Sensor Integration for Flexible and Wearable Wound Monitoring Bandage

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Our goal is *integrate* flexible bio-impedance sensors with blood oxygenation sensors in order to monitor wound healing and provide therapy using electrical stimulation (ES) and accelerate the healing process. ES therapy originates from the observation that wounded epithelial tissues generate a significant lateral electric field (25-150mV/mm) that is actively regulated by intact cells to transport ions and direct cell migration towards the wound. Manipulating the electrical properties at wound edges reveals effective increases of angiogenic markers by 30% and cell division by 40%, and it is shown that ES can reduce infection and oedema, increase perfusion, and improve cellular immunity and cell reproduction to speed up healing. The sensors to monitor wound and the electrodes used for therapy will be printed onto flexible substrates for patient comfort and accurate placement in close proximity to the affected area. The electronics for data acquisition and transmission will be based on conventional integrated circuits (ICs) utilizing low power strategies. In the final form, the bandage will have electronics, antenna, theranostic devices, i.e. devices with *both* diagnostic and therapeutic functions, integrated on a flexible substrate. The final bandage will have the capability *to acquire, process, transmit and* transform data into information that can be interpreted by medical personal. Therefore, our goal is not to develop novel medical device technology, but rather integrated methods already demonstrated by the team into a prototype that will identify technology shortcomings, power requirements and materials compatibility and establish integration processes that will enable the design and manufacturing of a theranostic patch to speed up wound healing.