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Identifying the intracellular response in surface acoustic wave-stimulated wound healing

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Surface Acoustic Waves (SAW) are a powerful tool for biophysical applications like manipulation, sensing and stimulation of cellular properties or functions. We here stimulate epithelial wound healing assays on LiNbO3 substrates with an interdigital transducer (IDT), generating travelling Rayleigh waves with a frequency of f = 160 MHz. By variation of the SAW intensities and pulse parameters, we reveal an optimal SAW stimulation intensity range between P = 4 and 8 mW, accelerating wound healing up to 235 %. The stimulation efficiency increases with increasing pulse width. Following the hypothesis that the cytoskeleton is responsible for faster cell migration in SAW-stimulated wound healing, we show that the orientation of actin fibres is significantly enhanced parallel to the SAW propagation direction. Ultimately, we aim to identify the contribution of the protein YAP and SPPL3 membrane proteases to the stimulation process. Thereby, we hope to unravel the underlying biophysical and biochemical mechanisms in SAW-stimulated wound healing and gain a better understanding of the impact of SAW on cellular processes.