

二零二三年香港學生科學比賽

延伸摘要範本 (研究項目)

隊伍號碼：SBBC056

作品名稱：抗原大解剖

參賽類別：研究項目

就我們所知，坊間有/沒有*類似的作品；(如有，) 相關研究連結如下：

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I. 前言

越來越多的人因謊報 Covid-19 陽性結果而被捕。 COVID-19 快速抗原檢測的原理是將含有病毒核衣殼蛋白抗原的鼻咽拭子樣本加入 RAT 盒的樣本墊時，樣本中的病毒抗原與樣本中的病毒抗原發生抗原抗體反應。相應的抗病毒抗體包被在硝酸纖維素膜上。我們想調查人們如何在沒有對 COVID 測試呈陽性的情況下為 RAT 創建陽性結果。我們將使用 pH 指示劑、Benedict 溶液等測試 pH、糖水平、蛋白質的存在和溫度等因素如何影響 RAT 結果。

目標

- 哪些物質會影響 RAT 的結果
- 不同因素如何影響 RAT 的準確性

II. 假設

假設：酸性、鹼性溶液、含糖量較高的溶液會導致假陽性結果。

III. 研究方法

材料

快速抗原檢測試劑盒, pH 指示劑, 果汁, 碳酸飲料, 咖啡, 牛奶, 養樂多

儀器

熱板, 燒杯, 移液器, 量筒, 滴管, 試管, 立夾, PH 試紙

實驗方案

滴幾滴配製好的溶液到抗原快速檢測試劑盒的檢測區。等待 15 分鐘出結果。

對照實驗

滴幾滴蒸餾水到抗原快速檢測試劑盒的檢測區。等待 15 分鐘出結果。

IV. 研究結果



呈陽性的物質：

含緩衝液的養樂多, 煮沸的養樂多, 0.1M CH₃COOH, 0.01M CH₃COOH

V. 結論

影響 RAT 結果的最大因素是 pH 值 (H⁺的濃度)。

pH 值較低的酸和 pH 值較高的鹼會破壞樣品墊上的液體。而具有合適 pH 值的溶液 (0.1 M CH₃COOH, pH 4) 會對 RAT 顯示出陽性結果。某些溶液中的沉澱物會阻塞樣品墊並防止其與添加的溶液發生反應。因此, pH 值約為 4 且無任何沉澱的溶液可產生陽性結果。

Hong Kong Student Science Project Competition 2023

Template of Extended Abstract (Investigation)

Team Number: SBBC056

Project Title: Dissection of RAT

Project Type: Investigation

*To our best knowledge, there are/ are no * similar works in the field; (if there are,) related research links are as below:*

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I. Background

There is an increasing number of people being arrested for falsely reporting a positive Covid-19 result. The COVID-19 rapid antigen test is based on the principle that when a nasopharyngeal swab sample containing the viral nucleocapsid protein antigen is added to the sample pad of the RAT cassette, an antigen-antibody reaction occurs between the viral antigen from the sample and the corresponding antiviral antibody which is coated in the nitrocellulose membrane. We would like to investigate how people create a positive result for RAT without testing positive for COVID. We will test how factors like pH, sugar level, presence of protein and temperature affect the result of RAT using the pH indicator, Benedict's solution, etc.

II. Objectives

- What substances will affect the result of RAT
- How different factors affect the accuracy of RAT

III. Hypothesis

Hypothesis: Acidic, alkaline solution, solution with higher sugar level will lead to a fake positive result.

IV. Methodology

Materials

-rapid antigen testing kit, pH indicator, Juice, (Carbonated)Drinks, Milk, Yakult

Apparatus

Hot plate, Beaker, Test Tube, pipette, dropper, measuring cylinder, stand and clamp, pH paper

Experimental Protocol

Drop a few drops of prepared solution to the testing region of the rapid antigen testing kit. Wait 15 mins for the result.

Control Experiment

Drop a few drops of distilled water to the testing region of the rapid antigen testing kit. Wait 15 mins for the result.

V. Results



Substances that show a positive result:

Yakult with buffer solution, Boiled yakult, 0.1M CH_3COOH , 0.01M CH_3COOH

VI. Conclusion

The largest factor that affects the result of RAT is pH value (concentration of H^+). Acids with lower pH and alkalis with higher pH will destroy the liquid on the sample pad. While solutions with suitable pH value (0.1 M CH_3COOH , around pH 4) shows a positive result towards the RAT. Precipitation in some of the solutions will block the sample pad and prevent it from reacting with the solution added. Therefore, solutions with suitable pH of ~ 4 without any precipitate can give a positive result.