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## CASE REPORT

# Combating Lipemia in Severe Hypertriglyceridemia Pancreatitis: Dilution and Centrifugal Tactics

Yinjie Lv, Jiehua Han

*Department of Laboratory, The Affiliated Yangming Hospital of Ningbo University, Yuyao People's Hospital of Zhejiang Province, Yuyao, China*

**SUMMARY**

***Background:*** **Severe hypertriglyceridemia (HTG) is a critical risk factor for acute pancreatitis. Lipemic interference in laboratory testing complicates diagnosis and delays clinical intervention. This case highlights strategies to mitigate lipemia-induced analytical errors.**
***Methods:*** **A 42-year-old male presented with severe abdominal pain and markedly elevated triglycerides (> 21.94 mmol/L). Lipemia interference was addressed via 1) 10-fold dilution for rapid lipid profiling and 2) high-speed centrifugation (15,000 rpm, 20 minutes) with repeated processing of the subnatant.**
***Results:*** **Dilution provided preliminary lipid results within 2.5 hours, revealing extreme hypertriglyceridemia (77.72 mmol/L), prompting plasma exchange. Centrifugation corrected electrolyte and protein measurements (e.g., sodium: 128 - 137 mmol/L; total protein: 84.2 - 62.8 g/L).**
***Conclusions:*** **Dilution and centrifugation are effective for rapid reporting and accurate analysis of lipemic samples. Standardized protocols for lipemia management are essential for timely clinical decision-making.**
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**Correspondence:**
Jiehua Han
Department of Laboratory
The Affiliated Yangming Hospital of
Ningbo University Yuyao People's Hospital of
Zhejiang Province
Yuyao
China
Phone: +86 13958373090
Email: 83561912@163.com

**KEYWORDS**

lipemia, hypertriglyceridemia pancreatitis, centrifugation, dilution, laboratory interference

## INTRODUCTION

Lipemic samples, characterized by turbidity from chylomicrons (CM) and very-low-density lipoproteins (VLDL), interfere with biochemical assays through light scattering, volume displacement, and inhomogenous sampling [1]. Severe hypertriglyceridemia (HTG) (> 11.3 mmol/L) is a leading cause of acute pancreatitis, necessitating urgent laboratory results to guide therapies like plasma exchange [2]. However, lipemia obscures critical parameters (e.g., electrolytes, lipids), delaying diagnosis. This case demonstrates how strategic sample processing mitigates interference, enabling rapid clinical action.

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**Table 1. Initial and diluted lipid profiles.**

| Parameter | Initial results | Diluted (x 10) | Reference value |
|---|---|---|---|
| Total cholesterol (mmol/L) | > 25.87 | 26.25 | < 5.20 |
| Triglycerides (mmol/L) | > 21.94 | 77.72 | < 1.7 |
| HDL cholesterol (mmol/L) | 10.86 | 0.75 | > 1.04 |
| LDL cholesterol (mmol/L) | 0.49 | 9.45 | < 3.40 |

**Table 2. Post-centrifugation results.**

| Parameter | Initial results | Post-Centrifugation | Reference value |
|---|---|---|---|
| Sodium (mmol/L) | 128 | 137 | 137 - 147 |
| Chloride (mmol/L) | 94 | 97.8 | 99.0 - 110.0 |
| Total protein (g/L) | 84.2 | 62.8 | 65.0 - 85.0 |
| Albumin (g/L) | 34.8 | 33.5 | 40.0 - 55.0 |

## CASE PRESENTATION

A 42-year-old male presented with an 11-hour history of persistent dull epigastric pain that progressively worsened without identifiable triggers. The pain was not accompanied by nausea, vomiting, back radiation, chills, fever, chest discomfort, dyspnea, dizziness, headache, or bowel obstruction symptoms. Initial evaluation in the emergency department suggested acute pancreatitis, though no immediate interventions were administered. The patient was subsequently admitted to the gastroenterology unit for comprehensive management. His medical history included a prior episode of acute pancreatitis two years ago, which resolved following hospitalization. Physical examination revealed stable vital signs: temperature 36.7℃, heart rate 108 bpm, respiratory rate 20 breaths/minute, and blood pressure 120/86 mmHg.

Initial laboratory testing revealed profound metabolic disturbances: sodium 128.4 mmol/L, chloride 94 mmol/L, and lipemia index 745 (reference: < 20). Lipid profiling showed triglycerides > 21.94 mmol/L and total cholesterol > 25.87 mmol/L (Table 1). Given the severity of hypertriglyceridemia and clinical instability, the patient was urgently transferred to the intensive care unit (ICU) for plasma exchange.

### Laboratory Interventions

#### Dilution

A 10-fold dilution of the lipemic serum was performed using normal saline. The diluted sample was analyzed via a rapid lipid panel (Hitachi 008AS), yielding a triglyceride level of 77.72 mmol/L within 2.5 hours (Table 1). These results were immediately communicated to clinicians, enabling prompt initiation of plasma exchange.

#### Centrifugation

The residual sample was centrifuged (15,000 rpm, 20 minutes). The subnatant was collected and subjected to an additional identical centrifugation cycle prior to reanalysis, with sodium levels corrected to 137 mmol/L and total protein to 62.8 g/L (Table 2).

## DISCUSSION

The rapid generation of preliminary results through sample dilution proved pivotal in this case. Within 2.5 hours of sample receipt, diluted triglyceride levels (77.72 mmol/L) were verbally reported, prompting immediate plasma exchange - a critical intervention for severe hypertriglyceridemia pancreatitis (HTGP) [3]. This contrasts sharply with prior reports where laboratories required up to 12 hours to process and report results for highly lipemic samples [4]. Such delays risk irreversible pancreatic injury or multiorgan failure in HTGP, underscoring the lifesaving value of preliminary reporting. Dilution bypasses lipemic interference by lowering lipid concentrations below the detection limit, enabling timely clinical action despite incomplete sample clarification.

The extreme lipemia index (745) and triglyceride level (77.72 mmol/L) necessitated modified centrifugation protocols. Standard centrifugation (15,000 rpm, 10 minutes) is often insufficient for samples with triglyceride levels > 20 mmol/L due to persistent stratification of chylomicrons (CM) and VLDL [5]. In this case, prolonging centrifugation to 20 minutes increased gravitational force duration, enhancing CM separation. Subsequent re-centrifugation of the subnatant further reduced residual turbidity caused by VLDL, which are denser than CM but still prone to incomplete sedimentation [1].

These adjustments were critical to recovering accurate electrolyte values (e.g., sodium: 128 - 137 mmol/L), as prolonged stratification exacerbates volume displacement effects in lipid-rich samples [6].

While dilution enabled rapid lipid profiling, centrifugation provided comprehensive correction of non-lipid analytes. Dilution risks analyte underestimation if overdone, highlighting the need for validation against linearity ranges [2]. Conversely, centrifugation avoids dilution-related inaccuracies but demands additional time and labor-factors that may delay reporting in resource-limited settings. The dual approach here balanced speed (dilution) and accuracy (centrifugation), aligning with guidelines advocating multimodal strategies for severe lipemia [7].

Ultimately, addressing lipemia requires a systematic approach combining pre-analytical vigilance, technical adaptations, and robust result validation. Laboratories should implement standardized protocols for identifying and processing lipemic samples, coupled with staff training to recognize interference patterns. For instance, automated analyzers equipped with lipemia indices should flag turbid samples, triggering reflex protocols such as dilution or centrifugation. As automation advances, integrating algorithmic flagging systems for lipemic interference could further enhance detection accuracy. Machine learning models trained on lipemia indices and analyte discrepancies might predict interference thresholds, automatically initiating corrective workflows. By adopting these measures - protocol standardization, staff education, and technological integration - laboratories can minimize reporting errors and provide clinicians with reliable data, ultimately improving patient care outcomes in critical settings like HTGP.

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**Declaration of Interest:**
All authors declare that they have no competing interests.

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