

# Developing a Lateral Flow Immunoassay for Cortisol Detection, Year Two

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In recent years, societal focus has shifted towards maintaining a balanced stress level. Stress is an issue that all people will face in their lifetime, however, few know the severity that results in chronic stress. Cortisol is the steroid hormone that is known as the “biochemical marker of stress.” Numerous health problems occur as a result of increased cortisol and may cause a large range of side effects. Although interest in this field is always growing, tests available for measuring cortisol are limited. However, all previously existing tests are very time consuming and often very expensive. This project focuses on the development of a urinalysis immunoassay for cortisol detection. Similar to a pregnancy test, the results of this test show a number of lines depending on a person’s stress level. First, to create the test, a variety of glass fibers were tested for their absorbance ability. Next, a conjugate pad was created by mixing a solution of a purified cortisol antibody and gold nanoparticles. Then, the remainder of the cortisol antibody was mixed with fluorescent dyes and added to the test strip. After, the components of the test strip were all put together to create a finalized test. A plastic cassette was designed using TinkerCAD and a 3D printer. Finally, after all of the pieces of the test were created, numerous trials of the test were checked for accuracy using synthetic urine with altered amounts of cortisol. The results of the test found it to be 96% accurate, completing the original engineering goal. Because an excess of stress is common, the method created in this procedure will assist millions worldwide in the ability to check their cortisol level rapidly and inexpensively.