

Research Title:**Research and Development of a Specific Aptamer-Based Kit for the Detection of Microhematuria in Urine****Supervisor:** Dr. Gia Bach Pham**Research Team Members:** Hoang Do Uyen Nhi, Bui Tu Anh, Hoang Thuy Giang**Abstract**

This study develops a detection kit for microscopic hematuria in urine based on an aptamer-hemin sensor, in which hemin is selected as the detection target due to its ability to catalyze the redox reaction between TMB and H_2O_2 . The specific aptamer binding to hemin stabilizes its structure and enhances catalytic activity, producing a yellow color signal easily observed by the naked eye. The system achieves an LOD of 0.14 nM and an LOQ of 0.46 nM - 4 to 10 times lower than the characteristic heme threshold of microscopic hematuria, demonstrating exceptional sensitivity. The sensor provides stable signals under optimal conditions (pH 5, 150 mM NaCl, 5 mM MgCl_2 , 35 mM TMB, 100 mM H_2O_2), performs well in artificial urine, and detects sheep blood at extremely low concentrations ($\sim 0.001\%$ RBC), with results comparable to commercial test kits. The study highlights the potential of the aptamer-hemin sensor as a rapid, accurate, and selective solution for micro-blood detection, aiming toward the development of a "Made in Vietnam" diagnostic kit for early urinary disease screening and supporting future telehealth applications.

Keywords: microscopic hematuria, aptamer, hemin, biosensor, TMB, hydrogen peroxide.