

**Intel International Science & Engineering Fair 2014
Los Angeles, USA**

ABSTRACT

Project No.: Intel2014_019

Title: An Investigation on Traditional Chinese Silver Staining Diagnosis and its potential use as a novel preliminary test for Chronic Renal Failure

Silver plates embedded inside hard-boiled eggs were said to be used for diagnosing one's sickness by the obvious colour change after rolling on the area where the patient feels sick. Inspired by the traditional Chinese medical diagnosis with silver plates and eggs, we have an idea to verify the chemistry behind.

The experiments were conducted by rolling hard-boiled eggs with silver plates inside on a white tile with different chemicals added onto the tile. Incubating the mixture of chemicals with different amino acids and a silver plate put inside was also the methodology we have adopted for the experiments.

The different chelation modes between silver ion formed on the silver plate and the thiol group of cysteine of proteins present in albumen was determined to be the cause of the colour change, silvery to yellow then to blue. On top of this, it was found that high pH environment and presence of phosphate ion catalyses the reaction of forming complexations, turning the silver plate into blue.

For the lowest concentration, 3.125×10^{-6} M phosphate solution is able to turn the silver plate into blue within 10 minutes. This enables us to have preliminary detection for pollution of excessive phosphate ion in fresh water bodies and for various diseases by analyzing phosphate ion concentration in sweat. In addition, an experiment of testing the accuracy of the phosphate ion test on chronic renal failure (CRF) patients with high-phosphate-ion-content sweat was carried out. The tests are found to be generally accurate so it is recommended as a preliminary test for CRF. As the tests can be conducted easily and economically, they are recommended as an alternative for detecting phosphate ion.