

3050 Spruce Street, Saint Louis, MO 63103, USA

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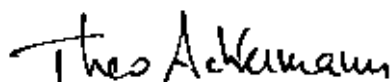
## Certificate of Analysis

Product Name:

Lipopolysaccharides from Escherichia coli 055:B5 - purified by ion-exchange chromatography, TLR ligand tested

**Product Number:** L4524  
**Batch Number:** 045M4024V  
**Brand:** SIGMA  
**Storage Temperature:** Store at 2 - 8 °C  
**Quality Release Date:** 16 FEB 2015  
**Recommended Retest Date:** FEB 2021

Test	Specification	Result
Appearance (Form)	Lyophilized Powder	Lyophilized Powder
Appearance (Colour)	White to White w/ Yellow Cast	White
Solubility (Solvent)	Water	Water
Solubility (Conc)	4.90 - 5.10 mg/ml	5.00 mg/ml
Solubility (Turbidity)	Hazy	Hazy
Solubility (Color)	Colorless to Light Yellow	Colorless
Protein Content (Method)	Lowry-TCA	Lowry-TCA
Prot. Content (% Protein)	≤ 1.00 %	0.93 %
Potency (Sample EU/mg)	≥ 500000 EU/mg	1200000 EU/mg
UV (% RNA)	≤ 1.00 %	0.00 %



Theo Ackermann PhD MScEng CQM  
Manager, Quality and Regulatory Affairs  
Jerusalem, Israel IL

Sigma-Aldrich warrants, that at the time of the quality release or subsequent retest date this product conformed to the information contained in this publication. The current Specification sheet may be available at Sigma-Aldrich.com. For further inquiries, please contact Technical Service. Purchaser must determine the suitability of the product for its particular use. See reverse side of invoice or packing slip for additional terms and conditions of sale.

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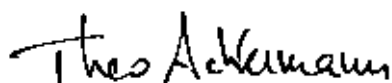
## Certificate of Analysis

Product Name:

Lipopolysaccharides from Escherichia coli 0111:B4 - purified by ion-exchange chromatography, TLR ligand tested

**Product Number:** L3024  
**Batch Number:** 025M4041V  
**Brand:** SIGMA  
**Storage Temperature:** Store at 2 - 8 °C  
**Quality Release Date:** 14 DEC 2014  
**Recommended Retest Date:** DEC 2020

Test	Specification	Result
Appearance (Form)	Lyophilized Powder	Lyophilized Powder
Appearance (Colour)	White to White w/ Yellow Cast	White
Solubility (Solvent)	Water	Water
Solubility (Conc)	4.90 - 5.10 mg/ml	5.00 mg/ml
Solubility (Turbidity)	Hazy	Hazy
Solubility (Color)	Colorless to Light Yellow	Colorless
Protein Content (Method)	Lowry-TCA	Lowry-TCA
Prot. Content (% Protein)	≤ 1.00 %	0.64 %
UV (% RNA)	≤ 1.00 %	0.00 %
Potency (Sample EU/mg)	≥ 500000 EU/mg	1200000 EU/mg
Storage Conditions	Desiccated	Desiccated



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## Certificate of Analysis

Product Name:

Lipopolysaccharides from Escherichia coli 0127:B8 – purified by ion-exchange chromatography, TLR ligand tested

**Product Number:** L5024  
**Batch Number:** 046M4083V  
**Brand:** SIGMA  
**Storage Temperature:** Store at 2 - 8 °C  
**Quality Release Date:** 27 MAR 2016  
**Recommended Retest Date:** MAR 2022

Test	Specification	Result
Appearance (Form)	Lyophilized Powder	Lyophilized Powder
Appearance (Colour)	White to White w/ Yellow Cast	White
Solubility (Solvent)	Water	Water
Solubility (Conc)	4.90 - 5.10 mg/ml	5.00 mg/ml
Solubility (Turbidity)	Faint Hazy to Hazy	Hazy
Solubility (Color)	Colorless to Faint Yellow	Colorless
Protein Content (Method)	Lowry-TCA	Lowry-TCA
Prot. Content (% Protein)	≤ 1.00 %	0.35 %
UV (% RNA)	≤ 1.00 %	0.10 %
Potency (Sample EU/mg)	≥ 500000 EU/mg	> 1200000 EU/mg
Water (by Karl Fischer)	≥ 0.00 %	11.21 %



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## Certificate of Analysis

Product Name:

Lipopolysaccharides from Escherichia coli 055:B5 - Detoxified

**Product Number:** L9023  
**Batch Number:** 016M4009V  
**Brand:** SIGMA  
**Storage Temperature:** Store at 2 - 8 °C  
**Quality Release Date:** 26 NOV 2015  
**Recommended Retest Date:** NOV 2021

Test	Specification	Result
Appearance (Form)	Lyophilized Powder	Lyophilized Powder
Appearance (Colour)	White to Yellow/Tan	White
Solubility (Solvent)	Water	Water
Solubility (Conc)	4.90 - 5.10 mg/ml	5.00 mg/ml
Solubility (Turbidity)	Faint Hazy to Hazy	Faint Hazy
Solubility (Color)	Colorless to Yellow or Tan	Colorless
Protein Content (Method)	Lowry-TCA	Lowry-TCA
Prot. Content (% Protein)	≤ 3.00 %	0.68 %
Potency (Sample EU/mg)	≤ 1000 EU/mg	900 EU/mg



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## Certificate of Analysis

Product Name:

Lipopolysaccharides from Escherichia coli 0111:B4 - Detoxified

**Product Number:** L3023  
**Batch Number:** 055M4086V  
**Brand:** SIGMA  
**Storage Temperature:** Store at 2 - 8 °C  
**Quality Release Date:** 26 MAY 2015  
**Recommended Retest Date:** MAY 2021

Test	Specification	Result
Appearance (Form)	Lyophilized Powder	Lyophilized Powder
Appearance (Colour)	White to Yellow and Faint Beige to Beige	Light Beige
Solubility (Solvent)	Water	Water
Solubility (Conc)	4.90 - 5.10 mg/ml	5.00 mg/ml
Solubility (Turbidity)	Very Slightly Hazy to Hazy	Very Slightly Hazy
Solubility (Color)	Faint Yellow to Tan	Light Tan
Potency (Sample EU/mg)	≤ 1000 EU/mg	< 1000 EU/mg
Handling Precautions	Hygroscopic	Hygroscopic



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## Certificate of Analysis

Product Name:

Lipopolysaccharides (rough strains) from Escherichia coli F583 (Rd mutant)

**Product Number:** L6893  
**Batch Number:** 042M4093V  
**Brand:** SIGMA  
**Storage Temperature:** Store at 2 - 8 °C  
**Quality Release Date:** 26 MAR 2012  
**Recommended Retest Date:** MAR 2015

Test	Specification	Result
Appearance (Form)	Lyophilized Powder	Lyophilized Powder
Appearance (Colour)	White to White w/ Yellow Cast	White
Solubility (Solvent)	Water	Water
Solubility (Conc)	4.90 - 5.10 mg/ml	5.00 mg/ml
Solubility (Turbidity)	Slightly Hazy to Turbid	Hazy
Solubility (Color)	Colorless to Faint Yellow	Colorless
Protein Content (Method)	Lowry-TCA	Lowry-TCA
Prot. Content (% Protein)	≤ 3.00 %	2.80 %
Potency (Sample EU/mg)	≥ 500000 EU/mg	600000 EU/mg



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## Certificate of Analysis

Product Name:

Lipopolysaccharides (rough strains) from Escherichia coli EH100 (Ra mutant)

**Product Number:** L9641  
**Lot Number:** 071M4120V  
**Brand:** SIGMA  
**Storage Temperature:** Store at 2-8 DEGREE C  
**Quality Release Date:** 21 JUN 2011  
**Recommended Retest Date:** JUN 2014

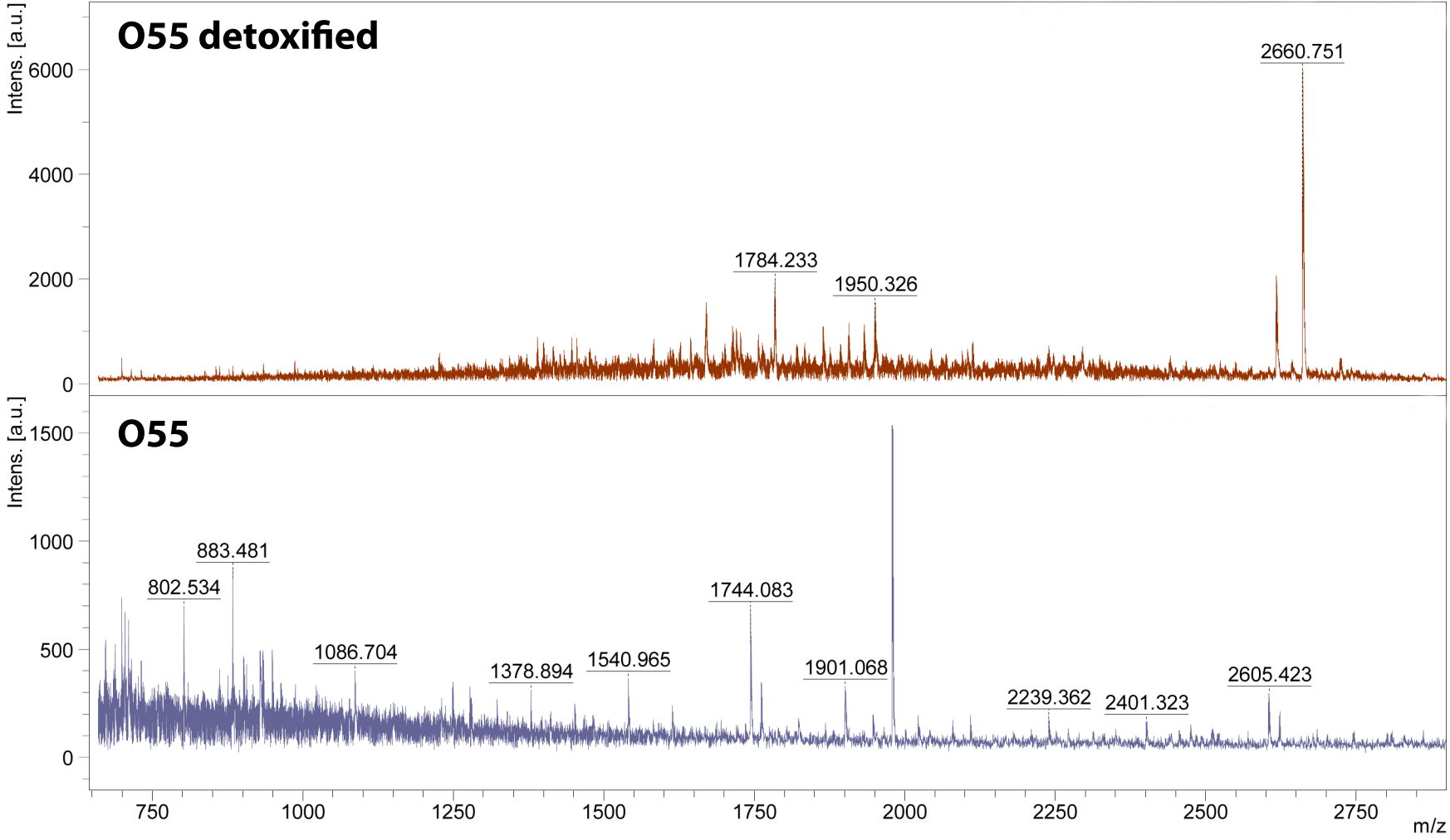
Test	Specification	Result
Appearance (Form)	Lyophilized Powder	Lyophilized Powder
Appearance (Colour)	White to Light Yellow/Tan	Off-White
Solubility (Solvent)	Water	Water
Solubility (Conc)	1.90 - 2.10 mg/ml	2.00 mg/ml
Solubility (Turbidity)	Faint Hazy to Hazy	Slightly Hazy
Solubility (Color)	Colorless to Faint Yellow	Colorless
Protein Content (Method)	Lowry-TCA	Lowry-TCA
Prot. Content (% Protein)	≤ 3.00 %	2.42 %
Potency (Sample EU/mg)	≥ 500000 EU/mg	1200000 EU/mg



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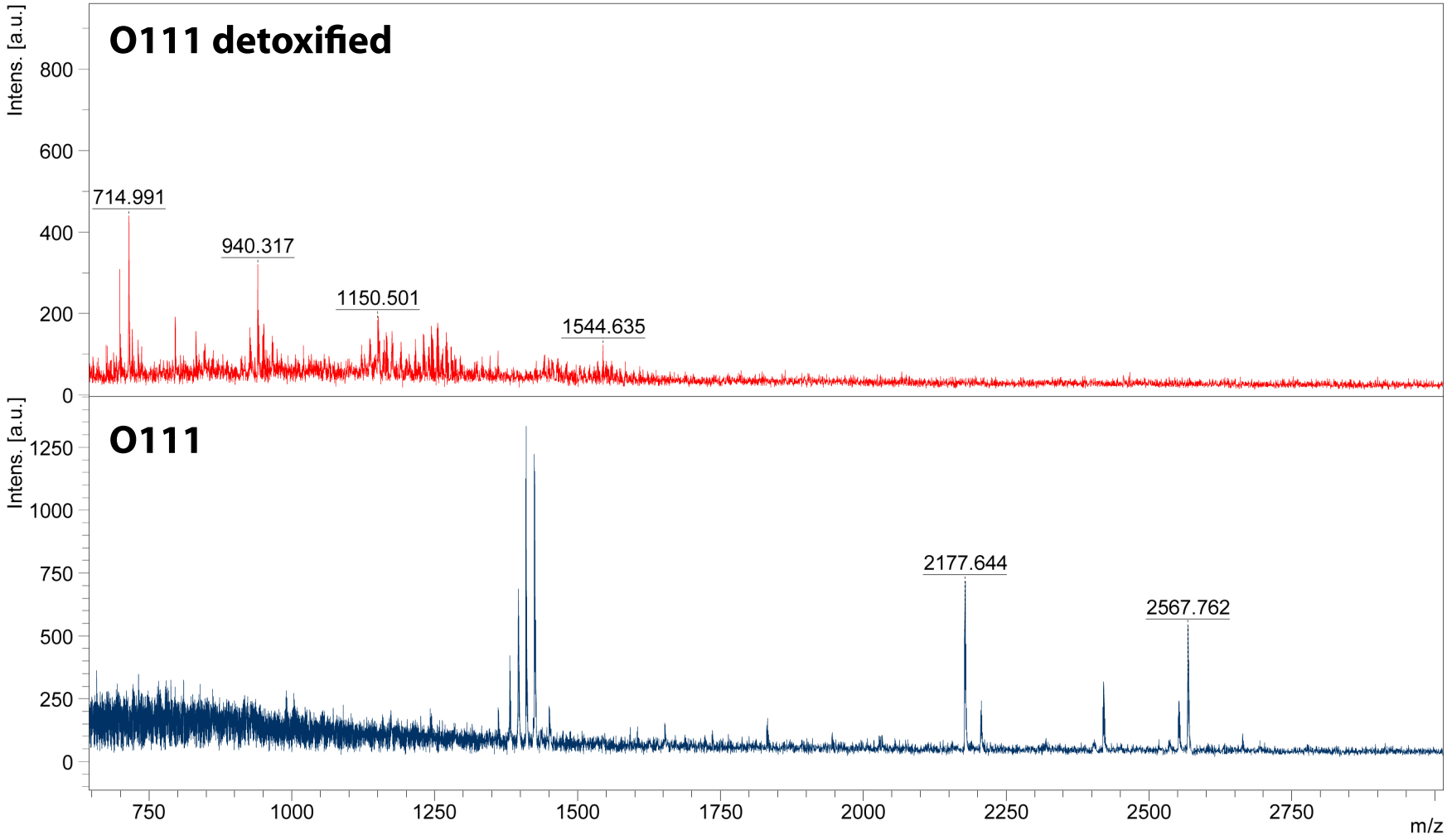
Comment 1  
Comment 2



m/z	S/N	Area
802.534	3.1	208
883.481	3.8	297
1086.704	2.1	139
1248.791	1.9	118
1378.894	2.2	109
1540.965	3.0	133
1744.083	6.0	742
1901.068	3.5	180
1979.252	18.0	1876
2239.362	1.4	73
2401.323	2.3	75
2605.423	4.2	145



Comment 1  
Comment 2



m/z	S/N	Area
699.002	5.5	61
714.991	7.9	81
940.317	5.6	73
1150.501	3.4	43
1216.529	2.6	37
1254.535	3.2	49
1270.518	3.0	36
1544.635	2.8	21