Development of an Aptamer Based Lateral Flow Test: A Novel Approach to Depression Diagnosis

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Dopamine is a neurotransmitter that is responsible for reward, pleasure, and many other functions in humans. Major Depressive Disorder (MDD) causes persistent psychiatric and physical symptoms. MDD affects over 300 million people, yet less than half of these people receive effective treatment due to a high rate of misdiagnosis. Although brain neurochemistry is extremely difficult to determine, blood samples can be easily acquired. Plasma dopamine concentration has been found to be unregulated in depressed patients, suggesting that it can be an effective biomarker for MDD. This type of point of care testing is important because the results are available relatively quickly and can be acted upon without delay. Lateral flow tests are cellulose-based devices intended to detect the presence of a target analyte in a liquid sample. Their simple dipstick nature is becoming the cornerstone of point of care testing due to ease of use for patients, affordability, and speed. The goal of this research was to develop an efficient and reliable point of care test for plasma dopamine that can be used as a preliminary screen for MDD. 5 DNA probe sequences were designed complementary to different areas of the dopamine aptamer's target binding site. Polyacrylamide gel electrophoresis was used to determine which probe was sufficiently bound to the aptamer yet could be displaced in the presence of dopamine, however no probe proved to be effective. LFA design was simulated with one probe and it was concluded that the aptamer never sufficiently bound the probe.

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