Designing a Cost-Effective Lateral Flow Assay for Hypercalcemia Detection and Formulation of Therapeutic Supplements to Modulate Serum Calcium Concentrations

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Hypercalcemia is a condition where the levels of calcium in the blood are greater than normal, having the ability to weaken bones, create kidney stones, and disrupt the heart and brain connections in the body. A hypercalcemia diagnosis often requires lab testing which can be time consuming and costly, leading to high morbidity. Thus, the goal of this experiment is to create a test that can detect hypercalcemia in a timely, cost-effective manner, and then create a treatment to reduce calcium levels in the blood. Phase 1 focused on engineering a lateral flow immunoassay, infusing conjugate pads with a calcium reagent comprising o-Cresolphthalein Complexone 8-hydroxiquinoline (color reagent), and potassium cyanide with 2-Amino-2 methyl-1 propanol (buffer reagent). Phase 2 focused on creating a supplement, primarily composed of potassium and magnesium, designed to counteract worm blood with elevated calcium levels, mimicking the human body's conditions. Testing the supplement's efficacy using the previously developed lateral flow immunoassay revealed that, as calcium levels increased, the absorbencies of the reagent decreased, supporting the research hypothesis. The rise in pH levels in the calcium and potassium/magnesium solution suggests the potential success of potassium/magnesium as a treatment to reduce blood calcium levels, including potential intravenous applications. Thus, with proper regulations, both the test and the supplement can be used to detect and reduce mild cases of hypercalcemia before they become too severe.

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