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From repair to regeneration – transcription factor FOXN1 directs the skin wound healing processes

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Skin wound healing in mammals can be resolved through the common process of reparation (scar-forming) or sporadically observed regeneration (scar-free). Regeneration is characterised by lack of scarring and reconstruction of normal tissues architecture and function. However, to date no mechanism has been proposed that allows the transformation of reparative healing into regeneration. We showed that the skin of nude mice, which is deficient in the transcriptional factor FOXN1, is capable of remarkable scar-free healing similar to mammalian fetuses. Interestingly, in both mammalian fetuses and nude mice lack in their skin FOXN1 activity coincide with regenerative wound healing. Next-generation high-throughout DNA sequencing data analysis comparing the uninjured skin of mouse fetuses during regenerative period (14th day of embryonic development; FOXN1 non-active) and adult nude mice (FOXN1-deficient) revealed the similarities in transcriptomic signature that predisposes them to regenerative skin healing. FOXN1 activity appears to be an essential condition to establish the adult skin phenotype and a key component of skin maturation. Analysis of post-injured skin from FOXN1::Egfp transgenic mice showed an intense FOXN1-eGFP signal at the wound margin and in the leading epithelial tongue, where it co-localized with keratin 16 and Mmp-9. Moreover, high levels of Snail1 and Mmp-9 expression, co-localization of vimentin/E-cadherin-positive cells and myofibroblast marker (α SMA) in dermis revealed the involvement of FOXN1-positive keratinocytes in an epithelial-mesenchymal transition (EMT). Together, our findings indicate that (i) FOXN1 inactivity in nude mice creates pro-regenerative conditions, (ii) FOXN1 is a potent factor in reparative (scar-forming) wound healing through engagement in re-epithelization and the EMT process.

Biography

Barbara Gawronska-Kozak received her PhD from University of Warmia and Mazury in Olsztyn, Poland and her habilitation from Medical University in Bialystok, Poland. From 2005 to 2011, she worked as an Assistant Professor and Head of the Regenerative Biology Laboratory at Pennington Biomedical Research Center, Baton Rouge, USA. Currently she is Associate Professor at the Polish Academy of Sciences in Olsztyn, Poland and Leader of Regenerative Biology Team. She published more than 60 papers in reputed journals. Her study focuses on skin wound healing, adult stem cells and obesity.

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