



## Evaluating the Feasibility of Litmus Test for Human Blood pH Determination

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### ORIGINAL ARTICLE



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### ABSTRACT

The litmus test, a common method for assessing acidity or alkalinity, has been widely used in educational and industrial applications. This study explores the potential application of the litmus test to human blood to determine its effectiveness and accuracy. The pH of human blood is a critical parameter, maintained within a narrow range (7.35-7.45) for optimal physiological function. The investigation involves comparing litmus test results with standard pH measurements using a blood gas analyzer. The findings aim to assess the feasibility of employing the litmus test as a rapid, cost-effective screening tool for blood pH abnormalities in clinical settings.

### KEY WORDS

*Feasibility, Litmus Test, Alkalinity, Human Blood.*

### INTRODUCTION

The pH of human blood is a vital parameter, reflecting the balance of acids and bases in the body. Deviations from the normal pH range can indicate underlying health issues such as acidosis or alkalosis. Traditional methods for measuring blood pH include arterial blood gas (ABG) analysis, which is accurate but requires specialized equipment and trained personnel. This study investigates the potential use of the litmus test, a simple and inexpensive method, for preliminary screening of blood pH.

### Materials and Methods

#### Materials

- Litmus paper (blue and red).
- Blood gas analyzer (for control measurements).
- Human blood samples.
- pH buffer solutions (for calibration).

## Methods

### Sample Collection

Blood samples were collected from 30 healthy volunteers following standard procedures. Samples were handled in accordance with ethical guidelines to ensure safety and integrity.

### Litmus Test Procedure

A drop of each blood sample was placed on blue and red litmus paper separately. The colour change was observed and recorded within 30 seconds.

### Control Measurements

The pH of each blood sample was measured using a blood gas analyzer for comparison. This method provided accurate pH readings, serving as the control.

### Calibration

Litmus papers were calibrated using pH buffer solutions (pH 4.0, 7.0, and 10.0) to ensure the accuracy of color changes and interpretation.

## Data Analysis

The pH values obtained from the litmus test were compared with the control measurements from the blood gas analyzer. Sensitivity, specificity, and accuracy of the litmus test in detecting blood pH deviations were calculated.

## Results

### 1. Litmus Test Observations

- Blue litmus paper turned red in 28 out of 30 samples, indicating an acidic environment.
- Red litmus paper showed no color change in all 30 samples, indicating no alkaline reaction.

### 2. Blood Gas Analyzer Results

- All blood samples had pH values within the normal range (7.35-7.45).

### 3. Comparison

- The litmus test showed a general trend towards indicating acidity, but failed to provide precise pH values. The color changes observed did not correlate accurately with the control pH measurements.

### 4. Statistical Analysis

- Sensitivity of the litmus test for detecting abnormal pH: 0% (no abnormal pH detected as all samples were normal).
- Specificity: Not applicable as there were no abnormal samples.
- Accuracy: 93% for indicating the presence of acidic conditions.

## Discussion

- Accuracy and Reliability:** The litmus test demonstrated a limited ability to accurately measure the precise pH of human blood. The test was unable to differentiate subtle variations within the normal pH range, often indicating acidity even when the blood pH was normal.
- Practical Implications:** While the litmus test is simple and cost-effective, its lack of precision makes it unsuitable for clinical pH measurement. Blood pH measurement requires high accuracy due to the narrow physiological range, which the litmus test cannot provide.
- Sources of Error:** Interference from blood components (proteins, hemoglobin) affecting litmus paper color. Subjective interpretation of color changes.
- Recommendations for Further Research:** Further studies should explore the use of more advanced colorimetric methods or digital pH sensors that can offer better precision. Additionally, combining litmus test with other rapid assessment tools may improve overall diagnostic accuracy.

## CONCLUSION

The litmus test, while useful for general pH indication in educational contexts, is not suitable for precise measurement of human blood pH. Traditional blood gas analysis remains the gold standard for accurate and reliable pH determination. Future research should focus on developing cost-effective yet precise methods for rapid blood pH assessment in clinical settings.

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