(4), 586–610. doi:10.1111/1751-7915.13392
- Qin, X., Qiao, W., Wang, Y., Li, T., Li, X., Gong, T., ... Fu, Y. (2018). An Extracellular Matrix-Mimicking Hydrogel for Full Thickness Wound Healing in Diabetic Mice. *Macromolecular Bioscience*, 18(7), 1800047. doi:10.1002/mabi.201800047
- Raharivelomanana, P., Ansel, J.-L., Lupo, E., Mijouin, L., Guillot, S., Butaud, J.-F., ... Pichon, C. (2018). Tamanu oil and skin active properties: from traditional to modern cosmetic uses. *OCL*. doi:10.1051/ocl/2018048
- Saska, S., Teixeira, L. N., Tambasco de Oliveira, P., Minarelli Gaspar, A. M., Lima Ribeiro, S. J., Messaddeq, Y., & Marchetto, R. (2012). Bacterial cellulose-collagen nanocomposite for bone tissue engineering. *Journal of Materials Chemistry*, 22(41), 22102. doi:10.1039/c2jm33762b
- Serra, R., Grande, R., Butrico, L., Rossi, A., Settimio, U. F., Caroleo, B., ... de Franciscis, S. (2015). Chronic wound infections: the role of *Pseudomonas aeruginosa* and *Staphylococcus aureus*. *Expert Review of Anti-Infective Therapy*, 13(5), 605–613. doi:10.1586/14787210.2015.1023291
- Serra, M. B., Barroso, W. A., Silva, N. N. da, Silva, S. do N., Borges, A. C. R., Abreu, I. C., & Borges, M. O. da R. (2017). From Inflammation to Current and Alternative Therapies Involved in Wound Healing. *International Journal of Inflammation*, 2017, 1–17. doi:10.1155/2017/3406215

- Singh, S., Young, A., & McNaught, C.-E. (2017). The physiology of wound healing. *Surgery (Oxford)*, 35(9), 473–477. doi:10.1016/j.mpsur.2017.06.004
- Than, M. P., Smith, R. A., Cassidy, S., Kelly, R., Marsh, C., Maderal, A., & Kirsner, R. S. (2012). Use of a keratin-based hydrogel in the management of recessive dystrophic epidermolysis bullosa. *Journal of Dermatological Treatment*, 24(4), 290–291. doi:10.3109/09546634.2011.654108
- Urbánková, Kašpárková, Egner, Rudolf, & Korábková. (2019). Caseinate-Stabilized Emulsions of Black Cumin and Tamanu Oils: Preparation, Characterization and Antibacterial Activity. *Polymers*, 11(12), 1951. doi:10.3390/polym11121951
- Wang, B., Yang, W., McKittrick, J., & Meyers, M. A. (2016). Keratin: Structure, mechanical properties, occurrence in biological organisms, and efforts at bioinspiration. *Progress in Materials Science*, 76, 229–318. doi:10.1016/j.pmatsci.2015.06.001
- Wilkinson, H. N., & Hardman, M. J. (2020). Wound healing: cellular mechanisms and pathological outcomes. *Open Biology*, 10(9), 200223. doi:10.1098/rsob.200223
- World Health Organization. (2017). Global report on diabetes. 2016.
- Wu, Y.-K., Cheng, N.-C., & Cheng, C.-M. (2018). Biofilms in Chronic Wounds: Pathogenesis and Diagnosis. *Trends in Biotechnology*. doi:10.1016/j.tibtech.2018.10.011
- Yazdanpanah, L. (2015). Literature review on the management of diabetic foot ulcer. *World Journal of Diabetes*, 6(1), 37. doi:10.4239/wjd.v6.i1.37
- Zhang, P., Lu, J., Jing, Y., Tang, S., Zhu, D., & Bi, Y. (2016). Global epidemiology of diabetic foot ulceration: a systematic review and meta-analysis. *Annals of Medicine*, 49(2), 106–116. doi:10.1080/07853890.2016.1231932

## APPENDICES

**Appendix 1. Two-way ANOVA table of the relative wound size reduction.** The relative wound size reduction is significantly ( $p < 0.05$ ) affected by time.

Source of Variation	SS	df	MS	F ratio	P-value
Interaction	109.6	4	27.39	0.2364	0.9124
Time	5948	2	2974	25.66	0.0012*
Treatment	1723	2	861.4	2.847	0.1351
Subject	1816	6	302.6	2.611	0.0741

**Appendix 2. The effect of time on wound healing in mice is illustrated by the relative wound size reduction.** All wounds show significant wound size reduction over nine days period. Significant value (\*) indicates  $p < 0.05$ . Data were presented as mean  $\pm$  SEM ( $n=3$ ).

