



Sorvall MTX and MX Plus Series Micro-Ultracentrifuges
Thermo Scientific MT 21 Microcentrifuge

Lipemia removal in serum samples by centrifugation

Background

Lipemia is an accumulation of lipoprotein particles that causes turbidity in samples. In general, lipemic samples are found to be between 0.5% and 2.5% of blood samples collected at scheduled visits [1]. Various factors cause lipemia, such as insufficient fasting before sample collection, parenteral (nonoral) administration of lipid supplements, or disease conditions such as type 2 diabetes.

The causes of lipemia contribute to the presence of lipoprotein particles of different sizes that are illustrated in Figure 1. Studies have shown that chylomicrons (70–1,000 nm), large VLDLs (60–200 nm), and medium VLDLs (35–60 nm) are the major causes of lipemia [1].

Interference in spectrophotometric measurements can be a notable cause of laboratory errors. Lipemia in blood samples, which makes them appear cloudy, is one of the main factors that interfere with downstream biochemical analyses of blood. It interferes with the measurement of biological analytes (e.g., sodium ions) by changing the absorption of light, resulting in skewed analyte values or no results at all. Therefore, lipemic blood samples must be processed to clear them prior to analyses [1].

Different methods are applied to processing of lipemic samples. Studies have shown that the use of some commercial chemical agents or dilution methods bear some risks that can affect the results [2]. Centrifugation, on the other hand, has been widely accepted as the most efficient method to clear lipemic blood samples [2,3].

The Clinical and Laboratory Standards Institute (CLSI) advocates ultracentrifugation as the gold-standard method to process lipemic samples [4]. Recent reports have found that high-speed centrifugation can also be applicable despite some drawbacks [2,3].

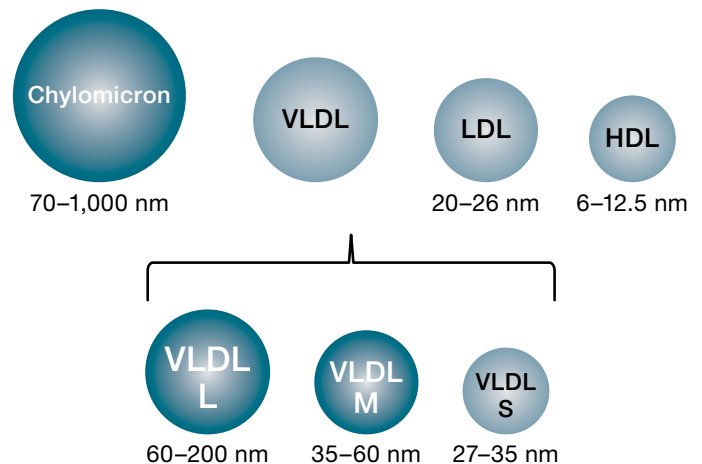


Figure 1. Lipoprotein particle sizes.

Particles shown in the darker color are the main sources of turbidity in lipemic samples [1]. Figure used with permission from Biochemia Medica.

Methodology

Prior to centrifugation, the serum samples must be homogenized to disrupt any lipid layer that may have formed.

Ultracentrifugation

1. Transfer 1.5 mL of samples to centrifuge tubes.
2. Centrifuge the samples for 15 min at 107,000 x g at room temperature [3].
3. Collect the infranatant serum with a fine-needle syringe.

High-speed centrifugation

1. Transfer 1.5 mL of samples to centrifuge tubes.
2. Centrifuge the samples for 15 min at 21,885 x g at room temperature [3].
3. Repeat step 3 if necessary, until clear separation is obtained.
4. Collect the infranatant serum with a fine-needle syringe.

Conclusion

While an ultracentrifuge is typically more expensive to purchase than other centrifuges, it provides the most effective solution for handling lipemic samples since most of the lipoproteins can be removed in a single separation [3]. High-speed centrifugation may prolong the turnaround time of sample handling prior to the biochemical test if the samples contain small lipids.

However, high-speed centrifugation can be recommended to low-throughput laboratories in which varied turnaround times are less detrimental [3].

In conclusion, centrifugation of lipemic samples can be applied in either the ultra-speed or high-speed range.

References:

1. Nikolac N (2014) Lipemia: causes, interference mechanisms, detection and management. *Biochem Med* 24(1):57–67.
2. Castro-Castro M-J, Candás-Estébanez B, Esteban-Salán M et al. (2018) Removing lipemia in serum/plasma samples: a multicenter study. *Ann Lab Med* 38(6):518–523.
3. Dimeski G, Jones BW (2011) Lipaemic samples: effective process for lipid reduction using high speed centrifugation compared with ultracentrifugation. *Biochem Med* 21(1):86–92.
4. CLSI (2012) Hemolysis, icterus, and lipemia/turbidity indices as indicators of interference in clinical and laboratory analysis; approved guideline. CLSI document C56-A. Wayne, PA: Clinical and Laboratory Standards Institute.

For ultra-speed protocol	For high-speed protocol
Thermo Scientific™ Sorvall™ MTX or MX Plus Series Micro-Ultracentrifuge with S55-A2 rotor (201,046 x g, 55,000 rpm, 12 x 1.5 mL) or S120-AT2 rotor (649,826 x g, 120,000 rpm, 10 x 2.0 mL)	Thermo Scientific MT 21 Microcentrifuge

* Alternative models: Thermo Scientific™ Pico™ 21 Microcentrifuge, Thermo Scientific™ MicroCL 21 Microcentrifuge. Please check with your sales representative for other suitable packages for this application.

Specifications	M17 Series	M21 Series
Max RCF	17,000 xg	21,100 xg
Max Speed	13,300 rpm	14,800 rpm
Max Noise Level	MT 17: <54db(A)(Rotor 24x2ml; 13300 RPM) MTR 17: <48db(A)(Rotor 24x2ml; 13300 RPM)	MT 21: <56db(A)(Rotor 24x2ml; 14800 RPM) MTR 21: <56db(A)(Rotor 24x2ml; 14800 RPM)
Weight	MT 17/MT 21: 120V/230V 11 kg; 100V: 12kg MTR 17/MTR 21: 120V 24 kg; 230V 24kg/25kg 100V: 25kg	
Acceleration/Deceleration Rates	11/12 seconds (ventilated); 10/12 seconds (refrigerated)	
Time Set Range	1 min - 99 min; 1 min increments + HOLD mode	
Temperature Range⁴	Set from -9 °C to +40 °C per 1 °C increment	
Certifications	CSA certified, CE marked, IVD compliant, Certified biocontainment ¹	
Technical Standards	IEC 61010-1, IEC 61010-2, IEC 61010-020	
Warranty	2 years	
Dimensions (H X W x D)		
MT 17 and MT 21	225 x 243 x 352 mm (8.86 x 9.56 x 13.8 in)	
MTR 17 and MTR 21	330 x 290 x 440 mm (12.9 x 11.4 x 17.3 in)	

¹Biocontainment certification by Public Health England, Porton Down, UK. ⁴M17 series centrifuges only.

Ordering information	MT 17		MT 21		MTR 17		MTR 21	
	IVD-MD	General Use Only	IVD-MD	General Use Only	IVD-MD	General Use Only	IVD-MD	General Use Only
120 V, 50/60 Hz	75002576	N/A	75002579	N/A	75002588	N/A	75002591	N/A
230 V, 50/60 Hz	75002577	75002571	75002580	75002574	75002589	75002583	75002592	75002586
100 V, 50/60 Hz	N/A	N/A	75002581	75002575	N/A	N/A	75002593	75002587
230 V, 60 Hz for USA only	N/A	N/A	N/A	N/A	75002597	N/A	75002599	N/A

All part numbers include a 24 x 1.5/2 mL rotor

Application Package	Voltage	Accessories included	IVD-MD or General use	Cat. No.
Everylab Centrifuge Package MT 21	120V	incl. 24 x 1.5/2 mL rotor, Thermo Scientific™ Finnpiptette™ F2 GLP Kit 2: <ul style="list-style-type: none"> Single-channel 0.2-2 µL, 2-20 µL, 20-200 µL and 100-1,000 µL pipettes <ul style="list-style-type: none"> Flex tips: 10 micro: 1 x 96; 200: 2 x 96; 1000: 1 x 96 F-stand Reagent reservoir demo pack and 1.5 Snap Cap Low Retention microcentrifuge tubes, full case (5,000 tubes) 	General use	75002532
Everylab Centrifuge Package MTR 21	120 V	incl. 24 x 1.5/2 mL rotor, Thermo Scientific™ Finnpiptette™ F2 GLP Kit 2: <ul style="list-style-type: none"> Single-channel 0.2-2 µL, 2-20 µL, 20-200 µL and 100-1,000 µL pipettes <ul style="list-style-type: none"> Flex tips: 10 micro: 1 x 96; 200: 2 x 96; 1000: 1 x 96 F-stand Reagent reservoir demo pack and 1.5 Snap Cap Low Retention microcentrifuge tubes, full case (5,000 tubes) 	General use	75002533
MT 17	230 V, 50/60 Hz	includes hematocrit rotor	IVD	75002578
MT 17	120 V, 50/60 Hz	includes hematocrit rotor	IVD	75002598
MT 21	120 V, 50/60 Hz	includes 24 x 1.5/2.0 mL rotor and 18x2 0/0.5 mL rotor	IVD	75002584
MTR 21	230 V, 50/60 Hz	includes 24 x 1.5/2.0 mL rotor and 18x2 0/0.5 mL rotor	General use	75002596
MTR 21	120 V, 50/60 Hz	includes 24 x 1.5/2.0 mL rotor and 18x2 0/0.5 mL rotor	IVD	75002590
MTR 21	230 V, 50/60 Hz	includes 24 x 1.5/2.0 mL rotor and 18x2 0/0.5 mL rotor	IVD	75002594

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