

LAMPIRAN

Lampiran 1. Surat Layak Etik



Terakreditasi KEPPKN No. 005/KEPPKN/AKT/IV/2024

Kementerian Kesehatan

Poltekkes Yogyakarta

Komite Etik Penelitian Kesehatan

Jalan Tata Bumi No. 3, Banyuraden, Gamping,
Sleman, D.I. Yogyakarta 55293

(0274) 617601

<https://poltekkesjogja.ac.id>

KETERANGAN LAYAK ETIK DESCRIPTION OF ETHICAL EXEMPTION "ETHICAL EXEMPTION"

No.DP.04.03/e-KEPK.1/1317/2025

Protokol penelitian versi 1 yang diusulkan oleh :
The research protocol proposed by

Peneliti utama : Desy Fitriani Yulianti
Principal In Investigator

Nama Institusi : Poltekkes Kemenkes Yogyakarta
Name of the Institution

Dengan judul:
Title

**"PERBEDAAN KADAR TRIGLISERIDA PADA SERUM LIPEMIK DENGAN PENANGANAN MENGGUNAKAN
FLOKULAN KITOSAN DAN HIGH SPEED SENTRIFUGASI"**

**"THE DIFFERENCE IN TRIGLYCERIDE LEVELS IN LIPEMIC SERUM WITH TREATMENT USING FLOCCULANT
CHITOSAN AND HIGH SPEED CENTRIFUGATION"**

Dinyatakan layak etik sesuai 7 (tujuh) Standar WHO 2011, yaitu 1) Nilai Sosial, 2) Nilai Ilmiah, 3) Pemerataan Beban dan Manfaat, 4) Risiko, 5) Bujukan/Eksploitasi, 6) Kerahasiaan dan Privacy, dan 7) Persetujuan Setelah Penjelasan, yang merujuk pada Pedoman CIOMS 2016. Hal ini seperti yang ditunjukkan oleh terpenuhinya indikator setiap standar.

Declared to be ethically appropriate in accordance to 7 (seven) WHO 2011 Standards, 1) Social Values, 2) Scientific Values, 3) Equitable Assessment and Benefits, 4) Risks, 5) Persuasion/Exploitation, 6) Confidentiality and Privacy, and 7) Informed Consent, referring to the 2016 CIOMS Guidelines. This is as indicated by the fulfillment of the indicators of each standard.

Pernyataan Laik Etik ini berlaku selama kurun waktu tanggal 22 Desember 2025 sampai dengan tanggal 22 Desember 2026.

This declaration of ethics applies during the period December 22, 2025 until December 22, 2026.



December 22, 2025

Chairperson,



Dr. drg. Wiworo Haryani, M.Kes.

Lampiran 2. Surat Izin Penelitian

 Kemenkes Poltekkes Yogyakarta	Kementerian Kesehatan Direktorat Jenderal Sumber Daya Manusia Kesehatan Politeknik Kesehatan Yogyakarta Jalan Tata Buni No. 3, Banyuraden, Gamping, Sleman, DI. Yogyakarta 55293 ☎ (0274) 617601 🌐 https://poltekkesjogja.ac.id	
Nomor	: LB.02.01/F.XXVII.10/1227/2025	Yogyakarta, 04 Desember 2025
Lamp	: -	
Hal	: Permohonan Izin Penelitian	
 Kepada Yth. : Kepala Balai Besar Laboratorium Kesehatan Masyarakat Yogyakarta di- Yogyakarta		
 Dengan hormat, Sehubungan dengan kegiatan penelitian yang akan dilakukan oleh mahasiswa Prodi Sarjana Terapan Teknologi Laboratorium Medis Jurusan Teknologi Laboratorium Medis Poltekkes Kemenkes Yogyakarta. Berkaitan dengan hal tersebut, dengan ini kami mohon izin dan bantuan Bapak/Ibu agar mahasiswa yang bersangkutan dapat melaksanakan kegiatan sesuai dengan perihal di atas. Adapun mahasiswa yang akan melakukan penelitian adalah :		
Nama	: Desy Fitriani Yuliarti	
NIM	: P07134222062	
Judul	: Perbedaan Kadar Trigliserida pada Serum Lipemik dengan Penanganan Menggunakan Flokulan Kitosan dan High Speed Sentrifugasi	
 Demikian atas perhatian dan kerjasamanya diucapkan terima kasih.		
 Ketua Jurusan  Muji Rahayu, S.Si, Apt, M.Sc. NIP. 196606151985112001		
		



Kementerian Kesehatan

Direktorat Jenderal
Kesehatan Primer dan Komunitas

Balai Besar Laboratorium Kesehatan Masyarakat
Yogyakarta

Jalan Imogiri Tetur Km 7.5 Grojogan, Winokerten

Banguntapan, Bantul, D.I. Yogyakarta 55194

(0274) 371588, 4295270 (Hunting)

<http://www.bbblabkesmayogyakarta.go.id>

Nomor : PP.05.01/B.X.2/31644/2025 30 Desember 2025
Hal : Izin Penelitian Mhs TLM Poltekkes Yogyakarta an. Desy Fitriani Yulianti

Yth. Ketua Jurusan Teknologi Laboratorium Medis
Prodi Sarjana Terapan Teknologi Laboratorium Medis
Poltekkes Kemenkes Yogyakarta
Jalan Tatabumi No. 3 banyuraden, Gamping, Sleman 55293

Sehubungan dengan surat dari Ketua Jurusan Teknologi Laboratorium Medis Prodi Sarjana Terapan Teknologi Laboratorium Medis Poltekkes Kemenkes Yogyakarta, Nomor: LB.02.01/F.XXVII.10/1227/2025, Tanggal 04 Desember 2025, perihal Permohonan Izin Penelitian, mahasiswa **an. Desy Fitriani Yulianti, NIM. P07134222062**.

Bersama ini kami sampaikan sesuai PMK No.25 Tahun 2023, bahwa Tugas Pokok dan Fungsi Balai Besar Laboratorium Kesehatan Masyarakat Yogyakarta adalah penyusunan rencana program dan anggaran, pelaksanaan pemeriksaan laboratorium kesehatan; surveilans kesehatan berbasis laboratorium; analisis masalah kesehatan masyarakat dan/atau lingkungan; pemodelan intervensi dan/atau teknologi tepat guna; penilaian dan respon cepat, dan kewaspadaan dini untuk penanggulangan kejadian luar biasa/wabah atau bencana lainnya; penjaminan mutu laboratorium kesehatan; pengelolaan biorepositori; bimbingan teknis; sistem rujukan laboratorium; jejaring kerja dan kemitraan; pengelolaan data dan informasi; pemantauan, evaluasi, dan pelaporan; dan pelaksanaan urusan administrasi UPT Bidang Labkesmas, maka kami dapat menerima permohonan tersebut, adapun pelaksanaan akan dilakukan pada tanggal 05 Januari s/d 05 Februari 2026.

Adapun biaya Penelitian di BB Labkesmas Yogyakarta sesuai dengan Permenkeu RI Nomor 45 Tahun 2024, tentang Jenis dan Tarif PNPB yang Bersifat Volatil dan Kebutuhan Mendesak Yang Berlaku Pada Kementerian Kesehatan sebesar Rp. 120.000,- (Seratus Dua Puluh Ribu Rupiah) per mahasiswa selama 1 (satu) bulan, diluar biaya pemeriksaan.

Atas perhatian dan kerja samanya, kami ucapkan terima kasih

Kepala Balai Besar Laboratorium Kesehatan
Masyarakat Yogyakarta,



dr. Muhammad Budi Hidayat, M.Kes

Kementerian Kesehatan tidak menerima suap dan/atau gratifikasi dalam bentuk apapun. Jika terdapat potensi suap atau gratifikasi silahkan laporkan melalui HALO KEMENKES 1500567 dan <https://whatsapp.kemkes.go.id>. Untuk verifikasi keaslian tanda tangan elektronik, silahkan unggah dokumen pada laman <https://tts.kemdikgo.id/verifyPDF>.



Dokumen ini telah ditandatangani secara elektronik menggunakan sertifikat elektronik yang diterbitkan oleh Balai Besar Sertifikasi Elektronik (BSrE), Badan Siber dan Sandi Negara (BSSN).

Lampiran 3. Data Penelitian



Kementerian Kesehatan
Labkesmas Yogyakarta

📍 Jalan Imogiri Timur Km 7,5 Grojogan, Wirokerten,
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FR/BBLabkesmasYk/7.8.m/Rev.1

LAPORAN HASIL UJI RS.02.04/B.X.2/558/2026

Pengujian Instalasi Laboratorium Patologi Klinik & Imunologi

Jenis Sampel : Darah Vena (Serum Lipemik)
Parameter : Triglicerida
Metode Uji : *Glycerol Phosphate Oxidase/Peroxidase*
Kegiatan : Penelitian
Asal Sampel : Desy Fitriani Yulianti, Jalan Ngadinegaran MJ 3 No.62, Mantrijeron, Mantrijeron, Yogyakarta,
Daerah Istimewa Yogyakarta,
Pengambil Sampel : Desy Fitriani Yulianti
Tanggal dan Waktu Pengambilan : 29-12-2025 08:00:00
Tanggal Penerimaan : 29-12-2025
Tanggal Pemeriksaan : 29-12-2025
Tanggal dan Waktu Hasil Dilaporkan : 13-01-2026 15:30:33
Kondisi Sampel :

No	Nomor Sampel	Hasil Uji	Satuan
1	K-1	550	mg/dL
2	K-2	571	mg/dL
3	K-3	366	mg/dL
4	K-4	433	mg/dL
5	K-5	528	mg/dL
6	K-6	444	mg/dL
7	K-7	395	mg/dL
8	K-8	473	mg/dL
9	K-9	416	mg/dL
10	K-10	638	mg/dL
11	K-11	537	mg/dL
12	K-12	308	mg/dL
13	K-13	450	mg/dL

14	K-14	349	mg/dL
15	K-15	366	mg/dL
16	K-16	333	mg/dL
17	K-17	559	mg/dL
18	K-18	370	mg/dL
19	K-19	476	mg/dL
20	K-20	434	mg/dL
21	K-21	407	mg/dL
22	K-22	468	mg/dL
23	K-23	325	mg/dL
24	K-24	315	mg/dL
25	K-25	472	mg/dL
26	K-26	467	mg/dL
27	K-27	451	mg/dL
28	K-28	374	mg/dL
29	K-29	469	mg/dL
30	K-30	523	mg/dL
31	K-31	515	mg/dL
32	K-32	471	mg/dL
33	K-33	345	mg/dL
34	K-34	498	mg/dL
35	K-35	331	mg/dL
36	K-36	551	mg/dL
37	K-37	436	mg/dL
38	K-38	445	mg/dL
39	K-39	448	mg/dL

40	K-40	444	mg/dL
41	H-1	491	mg/dL
42	H-2	561	mg/dL
43	H-3	301	mg/dL
44	H-4	339	mg/dL
45	H-5	434	mg/dL
46	H-6	345	mg/dL
47	H-7	324	mg/dL
48	H-8	364	mg/dL
49	H-9	352	mg/dL
50	H-0	508	mg/dL
51	H-11	558	mg/dL
52	H-12	480	mg/dL
53	H-13	418	mg/dL
54	H-14	442	mg/dL
55	H-15	362	mg/dL
56	H-16	420	mg/dL
57	H-17	467	mg/dL
58	H-18	362	mg/dL
59	H-19	389	mg/dL
60	H-20	392	mg/dL
61	H-21	445	mg/dL
62	H-22	367	mg/dL
63	H-23	452	mg/dL
64	H-24	382	mg/dL
65	H-25	363	mg/dL

66	H-26	464	mg/dL
67	H-27	469	mg/dL
68	H-28	309	mg/dL
69	H-29	406	mg/dL
70	H-30	451	mg/dL
71	H-31	432	mg/dL
72	H-32	376	mg/dL
73	H-33	425	mg/dL
74	H-34	403	mg/dL
75	H-35	312	mg/dL
76	H-36	541	mg/dL
77	H-37	382	mg/dL
78	H-38	495	mg/dL
79	H-39	396	mg/dL
80	H-40	304	mg/dL

Keterangan:

* : Parameter Terakreditasi

Bantul, 13-01-2026

Penanggungjawab Laboratorium Patologi Klinik dan Imunologi



(dr. Siti Maryam, Sp.PK)

NIP 3402126312740003

Data Kadar Trigliserida Sebelum Dilakukan Penanganan Serum Lipemik

1	556	21	646
2	613	22	562
3	530	23	523
4	512	24	565
5	565	25	595
6	567	26	783
7	543	27	531
8	585	28	560
9	578	29	787
10	527	30	552
11	708	31	586
12	512	32	562
13	596	33	527
14	530	34	503
15	562	35	518
16	572	36	524
17	668	37	598
18	564	38	573
19	590	39	703
20	525	40	560

Lampiran 4. Hasil Uji Statistik

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Kadar Triglisericida yang ditambah Kitosan	.106	40	.200*	.972	40	.410
Kadar Triglisericida yang diHigh Speed	.079	40	.200*	.971	40	.389

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Paired Samples Test

		Paired Differences							
				Std.	95% Confidence				Sig.
			Std.	Error	Interval of the				(2-
		Mean	Deviation	Mean	Lower	Upper	t	df	tailed)
Pair 1	Kadar Triglisericida yang ditambah Kitosan - Kadar Triglisericida yang diHigh Speed	26.950	76.236	12.054	2.569	51.331	2.236	39	.031

Lampiran 5. Hasil Perhitungan

A. Selisih Tiap Sampel

1.	550	-	491	=	12,016	=	12%
2.	571	-	561	=	1,783	=	2%
3.	366	-	301	=	21,595	=	22%
4.	433	-	339	=	27,729	=	28%
5.	528	-	434	=	21,659	=	22%
6.	444	-	345	=	28,696	=	29%
7.	395	-	324	=	21,914	=	22%
8.	473	-	364	=	29,945	=	30%
9.	416	-	352	=	18,182	=	18%
10.	638	-	508	=	25,591	=	26%
11.	537	-	558	=	-3,763	=	-4%
12.	308	-	480	=	-35,833	=	-36%
13.	450	-	418	=	7,656	=	8%
14.	349	-	442	=	-21,041	=	-21%
15.	366	-	362	=	1,105	=	1%
16.	333	-	420	=	-20,714	=	-21%
17.	559	-	467	=	19,700	=	20%
18.	370	-	362	=	2,210	=	2%
19.	476	-	389	=	22,365	=	22%
20.	434	-	392	=	10,714	=	11%
21.	407	-	445	=	-8,539	=	-9%
22.	468	-	367	=	27,520	=	28%
23.	325	-	452	=	-28,097	=	-28%
24.	315	-	382	=	-17,539	=	-18%
25.	472	-	363	=	30,028	=	30%

26.	467	-	464	=	0,647	=	1%
27.	451	-	469	=	-3,838	=	-4%
28.	374	-	309	=	21,036	=	21%
29.	469	-	406	=	15,517	=	16%
30.	523	-	451	=	15,965	=	16%
31.	515	-	432	=	19,213	=	19%
32.	471	-	376	=	25,266	=	25%
33.	345	-	425	=	-18,824	=	-19%
34.	403	-	498	=	23,573	=	24%
35.	331	-	312	=	6,090	=	6%
36.	551	-	541	=	1,848	=	2%
37.	436	-	382	=	14,136	=	14%
38.	445	-	495	=	-10,101	=	-10%
39.	448	-	396	=	13,131	=	13%
40.	444	-	304	=	46,053	=	46%

B. Mean Difference

$$\begin{aligned}\text{Mean Difference} &= \text{jumlah seluruh selisih tiap sampel} / \text{jumlah sampel} \\ &= 365/40 \\ &= 9 \%\end{aligned}$$

C. Standar Deviasi

$$s = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n - 1}}$$

Standar deviasi dihitung menggunakan Excel

$$SD = 18,4584$$

D. Standar Error (SE)

$$SE = SD / \sqrt{n}$$

n = jumlah sampel

$$SE = 18,4584/\sqrt{40}$$

$$= 2,91853$$

E. Upper Limit dan Lower Limit

$$t \text{ Tabel} = 2,2023$$

$$\text{Upper Limit} = \text{Mean difference} + (t \text{ tabel} \times \text{SE})$$

$$= 9 + (2,023 \times 2,91853)$$

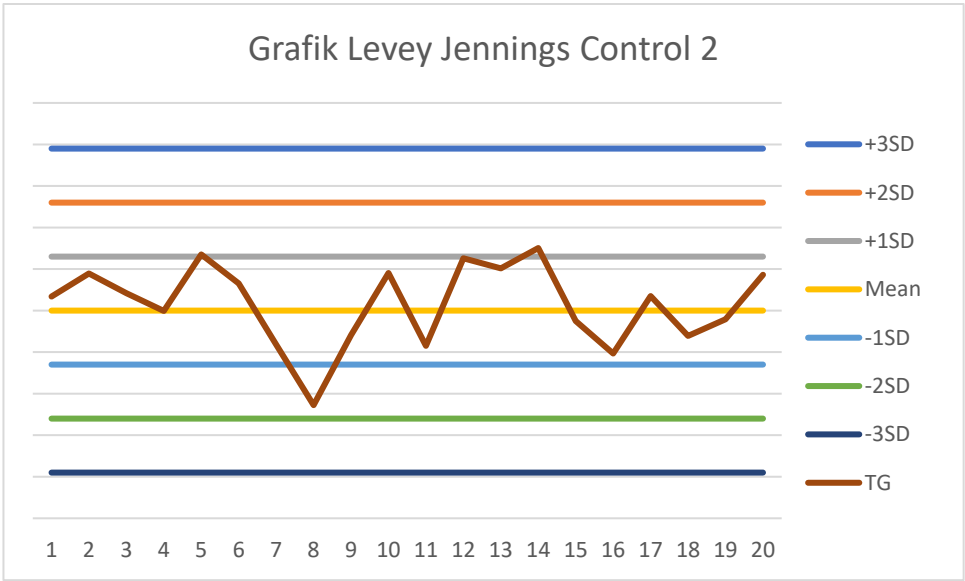
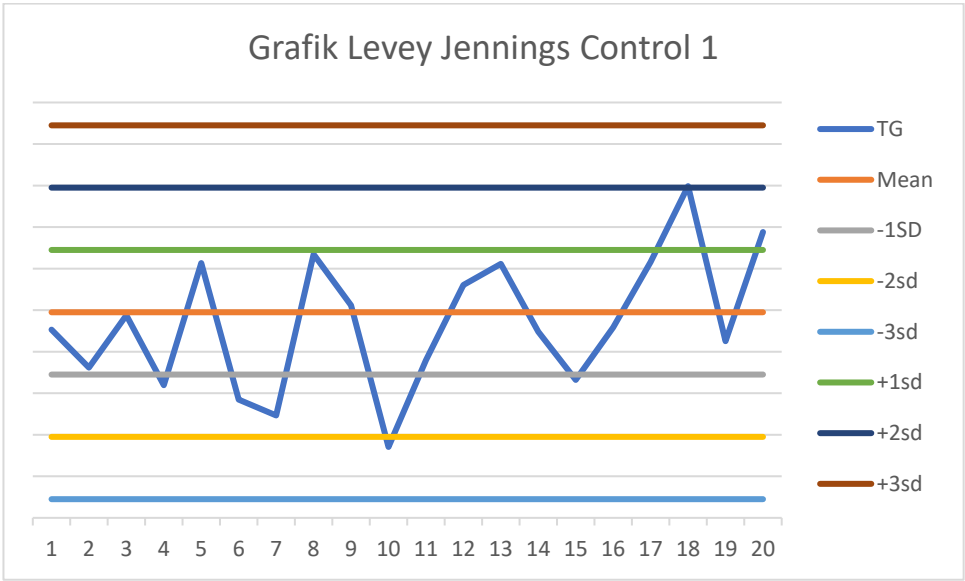
$$= 15,02\%$$

$$\text{Lower Limit} = \text{Mean difference} - (t \text{ tabel} \times \text{SE})$$

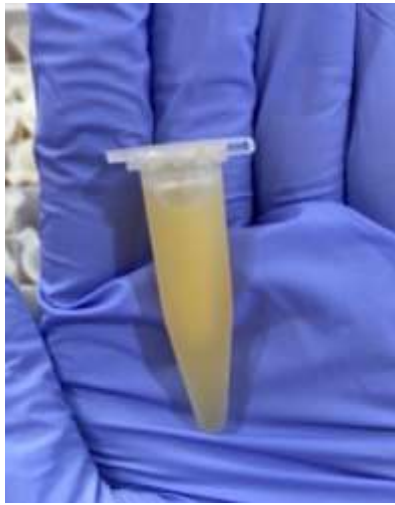
$$= 9 - (2,023 \times 2,91853)$$

$$= 3,21\%$$

Lampiran 6. Grafik Levey Jennings



Lampiran 7. Dokumentasi Penelitian



Serum Lipemik



Proses aliquot sampel



Bubuk Kitosan dalam kemasan



Bubuk kitosan



Alat *High Speed* Sentrifugasi



Alat sentrifugasi



Chemistry Biosystem A15



Proses penimbangan kitosan



Perbedaan visual serum sebelum dan setelah dilakukan *high speed* sentrifugasi



Perbedaan visual serum sebelum dan setelah ditambah kitosan



Serum Lipemik setelah ditambah Kitosan



Serum Lipemik setelah dilakukan *high speed* sentrifugasi

Lampiran 8. Kit Insert Pemeriksaan Kadar Trigliserida

N BIO - TRIGLYCERIDES
(GPO /PAP method)

KIT NAME	KIT SIZE	CAT. NO
N BIO - Triglyceries	2 x 50 ml	MTGL02050M

INTRODUCTION

Triglycerides are built of glycerol molecule sterified with three fatty acids molecules. Triglycerides are delivered with food or are synthesized endogenously in liver. Triglycerides stored in adipose tissue constitute a reserve of energy. Elevated triglycerides serum level is a risk factor of atherosclerosis. Triglycerides measurement is useful for hyperlipidemia diagnosis and treatment or for estimation of atherosclerosis progression.

METHOD PRINCIPLE

Colorimetric, enzymatic method with glycerophosphate oxidase.

triglycerides + H2O LPL → glycerol + fatty acids

glycerol + ATP GK → glycerol-3-phosphate + ADP

glycerol-3-phosphate + O2 GPO → dihydroxy-acetone-phosphate + H2O2

H2O2 + 4-AAP + TDO5 POD → quinoneimine dye + 2H2O

The colour intensity is proportional to the triglycerides concentration.

KIT CONTENTS

Reagent name	MTGL02050M
R1 - Triglycerides reagent	2 x 50 ml
R2 - standard	1 vial

Refer standard value mentioned in the vial.

WORKING REAGENT PREPARATION AND STABILITY

The reagent supplied is ready for use.

CONCENTRATIONS IN THE TEST

buffer PIPES (pH 7.2)	50 mmol/l
4-aminoantipyrine (4-AAP)	0.4 mmol/l
ATP	1.0 mmol/l
Chromogen	2.0 mmol/l
glycerol kinase (GK)	≥300 U/L
glycerol-3-phosphate oxidase (GPO)	≥1000 U/L
peroxidase (POD)	≥500 U/L
lipoprotein lipase (LPL)	≥2000 U/L
Activators & Stabilizers.	

WARNINGS AND NOTES

- Product for in vitro diagnostic use only.
- If the reagent is deteriorated, the working reagent absorbance > 0.5 (read against distilled water, wavelength λ=505 nm. And also physically we can observe the turbidity. Moreover it leads failure to recover control values within the acceptable range. Avoid contact with skin and mucous membranes.

ADDITIONAL EQUIPMENT

- Automatic analyser or photometer able to read at 505 nm
- Thermostat at 37°C
- General laboratory equipment

SPECIMEN

- Serum, EDTA or heparinized plasma (recommended: heparine lithium, sodium or ammonium salt) free from hemolysis.
- Blood should be collected only if the patient has been fasting for minimum of 12 hours. Before blood collection patient should stay in rest position for about 30 minutes. Venous blood is recommended for triglycerides measurement.



Plasma triglycerides values have been reported to be 2% to 4% lower than serum triglycerides values. Serum should be separated from red blood cells as soon as possible after blood collection.

Serum and plasma can be stored up to 3 days at 2-8°C or 3 months at -20°C. Nevertheless it is recommended to perform the assay with freshly collected samples.

PROCEDURE

These reagents may be used both for manual assay and in several automatic analysers. Applications for them are available on request.

Wavelength	505 nm
Temperature	37°C
Cuvette	1 cm

Pipette into the cuvettes:

	Blank (B)	Standard (S)	Test (T)
R1 Triglycerides Reagent	1000 µl	1000 µl	1000 µl
Bring upto the temperature of determination. Then add			
Distilled water	10 µl		
R2 - standard		10 µl	
Sample			10 µl

Mix well, incubate for 10 min. at 37°C or 20 min. at 25-30°C. Read the absorbance of test A(T) and standard A(S) against blank (B).

CALCULATION

Triglycerides concentration = $A(T) / A(S) \times \text{standard concentration}$

From calculated triglycerides concentration value subtract 0.11mmol/l (10 mg/dl), which corresponds to average amount of free glycerol in serum.

REFERENCE VALUES

25 - 160 mg/dl

It is recommended for each laboratory to establish its own reference ranges for local population.

QUALITY CONTROL

To Ensure adequate quality control, each run should include assayed normal and abnormal controls. If commercial controls are not available it is recommended that known value samples be aliquoted, frozen and used as controls.

For Fully Automated analyzers by using multicalibrators or triglycerides standard the calibration curve can plot and the same should be prepared every 8 weeks or with change of reagent lot number.

PERFORMANCE CHARACTERISTICS

-Sensitivity / Limit of Quantitation: 2.0 mg/dl (0.023 mmol/l).

-Linearity: up to 800 mg/dl (9.06 mmol/l). For higher triglycerides concentrations dilute the sample wit

Specificity / Interferences Haemoglobin up to 3.75 g/dl, bilirubin up to 20 mg/dl and ascorbate up to 62 mg/l do not interfere with the test.

WASTE MANAGEMENT

Please refer to local legal requirements.

LITERATURE

1. Jacobs N.J., Van Denmark P.: J. Arch. Biochem. Biophys. 88, 250-255 (1960).
2. Kodischek L.K., Umbreit W.W.: J. Bacteriol. 98, 1063-1068 (1969).
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4. Schettler G., Nussel E.: Arb. Med. Soz. Med. Prav. Med. 10, 25 (1975).
6. Tietz N.W., ed. Clinical Guide to Laboratory Tests, 3rd ed. Philadelphia, PA: WB Saunders, 610, (1995).
6. Burtis C.A., Ashwood E.R., ed. Tietz Textbook of Clinical Chemistry, 2nd ed. Philadelphia, PA: WB Saunders, 2209, (1994).
7. Dembinska-Kiec A., Naskalski J.W.: Diagnostyka laboratoryjna z elementami biochemii klinicznej, Volumed, 575, (1998).

SYSTEM PARAMETERS

Method	End point
Wavelength	505 nm
Zero Setting	Reagent blank
Temperature Setting	37°C
Incubation Temperature	37°C
Incubation Time	10 mins.
Delay time	----
Read time	----
No. of Reading	----
Interval time	----
Sample Volume	0.01 ml (10 µl)
Reagent Volume	1.0 ml (1000 µl)
Standard Concentration	Refer standard vial
Units	mg/dl
Factor	----
Reaction slope	Increasing
Linearity	800 mg/dl



Genuine Biosystem Private Limited

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Email: genuinebiosystem@gmail.com
website: www.genuinebiosystem.com

GBPL/MTGL/03 9.19

Lampiran 9. Sertifikat Kitosan

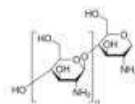
Sigma-Aldrich

3050 Spruce Street, Saint Louis, MO 63103, USA
Website: www.sigmaaldrich.com
Email USA: techserv@sial.com
Outside USA: eurtechserv@sial.com

Certificate of Analysis

Product Name:
Chitosan - medium molecular weight

Product Number: 448877
Batch Number: BCCM5232
Brand: ALDRICH
CAS Number: 9012-76-4
Formula: $C_{12}H_{24}N_2O_9$
Quality Release Date: 19 NOV 2024



Test	Specification	Result
Appearance (Color)	Off White to Beige and Faint Brown to Light Brown	Faint Beige
Appearance (Form) Powder and/or Chips	Conforms to Requirements	Powder
Assay Deacetylation	$\geq 75\%$	91%
Viscosity (C = 1%, 1% Acetic Acid)	200 - 800 cps	381 cps

Dr. Reinhold Schwenninger
Quality Assurance
Buchs, Switzerland CH

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