

Acknowledgements

We thank the facility Unitech NOLIMITS for the possibility of confocal microscope use and particularly Mrs. Miriam Ascagni for her technical assistance.

References

- Nestle FO, Kaplan DH, Barker J. Mechanisms of disease: psoriasis. *N Engl J Med* 2009;361:496-509.
- Lebwohl M. Psoriasis. *Lancet* 2003;361:1197-204.
- Lowes MA, Suárez-Fariñas M, Krueger JG. Immunology of psoriasis. *Annu Rev Immunol* 2014;32:227-55.
- Takahashi T, Gallo RL. The critical and multifunctional roles of antimicrobial peptides in dermatology. *Dermatol Clin* 2017;35:39-50.
- Fuentes-Duculan J, Bonifacio KM, Hawkes JE, Kunjraiva N, Cueto I, Li X, et al. Autoantigens ADAMTSL5 and LL37 are significantly upregulated in active psoriasis and localized with keratinocytes, dendritic cells and other leukocytes. *Exp Dermatol* 2017;26:1075-82.
- Giolomoni G, Mrowietz U, Paul C. Psoriasis: rationale for targeting interleukin-17. *Br J Dermatol* 2012;167:717-24.
- Miller LS. Toll-like receptors in skin. *Adv Dermatol* 2008;24:71-87.
- Hari A, Flach TL, Shi Y, Mydlarski PR. Toll-like receptors: role in dermatological disease. *Mediators Inflamm* 2010;2010:437246.
- Gilliet M, Conrad C, Geiges M, Cozzio A, Thürlimann W, Burg G, et al. Psoriasis triggered by toll-like receptor 7 agonist imiquimod in the presence of dermal plasmacytoid dendritic cell precursors. *Arch Dermatol* 2004;140:1490-5.
- Morizane S, Yamasaki K, Mühleisen B, Kotol PF, Murakami M, Aoyama Y, et al. Cathelicidin antimicrobial peptide LL-37 in psoriasis enables keratinocyte reactivity against TLR9 ligands. *J Invest Dermatol* 2012;132:135-43.
- Donetti E, Cornaghi L, Arnaboldi F, Ricceri F, Pescitelli L, Maiocchi M, et al. Epidermal barrier reaction to an in vitro psoriatic microenvironment. *Exp Cell Res* 2017;360:180-8.
- Karantza V. Keratins in health and cancer: more than mere epithelial cell markers. *Oncogene* 2011;30:127-38.
- Donetti E, Lombardo G, Baranelli Preis FW, Cornaghi L, Pescitelli L, Prignano F. 3D skin model to investigate the early epidermal morphological psoriatic features. *J Transl Sci* 2019;6:1-4.
- Bedoni M, Sforza C, Dolci C, Donetti E. Proliferation and differentiation biomarkers in normal human breast skin organotypic cultures. *J Dermatol Sci* 2007;46:139-42.
- El Tawdy AM, Amin IM, Abdel Hay RM, Hassan AS, Gad, ZS, Rashed LA. Toll-like receptor (TLR)7 expression in mycosis fungoides and psoriasis: a case-control study. *Clin Exp Dermatol* 2017;42:172-7.
- Kim HJ, Kim SH, Je JH, Shin DY, Kim DS, Lee MG. Increased expression of Toll-like receptors 3, 7, 8 and 9 in peripheral blood mononuclear cells in patients with psoriasis. *Exp Dermatol* 2016;25:485-7.
- Gürel G, Sabah-Özcan S. Evaluation of Toll-like receptor expression profile in patients with psoriasis vulgaris. *Gene* 2019;702:166-70.
- Seung NR, Park EJ, Kim CW, Kim KH, Kim KJ, Cho HJ, et al. Comparison of expression of heat-shock protein 60, Toll-like receptors 2 and 4, and T-cell receptor $\gamma\delta$ in plaque and guttate psoriasis. *J Cutan Pathol* 2007;34:903-11.
- Shi X, Jin L, Dang E, Chang T, Feng Z, Liu Y, et al. IL-17A upregulates keratin 7 expression in keratinocytes through STAT1- and STAT3-dependent mechanisms. *J Invest Dermatol* 2011;131:2401-8.
- Zhang W, Dang E, Shi X, Jin L, Feng Z, Hu L, et al. The pro-inflammatory cytokine il-22 up-regulates keratin 17 expression in keratinocytes via STAT3 and ERK1/2. *PLoS One* 2012;7:e40797.
- Steen Z, Chen L, Liu YF, Gao TW, Wang G, Fan XL, et al. Altered keratin 17 peptide ligands inhibit in vitro proliferation of keratinocytes and T cells isolated from patients with psoriasis. *J Am Acad Dermatol* 2006;5:992-1002.
- Yang L, Zhang S, Wang G. Keratin 17 in disease pathogenesis: from cancer to dermatoses. *J Pathol* 2019;247:158-65.
- Mussari CP, Dodd DS, Sreekantha RK, Pasunoori L, Wan H, Posy SL, et al. Discovery of potent and orally bioavailable small molecule antagonists of Toll-like receptors 7/8/9 (TLR7/8/9). *ACS Med Chem Lett* 2020;11:1751-8.
- Patinote C, Karroum NB, Moarbess G, Cirnat N, Kassab I, Bonnet PA, et al. Agonist and antagonist ligands of toll-like receptors 7 and 8: Ingenious tools for therapeutic purposes. *Eur J Med Chem* 2020;193:112238.

Received for publication: 11 January 2021. Accepted for publication: 18 February 2021.

This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License (CC BY-NC 4.0).

©Copyright: the Author(s), 2021

Licensee PAGEPress, Italy

European Journal of Histochemistry 2021; 65:3218

doi:10.4081/ejh.2021.3218