Development of a Cardiac Patch for Post-Myocardial Infarction Treatment

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Designing protocols to deal with heart attacks have always been a challenge, especially after they have occurred. Myocardial infarction (MI) events typically result in excess scar tissue formation. This deformation decreases the heart's ability to function since only healthy cardiac tissue is capable of directing electrical signals through the heart properly. A major concern for a treatment was that it needed to correct the heart's healing process while allowing a constant watch on its physical condition. This research aimed to develop a hydrogel-based cardiac patch. This project was inspired by other cardiac patch designs like Schaefer and his colleagues' 2017 cell-based approach. Although this method seemed promising, there was a risk that blood vessels would not form properly, potentially leading to necrosis. However, this patch design could eliminate this biological issue by using electrical stimulation to encourage cardiac cell regeneration from existing cells rather than introducing new ones. As this study exclusively covered the early stages of this device's development, only the ability of the patch to record cardiac parameter data was evaluated. This objective was accomplished by testing the cardiac patch in terms of strain, electrocardiogram (ECG) pacing, and temperature within an *in vivo* murine model. From these tests, the cardiac patch was shown to be able to collect all relevant data points simultaneously. They also displayed differences between identical sensors at different locations. Due to the limitations in terms of the device's regenerative properties, incorporating a means for it to assist in cardiac cell regeneration is a future consideration.