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Optimization of Human Plasma Preservation Method as a Standard for Biological Analysis

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INTRODUCTION

Currently, most research in the field of biochemical robots is centered on plasma control and calibration. This focus is natural, since plasma-based control and calibration enable the robot to carry out its intended functions efficiently. Without plasma control, for example, robots would be unable to communicate their functions. Advances in techniques for manipulating, generating, and monitoring plasma have greatly improved the plasma-control process, and these improved techniques are essential for ensuring a stable and effective plasma environment. Calibration is likewise crucial to make sure biochemical robots behave accurately and predictably. Because robots, like all devices, are prone to errors, calibration becomes necessary; if such errors accumulate, they can undermine the robot's reliability. In the event of a control-system failure, robots may become dangerous, as the control system could direct them into potentially hazardous and unexpected movements.[1]

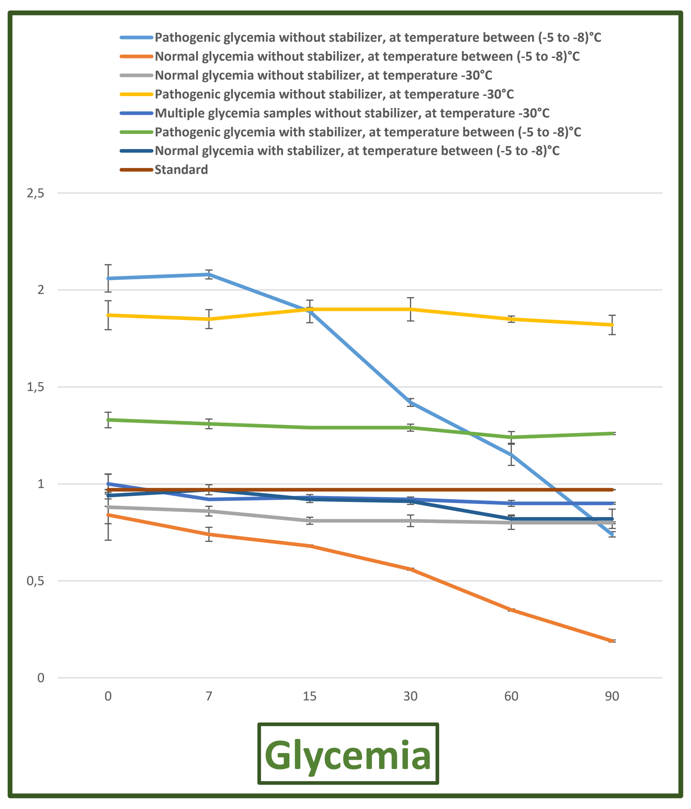
Control systems for biochemical robots usually require three kinds of calibration: actuator calibration, sensor calibration, and motion calibration. Customizable robots allow designers and users to rely on generic hardware that can easily be configured to support a wide range of movements and interactions. The behaviors displayed by a biochemical robot using plasma control and calibration are highly significant in any given design task, because they reveal the robot's true attributes. Plasma control, together with calibration, offers a unique way to observe the robot in terms of control and motion. While plasma calibration is under way, the robot's calibration window in the software is updated in real time, allowing the robot's processor to adjust to the plasma environment. Integrating plasma control and calibration into biochemical robots has opened new avenues for exploring robot movement and behavior.[2]

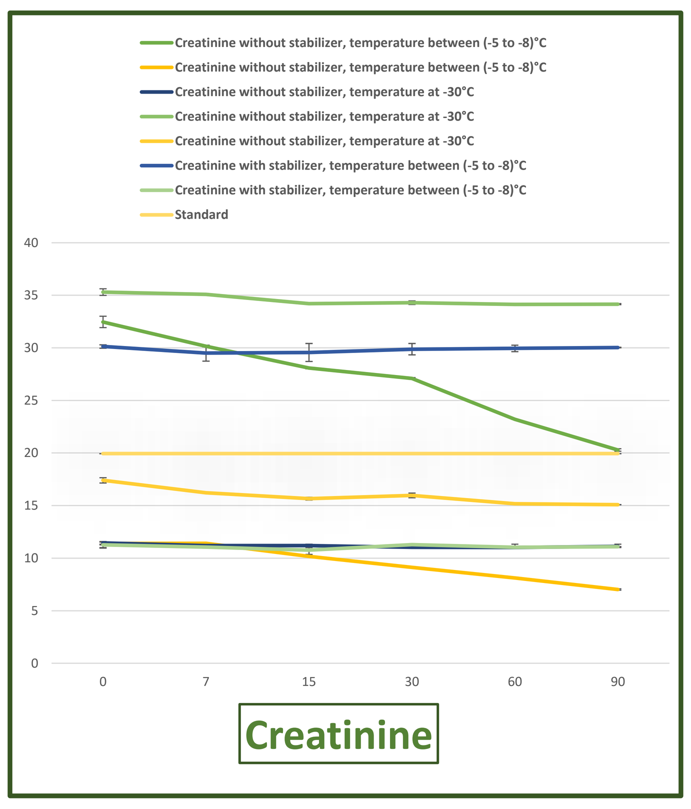
These methods also hold promise for designing more autonomous robots that can adapt to changes in both their surroundings and their own physical conditions. AI-based plasma calibration supports the plasma-control software by allowing users to define the palette of a given species in the plasma recipe editor—an especially important feature when multiple gas types are used. To ensure correct final results, please provide the machine-translated file and, using AssistEdit, help us improve the translation.[3]

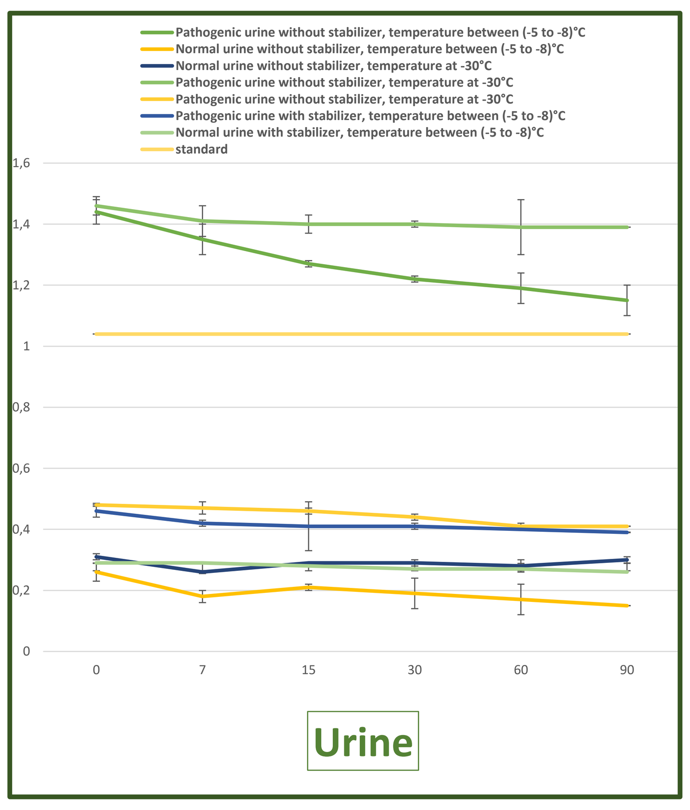
MATERIALS AND METHODS

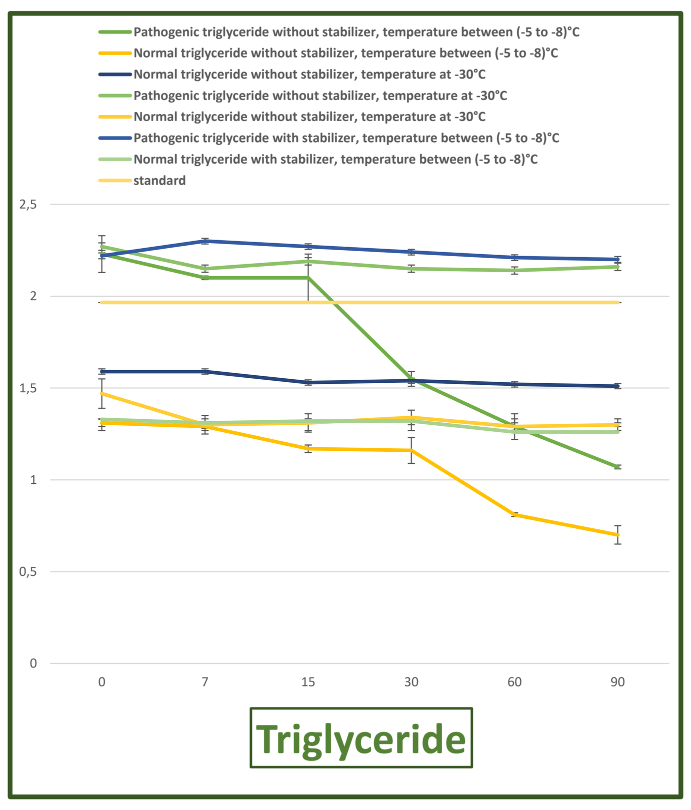
Blood Collection Techniques
Pathogenic and Normal Plasma Populations
Plasma Separation Equipment and Techniques
Spectrophotometer: MINDRAY BA-88A
Biochemistry Analyzer: MINDRAY BS 240
Diagnostic Reagents with Standards
Sample Preservation: Freezers at -30 °C and between -5 to -8 °C

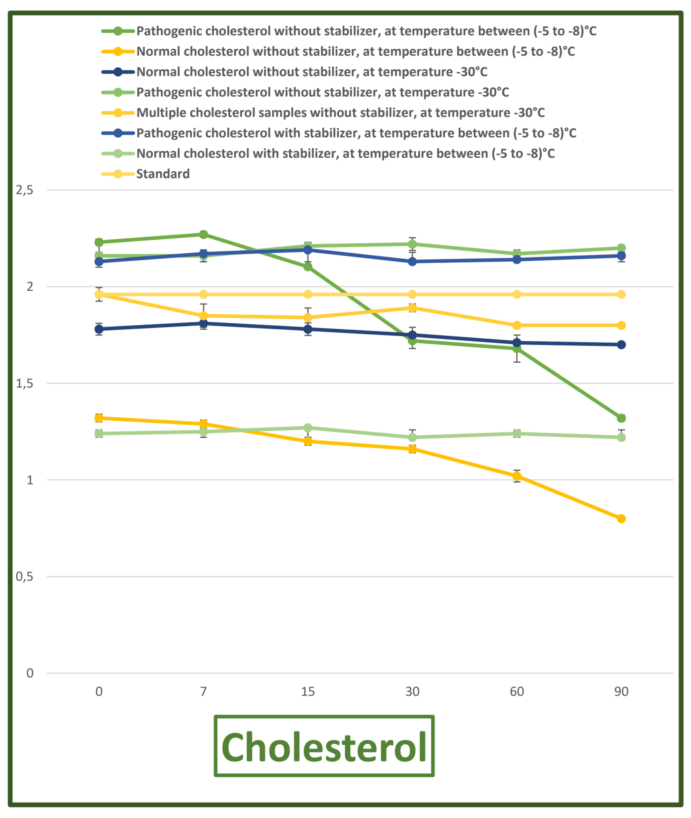
RESULTS











Discussion of Results

The conservation of human plasma is essential to ensure the reliability of biochemical analyses. However, current preservation methods present limitations, particularly when it comes to the long-term storage of biomarkers. This study aims to assess the stability of key biomarkers — glucose, urea, creatinine, cholesterol, and triglycerides — over a period of 90 days using three different storage methods: freezing at -30 °C, storage at -5 °C/-8 °C without chemical stabilizers, and storage at -5 °C/-8 °C with the addition of stabilizers. The goal is to evaluate the effectiveness of each method to potentially use the samples as reliable reference standards.

Plasma samples were subjected to these three storage conditions. To ensure precise and reproducible measurements, analyses were carried out using a Mindray biochemistry analyzer. The results showed that freezing at -30 °C allowed for optimal preservation with minimal variability across the biomarkers. In contrast, rapid degradation was observed in samples stored at -5 °C/-8 °C without stabilizers. Notably, the use of chemical stabilizers at the same storage temperature significantly improved biomarker stability, producing results comparable to those obtained with freezing.

In conclusion, freezing at -30 °C remains the most reliable method for long-term storage of plasma biomarkers. However, the incorporation of chemical stabilizers presents a viable alternative, particularly in settings where advanced refrigeration infrastructure is limited. A combined approach utilizing both freezing and chemical stabilization could help optimize the quality of plasma samples for biomedical applications.

CONCLUSION

The key findings of this study demonstrate that storing human plasma at -30 °C is the most effective method for preserving critical biomarkers such as glucose, urea, creatinine, cholesterol, and triglycerides. This temperature ensures excellent analyte stability, which is essential for maintaining the reliability of subsequent biochemical analyses.

Additionally, storing plasma at -5 °C to -8 °C with added chemical stabilizers also proved to be effective, showing significantly better biomarker preservation than storage without stabilizers. These findings highlight the importance of plasma stabilization protocols, especially in settings where deep freezing infrastructure is limited.

These conclusions carry important implications for medical practice and clinical diagnostics, particularly in the monitoring of patients with metabolic disorders. Healthcare professionals are thus encouraged to adopt appropriate storage techniques to ensure the accuracy and reliability of laboratory results.

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