A Novel Device for the Detection of Chronic Transplant Rejection

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Currently, organ transplantation is the best treatment available for patients experiencing end-stage heart and kidney failure. Unfortunately, the ten-year survival rate of a transplanted organ is only 54%. Chronic transplant rejection (CTR), the leading cause of late organ loss following transplantation, is primarily responsible for this low survival rate. However, if diagnosed early enough, there can be intervention to minimize CTR. Here I describe a simple, rapid, inexpensive, device that quantitatively screens for Vascular Endothelial Growth Factor-C (VEGF-C), a biomarker of CTR. A test strip was prepared by coating the wells of an 8-microwell strip with capture antibody directed against human VEGF-C. Biotinylated detection antibody and streptavidin-HRP conjugate were diluted in stability buffers to preserve activity and suspended in solution. The optimal concentration for each antibody was determined by titration. The prepared strip was tested by assaying serial dilutions of VEGF-C in a 10% solution of fetal bovine serum. The strip was incubated, washed, and developed with substrate, and each microwell's absorbance was measured with a microplate reader. A portable machine was then built to automate the entire testing process. The completed test strip produced a standard curve with an R-squared value of 0.9996, a prediction error of 71 pg/mL, and a minimum detectable concentration of 62 pg/mL. Each test takes 25 minutes, is 12 times faster than ELISA, 16 times less expensive, and provides a simple, rapid, inexpensive, method of quantifying VEGF-C concentration. Furthermore, this device can easily be modified to detect other biomarkers, and therefore other diseases.

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